THE UNIVERSITY of ADELAIDE

Banking Regulation and Corporate Governance

An Empirical Study of Chinese Banks

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ABSTRACT

Although there is an increasing research interest in banking capital requirements, the impact of the China Banking Regulatory Commission (CBRC) banking regulation on Chinese commercial banks' behaviors has not been fully explored. Even though CBRC banking regulation has tremendously improved the capital adequacy ratio, on average, for Chinese commercial banks in recent years, the question of whether and how different types of banks in China have reacted to constraints placed by the regulator on their capital has not been empirically tested in the literature for Chinese cases.

This overarching research problem, which forms the foundation of this doctoral research project, gives rise to three important research questions. First, do different types of banks in China react differently to capital requirements in terms of capital adequacy level, i.e. do state-owned banks, joint-equity banks, local banks, and foreign banks behave the same in their capital ratio when adhering to changes in capital requirements? Second, do Chinese banks differ in their ability to adjust risk, i.e. do different types of banks simultaneously adjust their capital and risk due to the influence of binding capital requirements? Third, do corporate governance factors jointly work with banking regulation in explaining Chinese banks' risk behaviors, i.e. does corporate governance have significant impact on the banks' risk level and affect the relationship between change in capital and change in risk? These three issues correspond to the three gaps found in the extant literature on the CBRC regulation, also in the strand of empirical studies focusing on the role of capital standards for regulating banks' behavior. To explore these research questions, this research tries to provide extensive

empirical evidence from three interrelated projects, each with a unique contribution to informing the research topic.

These closely related, investigative components jointly provide consolidated answers to the three research questions proposed previously. In response to the first research question, I show that regulation does affect all banks in the way they adjust their capital levels, although the degree to which this occurs does vary. Specifically, regulation has a stronger positive influence on capital ratios for unlisted banks, joint-stock banks and foreign banks, but a relatively weaker, positive influence on the capital ratios of the 'Big 5' banks, and local banks (i.e. city and rural commercial banks). With respect to the second question, I find that regulation does not have any impact on the risk ratio for banks where the state is the largest shareholder; it only has the expected and negative effect on risk levels for predominately non-state owned banks and unlisted banks (which primarily are the local and rural commercial banks). Therefore, banks with a large degree of state ownership still face a certain degree of credit risk. As for the last research question, my findings indicate that although corporate governance factors do have expected effects in reducing banks' risk, it is the specific feature of the bank itself that plays a major role in explaining their risk behaviors associated with binding capital requirements.

This doctoral research makes a valuable contribution to the field of the Chinese banking industry. From the theoretical perspective, it fills the significant gaps in the existing banking literature, adopts the specific variables to distinguish Chinese banks' unique character, extends knowledge and theoretical foundations, and identifies important issues which require further investigation. From the practical perspective, it follows

well-established models and applies the complicated estimation technique to show the effects of Chinese banking policy on different types of banks. My empirical results will contribute to the continuously improving the CBRC regulation by providing useful suggestions regarding whether these binding capital requirements have positive influences on commercial banks' performance in terms of capital adequacy level and risk control.

DECLARATION

I, Yishu Fu, certify that this work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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CHAPTER 1: INTRODUCTION

1.1. Background to the Thesis

Significant restructuring within the banking industry has been brought about by the global financial crisis (GFC). Despite government bailouts, many of the traditional, large banks around the world have shrunk in both size and business operations. This has not been the case in China. With its continued economic growth, Chinese banks such as the 'Big 5' banks, have become the largest banks in the new financial environment of the world (The Banker Top 1000 World Banks, 2009). These Chinese banks have, in addition, become the most profitable banks in recent years.

It is unfortunate that despite there being numerous studies on banking behavior among developed countries (Admati et al., 2010; Wilmarth, 2010; Finnerty et al., 2011), there has been very little empirical research focused on the Chinese banking sector. One important reason may be the surprising lack of data. Not until 2001, when China entered the World Trade Organization (WTO) agreement, has data about its banks become available. Another reason may be due to China's unique, fundamental position where state control of assets and the general economy have made it a great deal harder to decipher market dynamics (Allen et al., 2005; Ding, 2000). Further, the China Banking Regulatory Commission (CBRC) only started capital regulation in 2004, when it partially introduced the Basel I & II requirements. Nevertheless, some interesting questions arise from this unique setting. In particular, do different types of banks in China react differently to capital requirements, i.e. do state-owned banks, joint-equity banks, local banks, and foreign banks behave the same

in terms of adherence to changes in capital requirements and their subsequent risk-taking behavior? Moreover, a number of large banks in China are either purely state-owned, or at least have the state as their major shareholder. The Chinese central government, therefore, plays a role both as the owner, as well as the regulator for these banks. This "dual-agency" nature inevitably assigns Chinese banks some unique characteristics. For instance, their senior management staff are appointed by the government and are regarded as government officials (Heilmann, 2005). Despite their poor capital adequacy and high non-performing loan (NPL) levels before and in the early years after WTO entry (Dobson and Kashyap, 2006; Xu and Lin, 2007), they have been seen as government tools and carry out various government policies. Thus, as the state in many cases is the largest shareholder in these organizations, there is a good chance it will influence banks' behavior under a regulatory regime. This is the hypothesis I wish to test.

Additionally, Chinese banks may differ in their ability to adjust capital and risk. On the one hand, mainland Chinese and Hong Kong stock markets have both witnessed an increasing number of listed Chinese banks in recent years. It will be interesting to note whether bank behavior changes dependent on whether it is listed or not, as listing requirements should theoretically provide better public disclosure and practice. On the other hand, the Chinese government has been known to provide seemingly unlimited support (such as capital injections and NPL bailouts) to state-owned banks (Dobson and Kashyap, 2006; Chen et al., 2005). This study, therefore, can have some wide and important implications for investors, bank managers, managed funds, and policy makers in relation to how increased competition, plus tightening regulation, affects the banking sector. Chinese banks are now

important not only for the growth and stabilization of the world, but also in relation to the capitalization of the major stock markets in East Asia.

Finally, board structure may affect banks' response to regulatory capital requirements in China as well. For example, important factors such as board size, proportion of independent directors, CEO duality, CEO tenure in the Chinese two-layer board structure (board directors and their supervisors) may play an important role in firms' decisions in setting their capital level and risk-taking. Political connections, which are part of board structure and CEO characteristics, are also specific in China's context where CEOs and board directors who are well connected politically can get away with many things, including lower capital adequacy and higher risk-taking. However, few studies discuss the impacts of corporate governance on banks' risk decision in regard to the regulation in China.

This overarching research problem forms the foundation of this research project, leading to three important research questions which will be discussed in detail in the next section.

1.2. Research Questions

As previously discussed, I identify three major gaps in the existing literature on banking capital requirements, particularly in the strand of empirical studies focusing on the role of options as a mechanism for trading on information about underlying assets. This leads to the development of three important research questions which this thesis aims to address.

1. Do different types of banks in China react differently to capital requirements in terms of their capital adequacy level, i.e. do state-owned banks, joint-equity banks, local banks, and foreign banks behave the same in their capital ratio when adhering to changes in capital requirements?

This question tries to investigate the varying degrees of regulatory pressure on capital levels for different types of banks, based on the switching regime model. There are a number of advantages to this line of inquiry. First and foremost, given that the CBRC regulation plays an important role in enhancing banks' capital level in China, the issue of examining the varying effects of regulatory pressure on different banks is clearly of great, practical importance. I provide empirical evidence about the effectiveness of the CBRC banking capital regulation, which also has some wide and important implications for investors, bank managers, managed funds, and policy makers. Secondly, this study expands the empirical literature on the Basel Accords, by providing evidence from developing countries rather than that from developed countries. In fact, most existing banking studies are based on the U.S. and European countries. My study contributes to the body of knowledge by providing Chinese evidence, from one of the leading economies of the emerging market. Lastly, my study also relates to the strand of banking papers which examines bank performance and efficiency, as found in the work of Berger et al. (2009), Lin and Zhang (2009). It naturally leads to the second research question which explains how different banks alter their risk when constraints are placed by the regulator on their capital.

2. Do Chinese banks differ in their ability to adjust risk, i.e. do different types of banks simultaneously adjust their capital and risk due to the influence of binding capital requirements?

This question seeks to explore the relationship between capital and risk for different banks. Identifying the connection of simultaneous adjustment in capital and risk is clearly important, because regulation directly influences the banks' capital adequacy level. Thus, my empirical findings in this study will contribute to the existing literature which aims to investigate the effects of regulation on banks' risk via examining simultaneous, adjustment change in capital and change in risk. In particular, I am motivated to empirically study how different types of banks change their portfolio structure, and what implications this has for the ownership structure and banks' performance. It naturally raises the last research question of this research thesis, that of whether corporate governance factors, particularly political ties, affect banks' risk and the correlation between capital and risk.

3. Do corporate governance factors jointly work with banking regulation in explaining Chinese banks' risk behaviors, i.e. does corporate governance have significant impacts on the banks' risk level and affect the relationship between change in capital and change in risk?

This question tries to explain whether and how corporate governance influences banks' risk. Abundant studies investigate the relationship of bank performance and efficiency with their ownership structure. The banks' responses to regulation, which is reflected by their capital and credit risk ratio, are also well examined. However, few studies discuss the impacts of

corporate governance on banks' risk decision with regard to regulation. My study tries to fill the gap in the literature by relating the bank's credit risk behaviours with the corporate governance factors[1]. The variables of interest in this study are political connection and its interaction product terms. I also include two sets of corporate governance variables (Firth et al., 2009) to examine their impacts on banks' credit risk ratio. They are managerial characteristics (CEO experience) and board structure (number of independent directors, CEO duality).

1.3. Research Agenda

1.3.1. An overview of the research design

The three research questions discussed previously pointed to various, interrelated, research issues about the CBRC capital regulation and banks' behaviors, which require further investigation. My thesis follows a traditional style, which tries to explain the major research topic from three different perspectives.

For the first question, I use the disequilibrium model to investigate the varying impacts of the CBRC regulation on different banks. My study tries to evaluate the effects of capital requirements, based on whether banks are well-capitalized or not, whether they are listed or not, etc. Last, my methodology also provides a probability estimation from the switching regime regression which compares regulation force with market force. Regarding the

[1] I am only interested in the impacts of corporate governance on banks' risk level rather than on capital level as the majority of Chinese banks are well-capitalized.

second research question, I use the 3SLS to estimate the simultaneous adjustment in capital and risk. Empirical evidence is derived from the three groups of sub-sample regressions, which separate banks into, (1) listed and unlisted banks, (2) state-owned and non- state-owned banks, and (3) the 'big 5', joint-equity, local and foreign banks. With respect to the last research question, I use the same methodology and the same banks' categories as that used in the second research question. The only difference between the second and the third question is that I try to extend the second question by controlling corporate governance factors.

Thus, three interrelated projects have been conducted and three questions have been examined, each with a unique contribution to the research topic. The following benefits are brought by undertaking a series of questions and investigations in different settings. Firstly, it is easier and more suitable for me to achieve my research objectives. Second, the theoretical and practical implications which arise from the implementation of binding capital requirements in China will be examined in more depth.

1.3.2. An outline of the major research components

This thesis focuses on the three interrelated projects, whose literature, data, methodology and empirical results will be presented in Chapters 2 to 5. This section is devoted to providing a brief description and contribution to each individual research component.

The first project attempts to examine how different types of banks in China respond to regulatory capital constraints in terms of their capital ratios. In fact, the analysis in this

project tries to provide clear evidence about how regulation generates varying effects on different types of banks' capital ratio via a set of interaction product regulation terms. Although there are abundant studies on banks' regulation, it is the first time that the disequilibrium model has been used to provide the differential effects of regulation, which also estimates the probability of each observation belonging to the regulation regime or the market regime. My results indicate the dominance of regulation power which is in line with the general view people have of the banking industry in China as still being, primarily, regulatory driven. This research is related to the second research question since banks usually adjust their capital and risk at the same time according to the theory. Thus, it is natural to expand this research question by checking the relationship between change in capital and change in risk.

The second project tries to examine how different banks change their credit risk when they change their capital due to binding regulation. This work supplements the previous analysis and expands the empirical literature which focuses on the simultaneous change in capital and change in risk from another perspective. Specifically, as it is taken for granted that regulation is the driving force for the improvement in capital level for Chinese banks, the change in risk which is caused by the change in capital, would be automatically regarded as the transmission effects from the regulation. Thus, not only do my results offer some direct evidence showing that regulation does have significant impacts on banks' risk which vary with different types of banks, my results further enhance the empirical results from the first research project by suggesting that banks' ownership structures and their idiosyncrasies play an important role in explaining banks' behaviors. In addition, the investigation of

Chinese regulation on banks' capital and risk in these two projects provides some useful insights and practical implications for regulatory bodies and policy makers.

The third project seeks to find the effects of corporate governance variables on banks' risk level and, relationship between banks' capital adequacy and their risk level. The previous two research projects look at the differential impacts of regulations on banks' capital and risk in relation to ownership structure. Hence, a natural extension in addition to ownership structure will be to investigate whether and how board structure affects banks' response to regulatory capital requirements. As mentioned previously, there are many studies which investigate the relationship of bank performance and efficiency with their ownership structure. Moreover, the banks' responses to the regulation, which is reflected by their capital and credit risk ratio, are also well examined. However, few studies discuss the impacts of corporate governance on banks' risk decision confronting regulation changes, based on the simultaneous adjustment in capital and risk. Thus, I believe my study will contribute to the literature by examining whether and how corporate governance factors affect the bank's credit risk behaviours for different banks.

1.3.3. Some highlights of the research methodology

This sub-section briefly discusses the different statistical models used in each project. It also covers how the distinct features of each model would facilitate the way of addressing the research questions of interest in each project. Notice that I primarily use two important empirical models in this thesis which are carefully selected, depending on the attributes of the variables and the research questions that need to be investigated in each project. The

details of the specific statistical models employed in each project and how I derive the final version based on the original models for the purpose of my study will be explained in Chapter 4.

The first set of system equations focuses on the differential effects of regulation on banks' capital. I conduct this project by using the disequilibrium models, which consist of the regulation model and the market model. I then estimate these two models simultaneously through switching regime regression. Not only do my results provide the estimated coefficients for the variables of interest, they also show the probability of each observation coming from either the regulation regime or the market regime. The second model series tries to identify the relationship between capital and risk, as well as corporate governance impacts on banks' risk. I use the 3SLS to get efficient estimations for these system equations.

1.4. Thesis Outline

This subsection gives a brief introduction about the overall structure of this thesis before I move on to the details of the three research projects undertaken. This thesis is organized into 6 chapters. Chapter 1 outlines the research background, key research questions and detailed research agenda. Chapter 2 provides the literature review, including bank reform and capital regulation in China, the regulatory capital requirements and the market capital requirements, and bank ownership and performance. Chapter 3 describes some characteristics I found in the Chinese data, which will be presented in the format of tables and figures. Chapter 4 discusses the models and methodology I follow and use in this study.

Chapter 5 presents the key findings for the three research questions and discusses their important political and practical implications. Chapter 6 consolidates these projects, discusses the key findings and explains how these findings contribute to informing the research questions. This chapter also discusses the contributions of this thesis in terms of theory and practice. In addition, it states the limitations associated with the whole research project and points out the directions for future research.

CHAPTER 2: LITERATURE REVIEW

This chapter will provide the detailed background information about financial markets in China and the relevant literature review in banking research. Section 2.1 discusses bank reform and banking capital regulation development in China. Section 2.2 outlines the literature on regulatory capital requirements and market capital requirements for financial institutions. Studies on corporate governance in banking are covered in Section 2.3.

2.1. Bank Reform and Capital Regulation in China

Ever since the Open Door Policy in 1978, China has broken down its entirely state controlled banking system through the establishment of various financial institutions. The reform of the Chinese banking system is primarily about the 'Big 5' state-owned, commercial banks. They are the Industrial and Commercial Bank of China (ICBC), the Agricultural Bank of China (ABC), the Bank of China (BOC), the China Construction Bank (CCB) and the Bank of Communications (BOCM). Generally speaking, the process of reform can be divided into three stages (Wen, 2010).

2.1.1. Bank reform in China

2.1.1.1 State specialized banks: 1978 to 1994

Prior to the political and economic reform of China in 1978, there was only one bank, the People's Bank of China (PBOC), which not only functioned as the central bank, but also settled various types of banking business as a commercial bank. At that time, all the

banking system was administrated by the PBOC, which was defined as a mono-bank system (Aoki et al., 1994). However, in order to meet the needs of reform and opening up, the central government decided to make the PBOC specialize in the function of a central bank rather than carrying out commercial banking business in PBOC. In January 1984, the Industrial and Commercial Bank of China (ICBC) was established. The business credit and savings were then allocated from the PBOC to the ICBC. The ICBC, together with the ABC (which was re-established in 1979), the CCB and the ABC, became known as the 'Big 4' state specialized banks. From that time, China built a specialized banking system. Reform in this stage marked the end of the single bank system which had lasted for decades.

2.1.1.2 State-owned commercial banks (SOCBs):1994 to 2003

During March and April 1994, three policy banks were founded in order to separate policy-oriented financial services from the state specialized banks, which marked the establishment of the basic framework for the policy bank system. In March 1995, 'The People's Republic of China Commercial Bank Law' was promulgated and implemented, which legally established the status of the PBOC as the central bank, and the 'Big 4' as state-owned commercial banks (SOCBs). It also indicated that the 'Big 4' had begun to transform into commercial banks.

Meanwhile, urban and rural credit unions began to merge to form city commercial banks with a key service aim for local economic development, and small and medium enterprises. For instance, in September 1995, the State Council issued the 'Notice on Establishing City Cooperative Banks' and decided to build city cooperative banks with local joint-stock nature, based on the city credit unions in 35 large and medium-sized cities. On the 22nd of

June 1995, the PBOC approved the establishment of the Shenzhen City Cooperative Bank, which was the first city commercial bank in China. This added a new force to finance in China and worked as a stimulus for the construction of the commercial banking system.

With the first, national, financial, work conference held in November 1997, the State Council introduced a series of measures for promoting state-owned banks and financial regulation reform. For example, 270 billion RMB special Treasury bonds were issued by the central government for the purpose of supplementing capital for the 'Big 4'. In addition, 'big four' asset management companies were established[2] to deal with non-performing loans which were separated from the 'Big 4'. On the one hand, the China Securities Regulatory Commission (CSRC) and the China Insurance Regulatory Commission (CIRC) were founded, responsible for the supervision of security firms and insurance firms. On the other hand, the PBOC specialized in supervising banking and trust business. Moreover, the PBOC started the reform of its own organizations: the original provincial branches were cancelled and changed into 9 big regional branches, which enhanced the independence of the monetary policy. In this period, the joint-stock commercial banks grew up and became an important part of the Chinese banking system.

2.1.1.3 State-controlled joint-stock commercial banks: 2003 to now

The second, national, financial, work conference was held in February 2002, which confirmed that the direction of reform was to restructure the wholly state-funded commercial banks by following a modern, financial enterprise, shareholding system. In

[2] They are the China Great Wall Asset Management Corporation, the China Cinda Asset Management Corporation, the China Huarong Asset Management Corporation and the China Orient Asset Management Corporation.

September 2003, the state-owned commercial banks initiated the reform of the shareholding system, and the BOC and the CCB were chosen as the first pilot reform banks. In the following four years, three[3] of the 'Big 4' finished the shareholding system reform and listing procedure. For instance, on the 6th of January 2004, the State Council announced the shareholding system reform for the BOC and the CCB. 45 billion US of foreign reserves were injected by the Central Huijin Investment in order to supplement the capital for these two pilot banks. A comprehensive financial restructuring and corporate governance reform were launched by these two banks in 2004, which marked the stage of reform of state-owned banks being transformed into state-controlled, joint-equity, commercial banks. Meanwhile, the BOCM, the fifth largest stated-owned commercial bank, also participated in the reform process. After the completion of the financial restructuring, the ICBC, the BOC, the CCB and the BOCM were successfully listed in the HongKong and Shanghai stock exchanges before 2008. At the same time, the ABC, the only unlisted, state-owned bank, also underwent this kind of activity and began financial restructuring in 2007.

In order to adapt to this new change, the CBRC decided to regulate the large banks collectively as the 'Big 5[4]'. During this stage, other joint-stock banks, such as the China Merchants Bank, the Shanghai Pudong Development Bank, the Huaxia Bank etc., together with some city commercial banks, were all taking measures to attract investment and to become public listed. At the end of 2012, there were 16 publicly listed banks: 5 large, state-

[3] They are the BOC, the CCB and the ICBC.

[4] The 'Big 5' banks are the five largest, initially completely state-owned, national banks in China. They are the Industrial and Commercial Bank of China (ICBC), the Agricultural Bank of China (ABC), the Bank of China (BOC), the China Construction Bank (CCB), and the Bank of Communications (BOCM). Originally they were classified as the 'Big 4', although from 2006 the BOCM has been generally regarded as part of this group.

owned, commercial banks, 8 medium-sized, national, joint-equity banks and 3 small, city-level, commercial banks.

According to the 2012 annual report from the CBRC, as of the end of 2012, the number of banking financial institutions in China amounted to 3747 with 3.362 million employees. China's banking sector was comprised of 3 policy banks, 5 large, state-owned, commercial banks, 12 medium-sized, commercial banks, 1 postal savings bank, 144 city, commercial banks, 337 rural, commercial banks, 147 rural, cooperative banks, 1927 rural, credit cooperatives, 4 banking assets management companies, 42 locally incorporated, foreign banking institutions, 67 trust companies, 150 finance companies of corporate groups, 20 financial leasing companies, 5 money brokerage firms, 16 auto financing companies, 4 consumer finance companies, 800 village or township banks, 14 lending companies and 49 rural, mutual cooperatives.

2.1.2. Banking capital regulation in China

2.1.2.1 PBOC capital requirement

In the early 1990s, insufficient capital adequacy for Chinese banks was always subject to criticism from developed countries. In 1994, a variety of assessments was applied to commercial banks in China. The Peoples' Bank of China (PBOC) built corresponding standards for different capital ratios. In 1995, the same requirements of capital ratios were reaffirmed by 'Commercial Bank Law'. In 1996, the Chinese government approved a further regulation, which worked out more detailed rules on capital adequacy and the structure of risk weights on different risky assets. Along with the fast pace of growth and

business categories, slowly building up its legal framework in line with the Glass-Steagall Act (1933) between 1995 and 2003, China introduced minimum standards for capital ratios, principally through the PBOC Law (1995 & its 2003 Amendment), and the Commercial Bank Law (1995 & its 2003 Amendment). However, in the beginning, these standards were introduced to Chinese banks just as information rather than compulsory legislation. That is to say, Chinese policy makers did not put these standards into practice until the foundation of the CBRC in 2003. On 28th of April 2003, the CBRC was separated from the PBOC by the Chinese government to supervise the Chinese banking industry as well as enhance the independence of the PBOC monetary policy.

2.1.2.2 Development of the CBRC regulation

Delegated by Articles 21 & 37 in the China Banking Regulation Law (2003), the CBRC can punish banks for failing to follow its prudential regulation by various means, including suspension of banks' business licenses or replacement of banks' senior management. For the purpose of strengthening the supervision of capital adequacy in commercial banks and helping commercial banks operate in a safe and sound manner, the CBRC launched the 'Regulation Governing Capital Adequacy of Commercial Banks' in 2004 to regulate commercial banks within the territory of China, including Chinese-funded commercial banks, solelyforeign-funded commercial banks and Sino-foreign joint-equity commercial banks. Required by the '2004 Regulation', CAR and core CAR for commercial banks should be no less than 8.00% and 4.00% respectively.

In 2006, the CBRC announced the resolution about amendments, based on the '2004 Regulation'. The '2006 Resolution' provides a clear definition for banks' core capital ratio

and adds to the content hybrid capital bonds. In December 2008, the CBRC increased the minimum, regulatory, core capital ratio and total capital ratio for all the banks from 4.00% to 7.00% and from 8.00% to 10.00% respectively. The CBRC enhanced the standard for financial institutions again in December 2009. Nevertheless, it separated the criteria for large-sized from smallandmedium-sized banks for the first time. 11.00% minimum capital ratio requirement was assigned to the 'Big 5' banks while smallandmedium-sized banks kept 10.00% minimum CAR unaltered. In 2010, the CBRC enhanced the threshold for large commercial banks again, requiring that the 'Big 5' public-listed commercial banks have at least 11.5% CAR. In 2012, the CBRC increased the capital level and a minimum 10.5% CAR was imposed on the small and medium-sized commercial banks.

Through various other regulatory decrees and documents, such as the Administrative Rules over Commercial Banks' Capital Adequacy (2004)[5] , the Regulation Rules over Foreign Banks in China (2004)[6] , the Provisional Rules over Risk Evaluation of Joint-Stock Commercial Banks (2004)[7], the Guide of Corporate Governance and Relevant Regulation over State-Owned Commercial Banks (2006)[8] , and the Notice of Capital Adequacy Information Disclosure by Commercial Banks (2009) [9] , the CBRC continuously strengthened capital adequacy requirements. Chinese banks have, since 2003, reported increasing capital ratios. For example, in 2003 only 0.6% of Chinese banks had a minimum

[5] CBRC 2004 No. 2 Decree, Administrative Rules over Commercial Bank's Capital Adequacy, February 23, 2004.
[6] CBRC 2004 No. 4 Decree, Regulation Rules over Foreign Banks in China, July 26, 2004, Article 17.
[7] CBRC 2004 No. 3 Document, Provisional Rules over Risk Evaluation of Joint-Stock Commercial Banks, February 22, 2004 .
[8] CBRC 2006 No. 22 Document, Guide of Corporate Governance and Relevant Regulation over state-owned Commercial Banks, April 24, 2006, Article 20 & 23 .
[9] CBRC 2009 No. 97 Document, Notice of Capital Adequacy Information Disclosure by Commercial Banks, November 7, 2009.

8% capital adequacy ratio (CAR) with the average CAR across the country being -2.98%[10]. By the end of 2011, all commercial banks in China reported a CAR above 8%, the average indicators reaching 12.7% CAR and 10.2% Core CAR[11].

The CBRC, however, has only partially introduced Basel II capital adequacy requirements into the country and redefined risk weights in its regulations (Cai and Wheale, 2009). Although Basel II was implemented by the G-10 countries at the end of 2006, the CBRC mostly followed Basel I in setting banking capital rules in China[12]. One reason is that most Chinese banks were not classified as internationally active banks as defined by Basel II. Furthermore, the domestic banking environment was not mature enough to fully carry out Basle II within the country. In fact, the response of China to Basel II has already been well accepted by the international financial community. Based on the framework of Basel I, the CBRC chooses not to rigidly follow the first pillar (minimum capital requirements). The CBRC only implemented the second pillar (supervisory review) and the third pillar (market discipline), and set down Chinese capital supervisory framework. In fact, postponing the implementation of Basel II and setting new capital regulatory rules not only conforms to the situation in China but is consistent with the Basle Committees' standpoint. The Basel committees support some countries continuing to implement Basel I in the next few years and the committees encourage them to strengthen the second and third pillars.

[10] Historical Breakthrough in Banking Supervision, CBRC Website
[11] Banking Capital Statistics, February 17, 2012, CBRC Website
[12] The major difference with Basel I is that for my sample period Chinese banks do not include operational risk-weighted assets under the CBRC regulation.

In accordance with the 207th executive meeting of the State Council, the CBRC issued the 'Regulation Governing Capital of Commercial Banks (Provisional)' (hereinafter referred to as the Regulation) on 8th of June, 2012. Generally, the Regulation embodies the following requirements. First, the Regulation establishes a multi-layered framework, which is not only in line with the new requirements of international standards but also largely consistent with the current capital requirements. Second, the Regulation clarifies the qualified criteria for various capital instruments and enhances their loss absorbency. Third, the Regulation expands the risk coverage which includes credit risk, market risk and operational risk. Fourth, the Regulation highlights scientific classification and supervision with the proportionality principle. Fifth, the Regulation schedules the possible grace period for capital adequacy ratio to reach the standard. In general, the new capital regulatory framework not only complies with the unified standards of the international, financial, supervision reform but also reflects the objective requirement of promoting prudent operations for the Chinese banking sector and boosting the service capability for the real economy.

2.2. Regulatory Capital Requirements vs. Market Capital Requirements

2.2.1. Theoretical background: the M&M proposition

The starting point for all modern research on capital structure is the Modigliani and Miller (1958) (M&M) proposition. It suggests that, provided the existence of efficient market and the absence of taxes, bankruptcy costs, agency costs, and asymmetric information, the value of a firm is unaffected by its financial structure. The classical thesis, however, argues

that the value of the firm might reach an internal maximum with positive equity in its financial structure if one or more of these excluded conditions were restored. In order to support the idea of an optimal capital ratio for banking institutions, most of the past research on financial institutions contemplate several exceptions to the M&M proposition, such as taxes, costs of financial distress, transactions costs, asymmetric information, and especially regulation (Berger et al., 1995).

Although Miller (1995) argues that these imperfections may not be powerful enough to overthrow the M&M proposition, most papers on this special issue, implicitly or explicitly, take the view that deviations from M&M's frictionless world are important. They have shown that, in these situations, financial institutions may be able to increase their market values by taking on an optimal amount of leverage. Furthermore, an optimal capital ratio may exist in the absence of capital regulation (Berger et al., 1995). Banks with an optimal market capital ratio, lower than the minimum standard are obliged, by regulation, to keep a minimum capital ratio to minimize the social cost from a banking crisis. Nevertheless, this constraint is not binding for banks with optimal capital positions above the regulatory minimum. These two different situations allow banks to be classified into two different regimes: the market regime and the regulatory regime (Berger et al., 1995).

The purpose of introducing M&M theory and its related strand of studies in this paper is to investigate the importance of capital for financial institutions and how market-generated capital requirements differ from regulatory requirements. In the following process, I will examine why markets require banks to hold capital, discuss empirical evidence involved in regulation capital requirements and present some important recent studies about the effects

of stringent capital regulation on banks' performance.

2.2.2. Regulatory capital requirements

Minimum capital is required by regulators in many countries to protect their financial institutions against the costs of financial distress, agency problems and the reduced market discipline resulting from the safety net. It aims to enhance the stability of the financial system by providing a cushion against unexpected losses when banks enter into risky positions so that bank failures can be avoided. Santomero and Watson (1977) investigate factors that determine the socially optimum level of capital especially when regulatory supervision of capital standards is appropriate. The costs associated with bank failures resulting from insufficiently capitalized industry and the costs associated with forced-overcapitalization imposed on the bank and on the society as a whole are presented in their model as two offsetting elements. They argue that capital regulation is a trade-off between the marginal social benefit of the reduction in the risk of the negative externalities from bank failures and marginal social cost of the reduction in the size of the banking industry and the quantity of intermediation.

More capital is typically needed when banks enter into more risky positions. Therefore, banks need to curb their risk-taking behavior under capital constraints. Existing studies generally show that, following the introduction of banking capital regulations, both under-capitalized banks and well-capitalized banks (although these to a lesser extent) increase their capital to asset ratios, despite the uncertainty of changes in their risk levels. However, there is mixed evidence on the impact that capital constraints have on banks' risk-taking

behavior. Work by Kahane (1977) and Koehn and Santomero (1980) (hereafter KKS) represents one strand of the literature that focuses on utility-maximizing banks through the Markowitz two-parameter portfolio approach (such as Pyle, 1971; Hart and Jaffee, 1974) and proposes that more stringent capital regulation may increase the probability of bank failures among risk-averse banks and thus be counterproductive. Koehn and Santomero (1980) argue that the introduction of binding capital ratios leads banks to shift their portfolios into riskier assets and this restructure effect seems more evident with banks initially having more risky assets per unit of capital. Kim and Santomero (1988) suggest that regulators eliminate the risk-shifting incentive by requiring banks to meet risk-related capital ratios. Gennotte and Pyle (1991) further argue that increased capital requirements can result in riskier assets for banks when assuming banks invest in zero NPV assets.

The other strand of the literature claims that capital regulation does reduce risk exposure of the deposit insurance system. Furlong and Keeley (1989) argue that value-maximizing banks prefer to meet higher required capital ratios by raising additional capital rather than selling assets or withdrawing deposits. Keeley and Furlong (1990) find that under a non-zero probability of bankruptcy, it may be inappropriate to follow KKS or to apply the Markowitz two-parameter portfolio model to analyze banks' risk-taking behavior. Rochet (1992) argues capital regulations can be effective for utility-maximizing banks if the weights used to calculate capital ratios are proportional to the systematic risk of the assets. Nevertheless, capital regulation cannot prevent value- maximizing banks from choosing highly specialized and risky portfolios. Based on a three stage least squares (3SLS) model developed by Shrieves and Dahl (1992), Jacques and Nigro (1997) suggest that risk-based

capital standards have a significant impact on capital and risk levels of well-capitalized banks but little impact on undercapitalized banks.

Studies based on European data have also shown mixed results. For example, Ediz et al. (1998) find that British banks enhance their capital ratios primarily through issuing capital rather than reducing highly risky assets. Rime (2001) uses a simultaneous model and finds that capital pressure induces Swiss banks to increase their capital ratios but has no impact on their risk-taking behavior. Heid et al. (2004) discover that German banks with low capital buffers tend to rebuild a sufficient capital buffer by decreasing risk and increasing capital simultaneously. However, banks with high capital ratios prefer to maintain their capital buffer by taking more risks when their capital ratios increase.

2.2.3. Market capital requirements

As for market capital requirements, Berger et al. (1995) define it as the capital ratio that maximizes bank's value in the absence of regulatory capital requirements and all the regulatory mechanisms to enforce them but in the presence of the rest of the regulatory structure to protect its safety and soundness. This market capital ratio differs for each bank and toward which each bank would tend to move in the long run in the absence of regulatory capital requirements. Unlike regulatory requirements, sanctions and penalties for deviating from market capital requirements are two-sided in the way that the value of the bank will decline if it has either too little or too much capital.

Taxes and the costs of financial distress are first considered in determining optimal capital ratios or the market capital requirement. Due to the deductibility in interest payments, firms would substitute debt for equity to obtain higher returns for investors by reducing payments to the government. On the other hand, the increase in leverage also leads to increases in the risk of financial distress. The trade-off between the tax advantages of using additional debt and the increase in the expected costs of financial distress determines the market capital requirement in the presence of these two frictions. In effect, market capital requirements increase when there is a rise in the expected costs of financial distress. Berger (1995) finds empirical evidence supporting this hypothesis. The empirical results reported in his paper indicate a strong, positive relationship between capital ratios and earnings. That is, an unexpected increase in capital tended to be followed by an increase in earnings and vice versa for U.S. banks during the 1980s, a period when there was large exogenous increase in the probability of bank failure and the expected costs of financial distress raised market capital requirements. Regarding the Granger causality from earnings to capital, the results suggest that a significant proportion of the fluctuations in bank earnings are kept as retained earnings. Regarding the positive Granger-causality from capital to earnings, the data are consistent with the expected bankruptcy costs hypothesis that banks which raised their capital towards their new and higher equilibrium are associated with better earnings than other banks through lower interest rates paid on uninsured debt.

Following the discussion of taxes and the costs of financial distress, I turn to the asymmetric information problem and transaction costs. Shareholders have to balance the agency problems, arising from asymmetric information problems, between shareholders and creditors and between shareholders and managers. On the one hand, banks may

optimally increase their capital ratios to avoid the expropriation activities of shareholders and to assure creditors that the bank is safe and shareholder and creditor interests are closely aligned. Flannery (1994) examines the capital structure of financial intermediary firms (commercial banks, thrifts, finance companies, and some insurance companies), which finance themselves by using relatively illiquid, intensively informational securities. He argues that short-term debt is regarded as an unusually valuable, contracting device for banks according to general, corporate, financial consideration. It is because changes in banks' risk could be reflected in financing costs in time which allow banks the freedom to acquire any profitable investment. Furthermore, expropriating creditor's value is worse for long-term debt with difficult redemption in the short term. It is because shareholders have more time to expropriate creditor's value before creditors can react by raising rates or withdrawing credit.

On the other hand, high capital aggravates conflicts of interest between shareholders and managers (Jensen and Meckling, 1976; Grossman and Hart, 1982; Jensen, 1986). Increasing leverage, nevertheless, magnifies the managers' stake in the bank's performance and puts pressure on managers to generate cash flows, avoid loss of human capital from bankruptcy, reduce expense preference behaviors and make better investment decisions. Based on the idea that debt allows investors to generate information and discipline management, Harris and Raviv (1990) develop both static and dynamic models and derive a theory for capital structure. A once-and-for-all choice of debt level is considered in the static model while the evolution of capital structure and net payments to debt holders over time are examined in the dynamic model. In their model, managers are assumed reluctant to liquidate the firm under any circumstances and unwilling to provide information leading to

such an outcome. Consequently, debt is used by investors as a disciplining device to gather information about the firm's prospects and to decide whether to liquidate the firm or continue its operations. In fact, increasing leverage reduces the space for managers to keep the firm operating beyond the level at which shareholders would benefit from liquidation. Thus, shareholder and manager agency conflicts are reduced by using more debts in response to the lower capital ratio. Taken together, the net impact of the asymmetric information problem and transactions costs on market capital requirements is ambiguous.

A regulatory safety net, protecting banks from bankruptcy and the costs of financial distress, will affect market capital requirements as well. According to Berger et al. (1995), the regulatory safety net includes deposit insurance, unconditional payment guarantees, access to the discount window and the complete set of regulation and supervision not explicitly related to capital. The safety net would reduce market capital requirements by isolating banks from potential market discipline, blunting the risk-pricing of uninsured debt if the market believes this debt to be virtually insured and forcing banks to take on less portfolio risk since safer portfolios require less capital to protect against financial distress.

In summary, tax tends to reduce market capital requirements, the expected costs of financial distress tend to raise these requirements, asymmetric information problems and transactions costs may either increase or reduce the capital held in equilibrium, and the safety net tends to reduce market capital requirements as it shields bank creditors from the full consequences of bank risk taking.

2.2.4. Related studies about regulatory forces and market forces

The most related, empirical work regarding distinguishing, regulatory factors from the market factor is the study of Wall and Peterson (1987 and 1995) based on the US data, and the study of Barrios and Blanco (2003) on Spanish commercial banks.

Wall and Peterson (1987) use the market model and the regulatory model to explain how banks set their capital to assets ratio when the authorities establish a minimum capital adequacy regulation and enforce the rule through sanctions and penalties. Both models demonstrate the existence of a desired capital-to-assets ratio and indicate the determinative variables. The market model describes the behavior of firms not affected by regulation because their optimal, market, capital-to-assets ratios are higher than the regulated, capital ratios. In order to justify an optimal, capital structure, this model considers the issues proposed in the banking literature, such as liquidity premium, operating costs associated to deposits and deposit insurance. In contrast, the regulatory model shows the behavior of firms in the presence of regulatory capital requirements. This model incorporates factors such as variance of ROA and growth rate in assets. In fact, regulatory guidelines may encourage banks to maintain capital slightly in excess of the capital requirements. The idea of a capital cushion which serves as a precaution against contingencies is mentioned initially in Wall and Peterson (1987). However, they only provide an intuitive explanation of a capital cushion. This similar framework is also presented in their follow-up study (Wall and Peterson, 1995). However, they limit their analysis to building an empirical model based on factors discussed in previous academic literature and that of their contemporaries.

Barrios and Blanco (2003) jointly test the market and the regulatory model by using disequilibrium, estimation techniques. The original sample consists of the unbalanced, panel data from 76 Spanish commercial banks during the period 1985–1991. In their regulatory model, they show that banks with an optimal ratio below minimum regulation requirements will set the capital cushion whenever the capital ratio is totally stochastic and when there are important sanctions to enforce the capital rule. In this case, banks try to avoid being sanctioned by maintaining this cushion to prevent the stochastic capital ratio from falling below the permitted minimum.

2.3. Literature on Bank Governance and Performance

I will divide this section into 2 parts and present the relevant literature about corporate governance in banking by using evidence from different countries all over the world as well as evidence from Chinese studies. In the first part (Section 2.3.1), I will review some important research studies on the performance effects of corporate governance in banking, including domestic ownership, mergers and acquisitions (M&As), foreign ownership and acquisitions, and state ownership and privatization. In the second part (Second 2.3.2), I focus on corporate governance in China. Some important studies about banks' performance and efficiency will be discussed and provided.

2.3.1. Bank governance and performance

In this subsection, literature about bank governance and performance will be presented and discussed from the following three aspects: domestic ownership and M&As, foreign ownership and acquisitions and state ownership and privatization.

2.3.1.1 Domestic ownership and M&As

Studies on domestic bank governance mainly focus on the performance effects of bank scale or domestic M&As. However, they do not specify the static differences in performance between domestically-owned banks and their foreign-owned or state-owned competitors, if any. Besides, many authors usually conduct their studies using US data.

Generally speaking, studies on the bank cost efficiency using data on US banks during the 1980s find very little scale economies or diseconomies. For instance, on the one hand, Berger et al. (1987) indicate that conventional scale and scope economy measures are insufficient to determine the competitive power of banks that differ in both scale and product mix simultaneously. In order to more accurately capture future sources of competition in banking, apart from the standard ray scale economies (RSCE) and scope economy (SCOPE) measures, their study develops two new and more general multi-product economy measures, which are expansion, path scale economies (EPSCE) and expansion, path subadditivity (EPSUB). The standard RSCE and SCOPE measures examine competition from firms that either have the same product mix or all specialize completely, while the new EPSCE and EPSUB measures study the competitive challenges from firms currently represented in the data. They find slight diseconomies of scale and

product mix for banks, normally on the order of 1 to 3 percent. It might be because of demand-side factors. The empirical results are robust when altering cost and output specifications, organizational levels, and competitive environments. However, such results are different from other banking studies which find scope economies for depository financial institutions. Methodological difficulties might explain this conflict.

On the other hand, data from the 1990s suggests that there may be more cost scale economies compared with that from the 1980s because of technological progress (Berger and Mester, 1997). The study of Berger and Mester (1997) reviews the existing literature on the sources of efficiency of financial institutions and provides new evidence based on a large data set of almost 6000 US commercial banks that were in continuous existence over the six-year period from 1990 to 1995. They focus on three types of sources: (1) different, efficiency concepts, (2) different measurement methods, (3) potential efficiency correlates. First, for the differences in the efficiency concept (the first type of source), three distinct, economic, efficiency concepts (i.e. cost, standard profit and alternative, profit efficiencies) are examined. Since each corresponds to how well a firm performs relative to a different, economic optimization program, each may provide different insights about firm efficiency. As expected, measurement about every efficiency concept does add some independent, informational value. Regarding the impacts of a number of different, efficiency, measurement methods on each of the above mentioned three efficiency concepts (the second type of source), their study uses different measurement techniques, different functional forms and various treatments of output quality and financial capital. In fact, their results based on the above mentioned three efficiency concepts are quite robust and consistent. As for the potential correlates of bank efficiency (the third type of source), a

number of banks, markets and regulatory characteristics are covered in their analysis by using multiple variable and single variable regressions and mixed results are identified.

Next, I discuss the dynamic performance effects linked together with domestic M&As. The empirical evidence on US bank M&As, based on the data from the 1980s, usually indicates little or no cost efficiency improvement after consolidation on average. The study of Berger and Humphrey (1992) investigates the cost efficiency implications of megamergers in the U.S banking industry. Three primary results were presented as follows. First, the ex-ante option of megamerger partners often meets the requirements to improve X-efficiency. Second, on average, megamergers are not very effective in improving cost efficiency in banking in this sample period. Third, the mergers which successfully reduce cost ex- post are not strongly related to the ex- ante conditions theorized to cause such improvements. In a word, they believe that megamergers were not effective, on average, in improving cost efficiency.

However, the empirical evidence using US data from the early 1990s is mixed. Some papers find evidence about cost efficiency gains while others find little evidence on cost efficiency improvement. For instance, Rhoades (1998) analyzes 9 case studies about the efficiency effects of bank mergers, which seem more likely to produce efficiency gains. All 9 mergers lead to substantial cost reduction which is consistent with premerger predictions. Moreover, 4 out of the 9 mergers are clearly successful in improving cost efficiency while 5 are not. Besides, the studies of the European M&As provide mixed cost efficiency evidence as well. For example, Vander Vennet (1996) studies the performance effects of acquisitions and mergers between European Community (EC) credit institutions from 1988-1993 based

on a sample containing 422 domestic and 70 cross-border acquisitions (in total 492 takeovers). Significant increase in the performance of the merged banks is found for the domestic mergers among equal-sized partners. Moreover, cross-border acquisitions are associated with improved cost efficiency.

Last, profit efficiency studies of US bank M&As from the 1980s and early 1990s indicate that M&As could improve profit efficiency which can be associated with portfolio shifts that generate higher revenues because of the improved, risk-expected return frontiers. For example, Akhavein et al. (1997) investigate the efficiency and price effects of mergers by using a frontier, profit function to analyze bank megamergers. They find that mergers help banks to significantly increase their profit efficiency rank compared with other large banks. Improvement primarily comes from increasing revenues, which is the greatest particularly for the banks with the lowest efficiencies prior to merging. It is because they have the greatest space for improvement.

In order to search for evidence of economic motives to exploit improved opportunities for consolidation, Hughes et al. (1999) examine how consolidation may influence the expected profit, profit risk, profit efficiency, market value, market-value efficiencies and the risk of insolvency. The expected profit, the riskiness of profit and profit efficiency are estimated based on a structural model of leveraged, portfolio production. Two additional measures that assess efficiency of the market values for both assets and equity are estimated as well. Their results suggest that banks which participate in interstate expansion, in particular diversifying banks' macroeconomic risk, achieve the greatest economic benefits from consolidation. These banks not only experience apparent gains in their financial

performance, but also benefit society because of the enhanced bank safety that follows from this type of consolidation.

2.3.1.2 Foreign ownership and acquisitions

Studies of the effects of foreign governance typically discuss the static efficiency differences between foreign and domestic private institutions. Efficiency studies in developed nations suggest that foreign institutions are less efficient on average (DeYoung and Nolle, 1996; Berger et al., 2000). The study of DeYoung and Nolle (1996) investigates how and whether technical inefficiency contributed to the low profitability of foreign banks in the US between 1985 and 1990, when the foreign bank market share was expanding rapidly. A modified, profit-based frontier model, which is more stable with respect to the variations in asset size, was employed to generate separate estimates of input (cost) and output (revenue) inefficiency. Their results suggest that foreign banks were significantly less profit efficient than domestic banks because of the higher input inefficiency. Although little discrepancy exists between the two sets of banks in terms of output efficiency, foreign banks had an obvious disadvantage in terms of input efficiency, which is primarily driven by excess expenditures on purchased funds. Berger et al. (2000) examine the causes and outcomes of the cross-border consolidation of financial institutions and its implications for the global financial markets' integration in 5 countries. They find that domestic banks have both higher cost efficiency and higher profit efficiency than foreign banks, which is consistent with the home field advantage hypothesis in the extant literature. However, when their results are disaggregated by foreign nation of origin, their data supports the limited form of the global advantage hypothesis and rejects the home field advantage hypothesis.

However, in developing nations, foreign-owned banks usually appear to be more profitable and efficient than domestically-owned banks on average, which might be due to the superior access to capital markets and the advanced technologies of foreign banks (Claessens et al., 2001; Bonin et al., 2005a; Clarke et al., 2000; Dages et al., 2000).

The paper of Claessens et al. (2001) investigates the extent and effect of foreign ownership in national banking markets based on the bank level data for 80 countries from 1988-1995, with a sample of 7900 observations. Compared with domestic banks, the functioning of foreign banks is quite different. For instance, they find that foreign banks have higher profits than domestic banks in developing countries while the opposite situation holds for developed countries. Bonin et al. (2005a) investigate the impacts of ownership, especially by a strategic foreign owner, on bank efficiency for 11 transition countries based on an unbalanced panel which is composed of 225 banks with 856 observations from 1996 to 2000. Profit and cost efficiency, considering both time and country effects directly, are computed by applying stochastic, frontier estimation procedures. The efficiency measures, along with return on assets to investigate the influence of ownership type, are employed in second-stage regressions. They conclude that foreign banks are more cost-efficient than other private banks and that they provide better service as well, particularly if they have a strategic foreign owner.

Other research studies on the static effects of foreign ownership in developing countries suggest that foreign ownership and entry and fewer restrictions on these banks can stimulate competition for national banking systems (Claessens and Laeven, 2004; Martinez Peria and Mody, 2004). Using bank-level data, Claessens and Laeven (2004) estimate the

degree of competition in 50 countries' banking systems for the period 1994-200?. They show that most banking markets can be classified as monopolistically competitive. Besides, greater foreign bank presence and fewer activity restrictions in the banking sector can lead to more competitive banking systems. Martinez Peria and Mody (2004) analyse the impact of increasing foreign participation and high concentration levels on bank spreads in a sample of developing Latin American countries during the late 1990s. First, they examine the "own effect" of foreign bank presence, which is whether foreign banks could operate at lower spreads, directly benefiting borrowers. Second, they try to identify the extent of influences on the "own effect" due to the foreign bank entry. Third, they study whether a "spill-over effect" exits because of the foreign bank participation. Last, they investigate the impact of bank concentration on bank spreads as well. Their results suggest that foreign banks charge lower spreads and have lower costs relative to domestic banks, in particular for de novo foreign banks. The overall level of system-wide, foreign bank participation appears to affect spreads indirectly, primarily through its influence on administrative costs. Last, the extent of banking system concentration is positively and economically significant and is related to both higher spreads and costs.

Nevertheless, very little evidence is found about the effects of foreign acquisitions on bank performance with respect to the dynamic efficiency of foreign governance. In the study of Peek et al. (1999), foreign acquisitions of United States banks around the time of ownership changes are analysed in order to examine whether the observed poor performance of foreign subsidiaries is due to the changes in business strategy or the pre-existing problems in the target bank. They suggest that many problems already exist at the time of acquisition and foreign banks tend to acquire domestic banks with performance problems. However,

the dynamic effect of these acquisitions is only modestly positive but not strong enough to push the acquired banks performance level to that of its domestic peers.

2.3.1.3 State ownership and privatization

Studies of the effects of state ownership focus on comparing the performance of domestic banks. The main static questions with respect to state ownership generally include credit availability, portfolio allocation and efficiency. For one thing, most static research literature about state ownership focuses on developing countries and almost always finds unfavorable effects (La Porta et al., 2002; Barth et al., 2004; Beck et al., 2004; Berger et al., 2004).

La Porta et al. (2002) investigate the government ownership of financial systems in many countries around the world. They find that countries with higher initial levels of government ownership of banks in 1970 are associated with lower levels of bank development and slower economic growth, indicating the 'political' theories of the effects of government ownership of firms. Based on the unique, cross-country database that can be used to evaluate the interconnected relationships simultaneously, Barth et al. (2004) examine the relationships between specific bank regulation and supervisory practices and bank development, efficiency and stability. Their results, however, propose a warning with respect to government reform strategies that place excessive reliance on direct government supervision and regulation of bank activities. This study emphasizes that regulations and supervisory practices that force accurate, information disclosure and restrict the moral hazard incentives of poorly designed, deposit insurance schemes have positive impacts on bank development, performance and stability.

Beck et al. (2004) analyze how banking market structure influences firms' access to bank finance by using a unique database for 74 countries with firms of different sizes. Their evidence suggests that more bank concentration is associated with more financing obstacles but only in the countries with less developed economies and financial institutions. A larger share of foreign banks and an effective credit registry help to reduce the negative effects of concentration on financing obstacles. Nevertheless, such an effect is aggravated by more controls on banks' activities and more government intervention in the banking sector, as well as a larger share of government ownership.

In addition, a number of studies focus on privatization in developing countries. Some authors conduct cross-country analyses based on the data from the transition nations of Eastern Europe (Bonin et al., 2005 a&b) while others initiate their research by using the crisis nations of East Asia (Williams and Nguyen, 2005). Williams and Nguyen (2005) examine the effect of changes in bank governance on bank performance for a sample of commercial banks operating in South East Asia from 1990 - 2003, a period which was characterized by financial deregulation, the 1997 Asian crisis and substantial bank restructuring programs. Their results try to support the policy of bank privatization and the abolishment of state ownership on an economic basis. They expect that future privatizations would increase the efficiency and productivity for the entire banking industry, although it may take a little time for these gains to be realized. They also expect that foreign acquisition is associated with improved bank efficiency, although the potential benefits of foreign governance may take longer to be realized.

Some research papers about individual nations (Beck et al., 2005a&b; Nakane and Weintraub, 2005; Haber, 2005; Bonaccorsi di Patti and Hardy, 2005) suggest that at least one of the bank performance measures improves after privatization, although some measures fail to show any change. The paper of Beck et al. (2005a) analyzes the transformation of state banks in Brazil after the industry's collapse in 1995, by using an unbalanced panel of 207 banks with quarterly data from January 1995 to September 2003. They describe four options that were employed by the Brazilian state governments for the purpose of transforming their state banks under a special program[13] initiated by the federal government: liquidation, federalization, privatization and restructuring. They find that political, economy theories could explain states' choices best with respect to bank transformation. As states depend more on federal transfers, state-owned banks, which are already under federal administration and are converted into development agencies, are more likely to relinquish control to federal government during the transformation process. These banks perform much better relative to those which still remain state-owned. They argue that significant and positive effects of privatization on banks performance are identified. However, their evidence is less conclusive for the restructured banks.

Beck et al. (2005b) investigate the effect of privatization on performance using an unbalanced panel of 69 Nigerian banks with annual data for the period 1990–2001. They focus on the 9 banks that were completely privatized during this period and which gained remarkable performance improvement from privatization, even in the macroeconomic and regulatory environment that was very inhospitable to true financial intermediation.

[13] This is referred to as the Programa de Incentivo a Reducao do Setor Publico Estadual na Atividade Bancaria (PROES).

Moreover, privatization is useful in narrowing the very wide gap between the performances of government owned banks and privately owned banks in Nigeria. Nakane and Weintraub (2005) examine the privatization experience of roughly 250 Brazilian banks over the period 1990–2001, with a sample of 3958 annual observations. Their purpose is to assess the impacts of major and deep transformations of state-owned banks in total factor productivity. They find that bank size and ownership are important in determining banks' productivity. In particular, state-owned banks are significantly less productive relative to private-owned banks and privatization has a positive impact on productivity.

Furthermore, some research studies examine the dynamic effects of bank privatization in developed nations. Verbrugge et al. (2000) conduct a cross-country study on privatization in OECD countries. They find moderate, performance improvements in terms of the profitability ratios, fee income and capital adequacy, as well as significant declines in leverage. They also find that significant government ownership of banks remains even after privatization and suggest that such substantial, ongoing, state involvement would raise serious problems for establishing market-oriented governance and decision-making systems in the banks. Otchere and Chan (2003) perform a clinical analysis about the impact of the privatization of the Commonwealth Bank of Australia (CBA) on its own performance as well as on its domestic rivals. The primary results are summarized as follows. First, they find that the stock prices of major rival banks reacted negatively to the CBA privatisation announcement, with especially stronger negative reactions to the initial and final privatisation announcements. Second, CBA's long-term stock market performance improved substantially as the government's ownership stake declined. Last, the CBA has not only been very effective in reducing cost and improving its profitability after

privatization but also surpasses its major rivals on almost all the operating performance measures.

2.3.2. Some Chinese evidence

This subsection focuses on corporate governance studies of finance institutions in China. First, I will examine the economic effects of corporate governance in China. Next, I will review the studies about ownership, efficiency and performance of Chinese banks.

2.3.2.1 Economic effects of corporate governance in China

Corporate governance has gained extensive attention in China in recent years. The center of such attention is how China can develop an effective corporate governance system in order to improve the performance of public listed companies and to protect the interests of the minority shareholders (Liu, 2006). The official birth of the Chinese stock market can be dated back to late 1990. As suggested by Pistor and Xu (2005), the Chinese stock market has outperformed the markets in most transition economies in terms of the number of listed firms, market capitalization, liquidity and financing capability. This section will focus on the impact of corporate governance on Chinese firms' valuation, tunneling incentives and profit reporting decisions.

Gompers et al. (2003) suggest that a firm's various, corporate governance practices not only shape its behavior but also influence its stock market and accounting performance. Earlier studies about Chinese firms primarily investigate the relationship between state ownership and firm performance. For instance, Sun and Tong (2003) examine the

performance changes of 634 state-owned enterprises (SOEs) listed on China's two stock exchanges upon share issuing privatization (SIP) between 1994 and 1998. Their finding suggests that SIP is successful in improving SOEs' earnings ability, real sales, and workers' productivity while it is not effective in improving profit returns and leverage. Their results also suggest that state ownership is negatively related with firm performance but legal-person ownership is positively related with firm performance after SIP which implies that legal persons behave differently from the state government. Nevertheless, foreign ownership is not found to have the expected strong, positive impact on firm performance.

Several papers study the effects of other governance mechanisms on Chinese listed firms' performance. Kato and Long (2006) apply the Logit models to examine the link between firm performance and CEO turnover using comprehensive financial and accounting data on Chinese listed firms from 1998 to 2002. The main results are as follows. First, CEO turnover has a significant and negative association with firm performance although the extent of this relationship is modest. Second, the larger the percentage of company shares owned by the largest shareholder, the stronger the CEO turnover-performance link. To that extent, as far as stock performance is concerned, the turnover-performance tie is weakly related with state ownership, positively related with the appointment of independent directors and the listing suspension mechanism, etc. Their findings suggest that any fundamental improvement in China's corporate governance will require an extensive program that incorporates privatization, as well as laws and their effective implementation to provide better protection for investors.

Bai et al. (2004) empirically study the impacts of various, corporate governance mechanisms on the market valuation of publicly listed firms in China. Measures of corporate governance mechanisms and market valuation for all publicly listed firms on the two stock exchanges in China are constructed based on the firm's annual reports. They then examine how corporate governance variables influence the market-valuation variables when controlling for a number of factors commonly used in market valuation analysis. In order to do so, they construct a corporate governance index to summarize the information incorporated in variables which measure various governance mechanisms used by the firms in the most efficient way. Their results suggest that this index has a statistically and economically significant negative effect on market valuation.

Now, I turn to discuss tunneling, that is the actions taken by the controlling shareholders to increase their private benefit at the expense of other shareholders. Tunneling is the central agency problem in large corporations around the world. China also faces the tunneling problem due to weak legal enforcement and corporate governance. Usually, tunneling takes the form of 'connected transactions' in China, which refers to transactions between connected parties. Jian and Wong (2004) try to provide large, sample evidence of opportunistic, related party transactions in China. They find that earnings management and tunneling activities are more evident in group-controlled companies. Moreover, companies belonging to a corporate group engage in more related party transactions since they have incentives to manage earnings either to avoid being delisted or to meet the government's ROE requirements for rights issues. The evidence shows that once the group-controlled listed firms have more free cash flows, they divert resources back to the group through providing the controlling shareholders with generous trade credits. Finally, based on the

results from the Tobin's Q and market-to-book equity, they conclude that the market treats such related lending as tunneling since it discounts these firms' share prices.

Bai et al. (2004) argue that when a listed firm gets into serious financial trouble and is then designated as a special treatment (ST) firm by the regulatory authorities, overwhelmingly favorable market reactions are observed during the two years after being designated a ST. Such highly abnormal, stock market performance reflects the price paid by their controlling shareholder in resources obligation in order to achieve control over the firms and save them. They suggest that firms with a ST status are much more likely to undergo a turnover of the largest shareholder and a change in core business relative to other firms. These results imply that the ST designation may lead to an increase in competition for the control of the firm. Lee and Xiao (2007) suggest that state-owned firms in China prefer to pay cash dividends rather than subscribing to rights offering. Moreover, state-owned companies often increase cash dividend payments soon after rights offerings. Their findings suggest that the controlling shareholders in the state-owned firms use cash dividends as a tunneling devise to sell the non-tradable shares to the minority shareholders at a favorable price.

Firms' profit reporting incentives are directly affected by corporate governance (Liu, 2006). When the managers or the largest shareholders want to expropriate the minority shareholders and tunnel firms' resources, they have the motives to disguise the true performance of the firms they are operating. Aharony et al. (2000) examine the earnings patterns in the process of financial packaging, prior to IPOs in which Chinese state-owned enterprises (SOEs) issued shares to foreign investors. Based on the sample containing 83 completed IPOs between 1992 and 1995, they analyze the behavior of return on assets

(ROA) and selected earnings components in the two years before and the three years after the IPO. They find that medium-sized firms' ROA peak in the IPO year and decrease thereafter. Their results also suggest SOE manager's incentives and opportunities for earnings management differ across industries and listing locations. Chinese firms present strong incentives to 'package' their earnings preceding IPOs.

Chen et al. (2003) analyze the collusion between local government and state-owned enterprises in carrying out earnings management to avoid central government regulation. This study shows that local governments actively engage in earnings management of the listed firms located in their jurisdictional area by offering them fiscal transfer. Such government-assisted, earnings management aims to support the firms to manage accounting earnings to meet the regulation required by the central government.

2.3.2.2 Ownership, efficiency and performance studies for Chinese banks

This subsection presents some empirical papers about the ownership, efficiency and performance of Chinese banks.

Using an unbalanced panel data set for 60 Chinese banks over the 1997-2004 period, Lin and Zhang (2009) assess how the changes in ownership influence bank performance. In particular, they carry out a collective analysis of the static, selection, and dynamic effects of state, domestically private and foreign ownership on bank performance. Regarding the static effects of bank ownership, they show that the 'Big 4' state-owned banks have relatively poorer, long-term performance, on average, than the city commercial banks, domestic joint-stock banks and the newly established Sino-foreign joint venture banks and

wholly foreign-funded banks. Results from the selection effects show that banks that experience a foreign acquisition or public listing have a significantly better performance compared with those that do not, prior to the ownership change. The dynamic effects analysis indicates that the banks that are acquired by foreign firms or get listed are not found to have improvements in their performance after ownership changes, although this is not consistent with previous, similar studies for other countries.

Fu and Heffernan (2007) try to evaluate whether different ownership types and banking reforms affect X-efficiency in the Chinese banking sector from 1985–2002, by using the stochastic frontier approach. They perform a two-stage regression model to identify the significant variables that influence X-efficiency. Generally speaking, banks are observed to operate 40–60% below the X-efficiency frontier. In aggregate, the joint-stock banks are relatively more X-efficient relative to the state banks. It seems that X-efficiency is higher at the first phase of bank reform but experiences a decline at the second phase of bank reform.

Jia (2009) emphasizes the relationship between bank ownership and bank prudential behavior in China by using portfolio allocation data, such as bank excess reserve, loan/asset ratio and deposit/loan ratio, to measure bank prudence. Their data suggests that joint-equity banks tend to have higher excess reserves and deposit/loan ratios, and lower loan/asset ratios which indicates that lending by joint-equity banks is significantly more prudent than lending by state-owned banks. State-owned banks, on the other hand, have conducted fairly efficient reforms and hence are becoming more prudent.

The paper of Berger et al. (2009) tries to predict the effects of banking system reform by analyzing the efficiency of Chinese banks based on 266 annual observations from 1994–2003 of 38 commercial banks in China with different majority ownership (the Big Four, non-Big Four state-owned, private domestic and foreign). They find that the 'Big 4' banks are by far the least efficient while foreign banks are the most efficient and increased, minority, foreign ownership is associated with significantly improved efficiency. Thus, they believe that strong, favorable, efficiency effects can be achieved by reforms which reduce the share of state ownership of banks in China and increase the role of foreign ownership.

Chen et al. (2005) try to identify the change in Chinese banks' efficiency following the program of deregulation initiated by the government in 1995, using 43 Chinese banks from 1993-2000. Their results suggest that medium-sized Chinese banks are less efficient than the large state-controlled banks and smaller banks. The non-parametric DEA cost approach is applied to estimate the cost, technical and allocative efficiency scores for every year. They find that the financial deregulation of 1995 did improve cost, technical and allocative efficiency. Furthermore, deregulation seemed to improve the performance of Chinese banks, especially at the early stage in the deregulated period.

Kumbhakar and Wang (2007) analyze the impact of banking reforms on efficiency and total factor productivity (TFP) change in the Chinese banking industry from 1993-2002. 4 wholly state-owned banks and 10 joint-equity banks with partial or sole private ownership are included in this study. Results from an input distance function indicate that joint-equity banks are more efficient relative to the wholly state-owned banks. Moreover, they find that

both wholly state-owned banks and joint-equity banks operate slightly below their optimal size, suggesting potential advantages in expansion of their businesses. Joint-equity banks experience much higher growth in TFP than the wholly state owned banks. Yao et al. (2008) try to test whether bank efficiency can be raised through ownership reform and foreign competition by using a non-parametric approach on the 15 large commercial banks from 1998-2005. They find clear evidence that Chinese national commercial banks reacted positively and aggressively to ownership reform and foreign competition since their total factor productivity rose significantly by 5.6 per cent per annum over the data period.

2.4. Gaps in Literature

Since the CBRC was established in 2003 and the binding capital requirement became effective in 2004, there are few studies discussing the influences of the CBRC regulation on Chinese banks. Besides, no studies use the corporate governance factors to explain banks' risk. Thus, three main gaps are evident in the existing literature.

First, although abundant studies have been conducted for developed nations, which compare regulation forces with market forces, few studies discuss the binding capital effects for the developing nations due to the data limitation. In this study, I examine the varying degree of CBRC regulation pressure for different types of banks in China, depending on whether banks are well-capitalized or not, listed or not, state-owned or not, etc. Besides, my study also provides the empirical evidence about the comparison of the regulation regime with the market regime.

Second, although many studies examine the simultaneous changes in banks' capital and risk, few studies so far has explicitly tried to evaluate the impacts of CBRC regulation on different types of Chinese commercial banks' risk behaviour. Based on the simultaneous equations, the overall relationship between the changes in capital and risk could help me to identify whether the CBRC regulation is effective in reducing banks' risk. Besides, I also examine the varying ability for different types of banks in adjusting their risk level when adhering to the strict capital requirements.

Last, no study to date has examined the corporate governance factors in explaining banks' credit risk. In this study, I add the corporate governance factors in the risk equation and test whether corporate governance factors have significant impacts on banks' risk level and affect the relationship between banks' capital and risk.

CHAPTER 3: DATA AND DESCRIPTIVE STATISTICS

This chapter provides the data and descriptive statistics used in this research thesis. Section 3.1 presents some information about stock ownership structure for Chinese public-listed banks. Section 3.2 covers the stylized facts of domestic, commercial banks by different types, such as information on asset quality, asset and liability composition, and capital data. Section 3.3 discusses descriptive statistics for the variables used in the following empirical tests. Generally speaking, my sample initially covers all the commercial banks in Mainland China from 2004 to 2011. After filtering out banks that did not report sufficient information[14], I ended up with 58 banks (a total of 190 observations, spaced by bank and year), of which 16 are listed and the remaining 42 unlisted. All data for the first two projects was collected from the Bankscope and the China Stock Market and Accounting Research (CSMAR) databases. The data used in the last project was manually collected from banks' annual reports and some other online information[15], primarily related to the senior executive profile. All the variables are measured on an annual basis, representing the high periodicity for which data is systematically available.

3.1. Stock Ownership Structure of the Public-listed Banks in China

Table 3.1 discloses information about the listed banks' stock ownership structure by different bank types, including data about the percentage of state-owned shares, the top10 shareholding ratio and the Herfindahl_10 index. Among the currently 16 public-listed

[14] I delete the observations with the missing data because these observations could not generate effective empirical results.
[15] This online information is primarily collected from Sina finance, Hexun fiannce and Ifeng finance.

banks, 5 are large state-owned commercial banks (i.e. the 'Big 5'), 8 are medium-sized, national joint-equity banks, and the rest 3 are the city-level, small, commercial banks. Note that, except for the 5 banks[16] which were listed before 2004, 9 out of the 16 banks I examine in this research were listed around 2007. This is simply because of the '2004 Regulation' which requires that all banks should maintain at least 8% CAR. Thus, Chinese banks believe that a direct and effective means to raise more capital is getting listed on the stock exchange. In July and August of 2010, the Agricultural Bank of China and China Everbright Bank got listed on SSE.

In this table, 'state-owned shares' provides the detailed summary information of the proportion of state-owned shares over the total shares for the domestic banks. The 'Top 10' summarizes the descriptive statistics on the top 10 shareholders' shareholding ratios. 'Herfindahl_10 index' is defined as the sum of the square of the top 10 shareholders' shareholding ratios. The effect of this indication is, after shareholding ratios take square, I could observe the 'Matthew Effect'. That is to say, the gap between the square of the larger shareholding ratios and the square of the smaller shareholding ratios is widened. Thus, the Herfindahl_10 index highlights the differences between shareholders' shareholding ratios. The closer the Herfindahl_10 index to 1, the larger the differences among the top 10 shareholders' shareholding ratios. I could conclude that the distribution of the shareholding ratios for the top 10 shareholders is unbalanced if the observed Herfindahl_10 index is greater than 0.25.

[16] They are the China Merchants Bank, China Minsheng Banking Corporate.Ltd, Huaxia Bank, Shenzhen Development Bank and Shanghai Pudong Development Bank.

Table 3.1 Information of stock ownership structure for domestic listed banks

Bank types	Stock ownership structure	Mean	Minimum	Maximum	Median	Std Dev
'Big 5' banks	State-owned shares	0.3537	0.0000	0.8266	0.3339	0.3387
	Top 10	0.9139	0.7268	0.9742	0.9625	0.0974
	Herfindahl_10	0.3322	0.1289	0.5418	0.3167	0.1288
Joint-equity banks	State-owned shares	0.1926	0.0000	0.7405	0.0573	0.2406
	Top 10	0.5247	0.2544	0.9535	0.5003	0.1714
	Herfindahl_10	0.0959	0.0168	0.4299	0.0550	0.1180
Local banks	State-owned shares	0.1209	0.0000	0.2917	0.1638	0.1069
	Top 10	0.5179	0.4450	0.6651	0.4653	0.0895
	Herfindahl_10	0.0478	0.0431	0.0596	0.0475	0.0046

Note: (i) State-owned shares is the proportion of state-owned shares over the total shares for the domestic banks; (ii) Top 10 refers to the shareholding ratios for the top 10 shareholders; (iii) Herfindahl_10 index is defined as the sum of the square of the top 10 shareholders' shareholding ratios.

Table 3.2 General information about asset quality for different types of banks

	NPLTL	NPLTA	LLPTL	LLPTA
'Big 5' banks	2.34%	1.19%	0.57%	0.29%
Joint-equity banks	1.53%	0.89%	0.61%	0.34%
Local banks	2.46%	1.24%	0.79%	0.43%
Foreign banks	0.88%	0.58%	0.26%	0.17%

Note: (i) NPLTL is the ratio of non-performing loans to total loans; (ii) NPLTA is the ratio of non-performing loans to total assets; (iii) LLPTL is the ratio of the loan loss provision over the total loans; (iv) LLPTA is the ratio of loan loss provision over the total assets.

In this study I find that the mean value of the state-owned shares for the 'Big 5' banks ranks the highest among the three types of banks, which is consistent with people's general view that the 'Big 5' banks are state-owned banks. Second, the highest top 10 value explicitly reflects the highly concentrated ownership. Last, the mean value of the Herfindahl_10 index (0.3322) suggests that the distribution of the top 10 shareholders' shareholding ratio is unbalanced.

3.2. Stylized Facts of Chinese Commercial Banks

This subsection provides some stylized facts about Chinese commercial banks by using a set of tables and charts. First, the asset quality for different types of banks is discussed using different indicators. Next, I examine the capital adequacy situation as well as the asset and liability composition.

3.2.1. Asset quality

Table 3.2 briefly summarizes asset quality information by different bank types during 8 years. Local banks are found to have the highest non-performing loan ratios. Moreover, they set up relatively more loan loss provisions compared with other types of banks to cover bad assets, which are reflected by the highest mean value of the ratio for loan loss provision over total loan (or total assets).

Table 3.3 presents more detailed data while Figures 3.1 through 3.4 describe the dynamic trend of asset quality for each type of bank. In general, domestic banks have tried to

decrease the amount of non-performing loans gradually over the last few years. Both the domestic and the foreign banks maintain a relatively stable loan loss provision ratio during my sample period.

Table 3.4 and Figures 3.5 to 3.8 compare the situation of asset quality among different bank types based on different asset quality indicators. First, it is clearly shown from these 4 charts that local banks have the highest non-performing loan ratios as well as the highest loan loss provision ratios. Second, the amount of non-performing loans in domestic banks experiences an obvious decrease during these years. In the case of the domestic banks, I find that local banks experienced a slight increase in non-performing loans in 2010. The possible reason is that the substantial credit expansion in 2009 may have given rise to the increase in doubtful loans in the following years. Apart from this, the huge risk related with local debt attracts increasing attention, which may also be reflected in the increase in bad assets. As for the foreign banks, they encountered a successive increase in non-performing loans from 2008 to 2009. In 2010, a sudden drop in bad loans was identified. However, the bad loan level in 2010 was twice that of the starting year of my sample period (2005). Last, the ratios of the loan loss provision over total loans (or total assets) for my sample banks are maintained at a constant level from 2004 to 2011.

Table 3.3 Mean value of asset quality by bank types (2004~2011)

Bank types	Asset quality indicator	2004	2005	2006	2007	2008	2009	2010	2011
'Big 5' banks	NPLTL	3.98%	3.75%	3.47%	2.64%	2.30%	1.49%	1.12%	1.09%
	NPLTA	2.15%	1.92%	1.72%	1.29%	1.11%	0.78%	0.60%	0.56%
	LLPTL	0.61%	0.55%	0.65%	0.58%	0.77%	0.45%	0.42%	0.56%
	LLPTA	0.32%	0.28%	0.33%	0.28%	0.37%	0.24%	0.23%	0.29%
Joint-equity banks	NPLTL	2.62%	2.24%	3.02%	2.03%	1.29%	0.87%	0.61%	0.66%
	NPLTA	1.65%	1.40%	1.82%	1.12%	0.70%	0.49%	0.33%	0.36%
	LLPTL	0.71%	0.67%	0.64%	0.57%	0.92%	0.37%	0.52%	0.47%
	LLPTA	0.46%	0.42%	0.38%	0.32%	0.50%	0.21%	0.27%	0.25%
Local banks	NPLTL	/	5.06%	2.82%	2.26%	2.11%	2.04%	3.29%	0.53%
	NPLTA	/	2.64%	1.48%	1.25%	1.15%	0.97%	1.34%	0.22%
	LLPTL	/	1.09%	0.79%	0.71%	1.14%	0.68%	0.48%	0.60%
	LLPTA	/	0.58%	0.44%	0.40%	0.62%	0.36%	0.23%	0.25%
Foreign banks	NPLTL	/	/	0.25%	0.04%	0.87%	1.53%	0.60%	/
	NPLTA	/	/	0.20%	0.03%	0.62%	1.00%	0.35%	/
	LLPTL	/	/	0.40%	0.37%	0.42%	0.24%	0.09%	/
	LLPTA	/	/	0.32%	0.25%	0.29%	0.15%	0.04%	/

Note: (i) As part of the data is missing, some descriptive statistics for local banks and foreign banks in some particular years (i.e. year 2004, year 2006 and year 2010) is not available, which is marked by the symbol "/"; (ii) NPLTL is the ratio of non-performing loans to total loans; (iii) NPLTA is the ratio of non-performing loans to total assets; (iv) LLPTL is the ratio of the loan loss provision over the total loans; (v) LLPTA is the ratio of loan loss provision over the total assets.

Figure 3.1 Asset quality: 'Big 5' banks

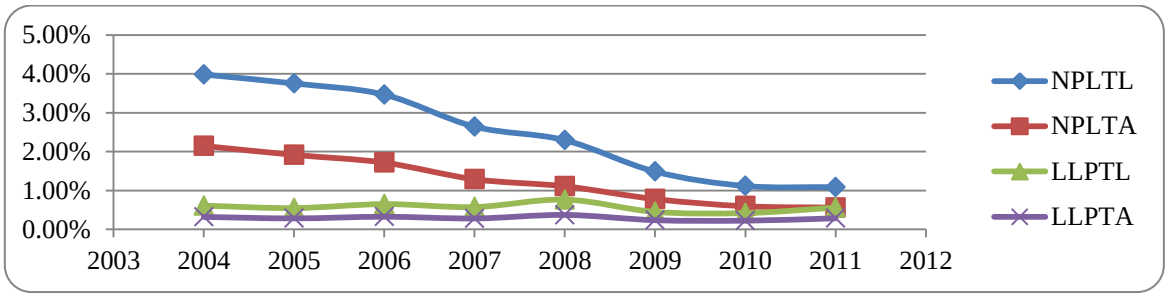


Figure 3.2 Asset quality: joint-equity banks

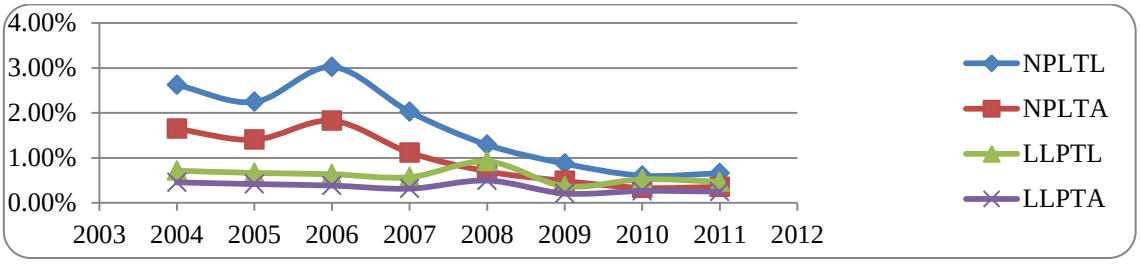


Figure 3.3 Asset quality: local banks

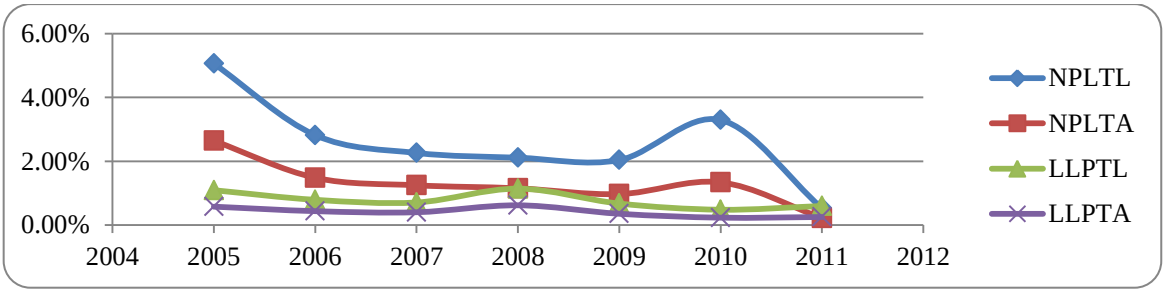


Figure 3.4 Asset quality: foreign banks

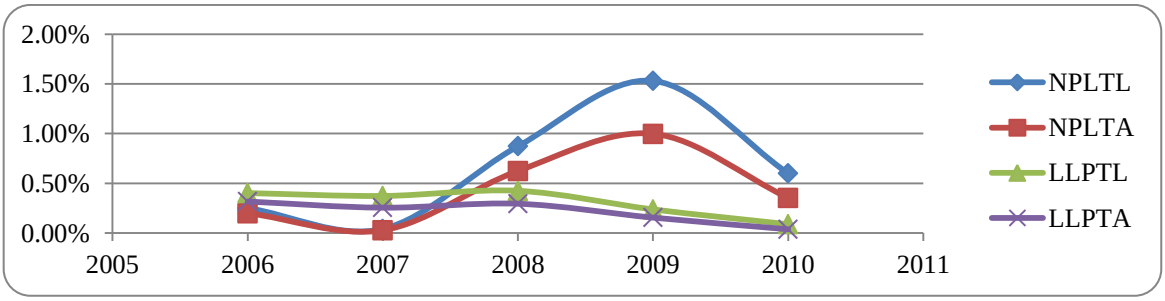


Table 3.4 Mean value of asset quality: different indicators (2004~2011)

Asset quality indicator	Bank types	2004	2005	2006	2007	2008	2009	2010	2011
NPLTL	'Big 5' banks	3.98%	3.75%	3.47%	2.64%	2.30%	1.49%	1.12%	1.09%
	Joint-equity banks	2.62%	2.24%	3.02%	2.03%	1.29%	0.87%	0.61%	0.66%
	Local banks	/	5.06%	2.82%	2.26%	2.11%	2.04%	3.29%	0.53%
	Foreign banks	/	/	0.25%	0.04%	0.87%	1.53%	0.60%	/
NPLTA	'Big 5' banks	2.15%	1.92%	1.72%	1.29%	1.11%	0.78%	0.60%	0.56%
	Joint-equity banks	1.65%	1.40%	1.82%	1.12%	0.70%	0.49%	0.33%	0.36%
	Local banks	/	2.64%	1.48%	1.25%	1.15%	0.97%	1.34%	0.22%
	Foreign banks	/	/	0.20%	0.03%	0.62%	1.00%	0.35%	/
LLPTL	'Big 5' banks	0.61%	0.55%	0.65%	0.58%	0.77%	0.45%	0.42%	0.56%
	Joint-equity banks	0.71%	0.67%	0.64%	0.57%	0.92%	0.37%	0.52%	0.47%
	Local banks	/	1.09%	0.79%	0.71%	1.14%	0.68%	0.48%	0.60%
	Foreign banks	/	/	0.40%	0.37%	0.42%	0.24%	0.09%	/
LLPTA	'Big 5' banks	0.32%	0.28%	0.33%	0.28%	0.37%	0.24%	0.23%	0.29%
	Joint-equity banks	0.46%	0.42%	0.38%	0.32%	0.50%	0.21%	0.27%	0.25%
	Local banks	/	0.58%	0.44%	0.40%	0.62%	0.36%	0.23%	0.25%
	Foreign banks	/	/	0.32%	0.25%	0.29%	0.15%	0.04%	/

Note: (i) As part of the data is missing, some descriptive statistics for local banks and foreign banks in some particular years (i.e. year 2004, year 2006 and year 2010) is not available, which is marked by the symbol "/"; (ii) NPLTL is the ratio of non-performing loans to total loans; (iii) NPLTA is the ratio of non-performing loans to total assets; (iv) LLPTL is the ratio of the loan loss provision over the total loans; (v) LLPTA is the ratio of loan loss provision over the total assets.

Figure 3.5 Asset quality indicator: NPL/Total Loans

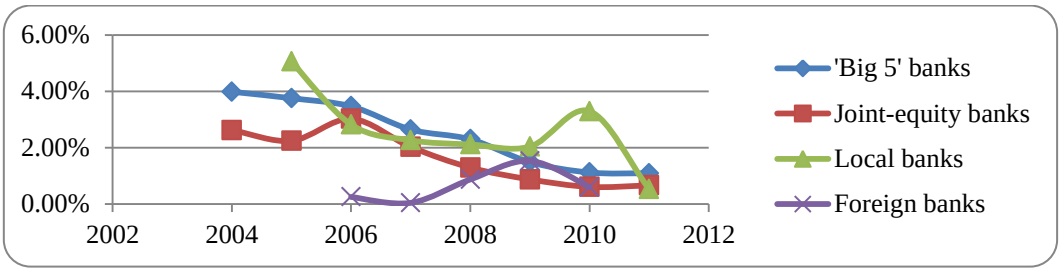


Figure 3.6 Asset quality indicator: NPL/Total Assets

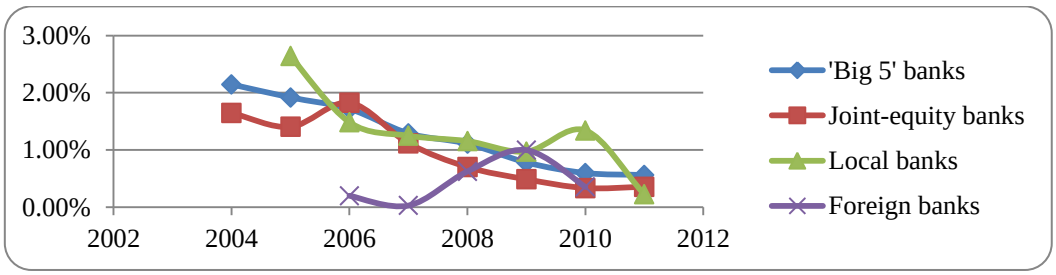


Figure 3.7 Asset quality indicator: Loan Loss Provision/Total Loans

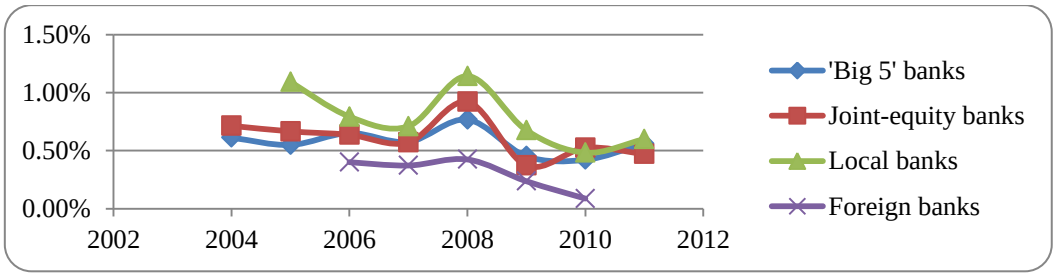
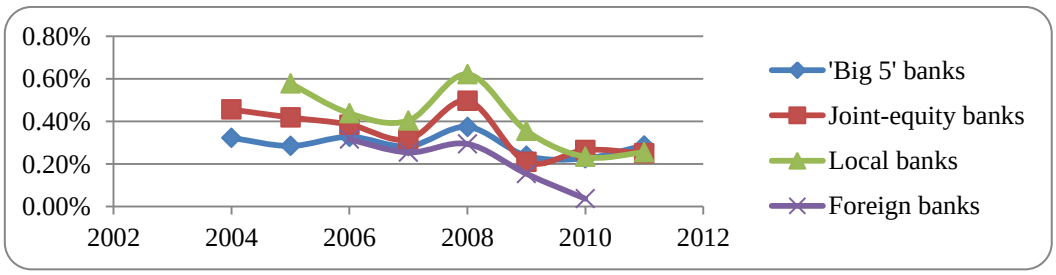


Figure 3.8 Asset quality indicator: Loan Loss Provision/Total Assets



3.2.2. Capital data for Chinese commercial banks (2004-2011)

Table 3.5 presents the average level of excess capital as the percentage of CBRC capital requirement and its standard deviation of my sample banks in this study for the period 2004-2010. On average, all banks have 41.96% excess capital, with some variation across bank types and whether they are publicly-listed (30.62%) or not (48.83%). Unlisted banks tend to be smaller compared to the listed banks and may also be under extra peer pressure to show capital adequacy. As a whole, the role of the central government in the significant capitalization of these banks has been very effective, particularly due to publicly listing bank stock, changing asset and liability rules (such as in 2003 the requirement for banks to include subordinated debt as Tier 2 capital) and encouraging overseas strategic investors to take positions in banks. Table 1 also shows that the level of excess capital is positively related to its volatility, measured by the standard deviation, which supports the buffer theory.

3.2.3. General information of Asset/ Liability structure for commercial banks in China (2004-2011)

Table 3.6 includes information on the general asset and liability structure of the banks by category of their respective ownership composition. Although the quality may vary, the asset and liability compositions of the banks look roughly the same. The difference between bank types is more evident when I examine share ownership. The last column in the table lists the percentage of banks in each category where the central government is the largest shareholder, either directly through shares, or indirectly through a state-owned

enterprise. Most of the unlisted banks have very little state ownership, whilst half of the joint-equity banks and all of the 'Big 5' banks have the state as their major shareholder. Local banks do have local and regional government ownership but not from central government.

Table 3.5 Capital data for Chinese commercial banks (2004-2011)

	excess capital (percentage of required capital)	standard deviation of excess capital
Panel A: Different Types of Banks		
'Big 5' banks	38.06%	0.25
Joint-equity banks	19.72%	0.37
Local banks	39.03%	0.30
Foreign banks	125.58%	0.89
Panel B: Listed & Unlisted banks		
Listed banks	30.62%	0.36
Unlisted banks	48.83%	0.55
All Banks	41.96%	0.50

Source: Bankscope Database and author's calculation.

3.3. Descriptive Statistics of Variables in the Empirical Tests

In this subsection, I try to explain the descriptive statistics of the variables used for the empirical estimations. Tables 3.7 and 3.8 present some information about the variables used in the disequilibrium models and the simultaneous equations for each of the eight sub-periods. Table 3.9 provides information about corporate governance variables.

Table 3.6 General Information of Asset/ Liability structure for commercial banks in China (2004-2011)

	Asset composition			**Liability composition**		**Percentage of banks whose largest shareholder is the State**
	Mortgage Loans Proportion	Other Consumer /Retail Loans Proportion	Corporate & Commercial Loans Proportion	Customer Deposits-Current	Customer Deposits-Term	
Panel A. Different Types of Banks						
'Big 5' banks	6.77%	5.63%	78.81%	51.34%	48.57%	100.00%
Joint-equity banks	8.92%	6.23%	82.39%	47.38%	52.84%	54.55%
Local banks	10.03%	10.60%	81.70%	58.90%	52.90%	0.00%
Foreign banks	8.18%	2.97%	91.42%	42.13%	59.70%	0.00%
Panel B. Listed & Unlisted banks						
Listed banks	8.23%	6.00%	80.21%	49.76%	50.94%	66.67%
Unlisted banks	9.21%	8.55%	84.81%	54.40%	54.25%	1.61%
All banks	8.66%	7.27%	82.57%	52.46%	52.98%	14.29%

Source: Bankscope database and author's calculation.

Table 3.7 Descriptive statistics for the variables in the disequilibrium models

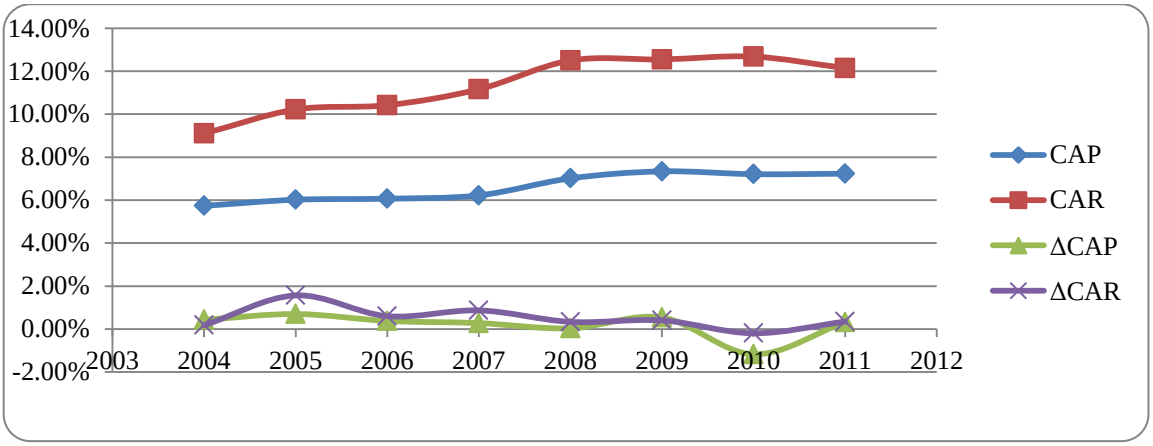
Variables	2004	2005	2006	2007	2008	2009	2010	2011
CAP_t	0.0573	0.0602	0.0607	0.0622	0.0701	0.0734	0.0721	0.0723
CAR_t	0.0910	0.1022	0.1042	0.1116	0.1250	0.1255	0.1268	0.1215
$OPERCOST_t$	0.0128	0.0118	0.0112	0.0113	0.0132	0.0121	0.0118	0.0107
$VARROA_{t-5}$	1.41E-06	4.94E-06	4.47E-06	9.32E-06	1.78E-05	2.36E-05	1.75E-05	5.41E-06
$SIZE_t$ (natural log)	13.4205	12.7420	12.4152	12.2948	12.1313	12.1456	12.6842	15.1729
$RWATA_t$[a]	0.6322	0.5783	0.5825	0.5620	0.5625	0.5742	0.5685	0.5949
$LIQUIDITY_t$[a]	0.6571	0.6419	0.6277	0.5914	0.5803	0.5906	0.5414	0.5551
RA_t[b]	3.7405	3.5853	3.4053	2.6253	2.6584	2.6084	2.2618	1.9264
$LLOSS_t$	0.0073	0.0074	0.0078	0.0056	0.0101	0.0051	0.0047	0.0052
TAX_{t-1}	0.3687	0.4600	0.4946	0.5068	0.4186	0.3175	0.3067	0.3112
REG_t	0.0110	0.0278	0.0272	0.0333	0.0450	0.0260	0.0255	0.0152
$REGU_t$	0.0000	0.0056	0.0030	0.0017	0.0000	0.0005	0.0000	0.0000
$REGUNLIST_t$	0.0000	0.0128	0.0111	0.0150	0.0258	0.0214	0.0213	0.0009
$REGNONSTATE_t$	0.0000	0.0173	0.0152	0.0203	0.0322	0.0237	0.0219	0.0024
$REGJOINT_t$	0.0053	0.0014	0.0032	0.0065	0.0091	0.0016	0.0040	0.0079
$REGLOCAL_t$	0.0000	0.0043	0.0100	0.0161	0.0275	0.0183	0.0133	0.0017
$REGFOREIGN_t$	0.0000	0.0128	0.0052	0.0030	0.0024	0.0044	0.0066	0.0000
$DEPOSIT_t$ (natural log)	13.2930	12.5215	12.1942	12.0203	11.8742	11.8912	12.3882	14.8603
$INTERBANK_t$ (natural log)	9.8635	9.4252	8.9663	8.9513	8.9757	9.1371	10.0228	13.0177
$STDCAP_{t-5}$	0.0081	0.0092	0.0108	0.0096	0.0164	0.0157	0.0159	0.0086
$STDCAR_{t-5}$	0.0271	0.0258	0.0203	0.0252	0.0350	0.0323	0.0260	0.0145
$LATA_t$	0.1695	0.1703	0.1823	0.2261	0.2327	0.2319	0.2831	0.3222

Note: (i) Both RWATA and LIQUIDITY are incorporated in the regressions as the control variables to reflect credit and illiquidity risk in the market model when CAP is the dependent variable; (ii) Only RA is included in the market model when CAR is the dependent variable.

Table 3.8 Descriptive statistics for the variables in the simultaneous equations

Variables	2004	2005	2006	2007	2008	2009	2010	2011
ΔCAP	0.0043	0.0070	0.0038	0.0028	0.0004	0.0054	-0.0117	0.0032
ΔCAR	0.0018	0.0157	0.0060	0.0087	0.0033	0.0040	-0.0019	0.0035
ΔRWATA	0.0490	-0.0322	-0.1804	-0.0400	-0.0051	0.0102	-0.0443	0.0086
CAP_{t-1}	0.0472	0.0443	0.0575	0.0624	0.0718	0.0769	0.1189	0.0691
CAR_{t-1}	0.0829	0.0753	0.0962	0.1066	0.1232	0.1350	0.1407	0.1180
$RWATA_{t-1}$	0.5701	0.6106	0.7707	0.5988	0.5734	0.5665	0.6864	0.5862
REG	0.0110	0.0168	0.0276	0.0366	0.0465	0.0394	0.0372	0.0152
REGU	0.0063	0.0058	0.0055	0.0013	0.0000	0.0004	0.0000	0.0000
ROA	0.0054	0.0054	0.0079	0.0101	0.0110	0.0092	0.0099	0.0124
SIZE	13.4744	12.9798	11.7681	11.2816	11.6695	11.8508	12.4978	15.1729
LLOSS	0.0079	0.0082	0.0074	0.0069	0.0100	0.0053	0.0041	0.0052

Figure 3.9 Capital adequacy level and their variation tendency



As shown in Tables 3.7 and 3.8, Chinese banks have had relatively high capital ratios in the past few years. For example, the average CAR suggests that most of the banks met the CBRC minimum capital requirements from 2004 to 2011.

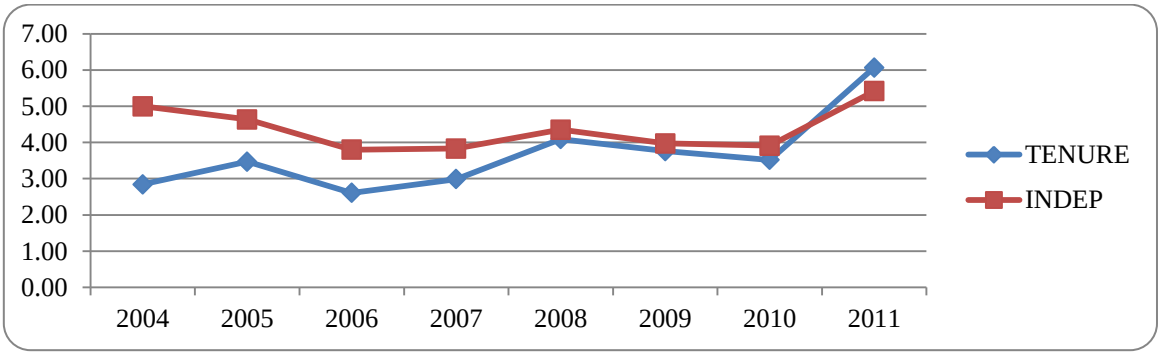
In general, an upward trend is identified for capital ratios (either CAP or CAR) except for year 2010 and 2011, when a slight decline in capital ratios was observed. Specifically, when I look at Table 3.8 and Figure 3.9, which cover the data and draw the dynamic changes in the capital ratios for each year, I find that, the figures for ΔCAR peaked in 2005 and 2007, followed by a decrease in 2010. The possible explanations are as follows. First, as I mentioned before, the '2004 Regulation', which requires banks to maintain at least 8% CAR by the beginning of 2007, places inevitable pressure on the banks' capital level. Accordingly, Chinese banks try to enhance their capital level by IPO, issuing financial securities, introducing foreign strategic investors, obtaining capital injections from the central government, etc. The substantial increase in the capital level is observed for the following years, in particular for the years 2005 and 2007. Since 2007 is the deadline for the banks to meet the minimum capital requirements according to the '2004 Regulation', ΔCAR in 2007 becomes the second highest value during my sample period. A negative value of ΔCAR in 2010 is more than likely due to the rapid credit increase in 2009. The fast speed of the increase in bank assets drags down the average level for the capital ratio.

Moreover, I also notice that banks in China operate at very low ROA. The low profitability of Chinese commercial banks is analyzed and criticized by some authors. Garcia-Herrero et al. (2009) argue that a less concentrated banking system would contribute to increases in bank profitability. Basically, the 'Big 5' large-sized, state-owned commercial banks have been the main drag for the system's profitability. Thus, I believe that the highly concentrated ownership is the main reason for the lower profitability level for Chinese banks.

Table 3.9 Descriptive statistics for corporate governance variables

Variables	2004	2005	2006	2007	2008	2009	2010	2011
ΔCAP	0.0035	0.0032	0.0069	0.0003	0.0013	0.0047	-0.0132	0.0032
ΔRWATA	0.0595	-0.0330	0.0059	-0.0314	0.0043	0.0191	-0.0546	0.0086
CAP_{t-1}	0.0472	0.0488	0.0471	0.0631	0.0628	0.0780	0.1256	0.0691
$RWATA_{t-1}$	0.5620	0.5900	0.5775	0.5859	0.5336	0.5586	0.7106	0.5862
POLCON	0.2500	0.1818	0.4500	0.3667	0.3226	0.3000	0.2353	0.3333
TENURE	2.8438	3.4691	2.6090	2.9893	4.0939	3.7630	3.5168	6.0692
INDEP	5.0000	4.6364	3.8000	3.8333	4.3548	3.9750	3.9118	5.4167
DUALITY	0.0000	0.0909	0.1000	0.0667	0.0323	0.0500	0.0882	0.0000
ROA	0.0058	0.0061	0.0072	0.0098	0.0104	0.0088	0.0094	0.0124
SIZE	13.4150	13.4355	12.6181	12.1748	12.5592	12.2432	12.6806	15.1729
LLOSS	0.0084	0.0074	0.0079	0.0072	0.0099	0.0041	0.0039	0.0052

Figure 3.10 Corporate governance variables and their variation trend



Now, I turn to examine corporate governance variables. Table 3.9 shows the mean value for the political connection (POLCON), bank president experience (TENURE), the number of independent directors (INDEP) and the bank president duality (DUALITY). Figure 3.10 shows the variation of TENURE and INDEP during the sample period, which are used to describe the managerial characteristics and board structure respectively. I find that president experience and the number of independent directors revealed a tendency to increase in general from 2004~2011, although these two variables fell dramatically in 2006 and 2010.

CHAPTER 4: MODEL AND METHODOLOGY

This Chapter provides a detailed explanation of the econometric technique used in this study. Section 4.1 outlines switching regime regression and builds up the regulation model and market model. It also introduces the important regulatory variables and the corresponding interaction product terms for the purpose of this study. Section 4.2 describes the simultaneous model and partial adjustment framework for capital and risk, with the emphasis placed on the relationship between the change of capital and change of credit risk. The last section, Section 4.3 discusses the impacts of corporate governance on commercial banks' risk-taking behaviors, with particular focus on the effects of political factors.

4.1. Regulatory Force verses Market Force

4.1.1. The disequilibrium model

Empirical estimation for markets in disequilibrium was first analyzed by Fair and Jaffee (1972) to investigate the market for housing starts. Methodologies were then improved by Maddala & Nelson (1974) and Goldfeld & Quandt (1975). A General complete disequilibrium model is assumed to consist of one regulatory and one market equation:

$$\mathrm{CAP}_{rj} = \beta_r' \mathrm{X}_{rj} + \mathrm{v}_{rj} \quad (1)$$

$$\mathrm{CAP}_{mj} = \beta_m' \mathrm{X}_{mj} + \mathrm{v}_{mj} \quad (2)$$

$$\mathrm{L}_j = \max(\mathrm{CAP}_{rj}, \mathrm{CAP}_{mj}) \quad (3)$$

The existence of the noted capital cushion is the key of the uncertainty. It is important to notice that CAP_{mj} and CAP_{rj} are not observed; only L_j is observed. X_{mj} and X_{rj} represent the variables that influence CAP_{mj} and CAP_{rj}, respectively. I assume that v_{mj} and v_{rj} are independently and normally distributed with variances σ^2_{mj} and σ^2_{rj} and that they are also serially independent. According to Wall and Perterson (1987), if the L_j is the log-likelihood, then

$$\mathrm{L}_j = \sum_{\mathrm{t}=1}^{\mathrm{n}} \log \mathrm{G}_t \tag{4}$$

$$\mathrm{G}_t\left(\mathrm{L}_j \middle| X_{mj}, \mathrm{X}_{rj}\right) = \mathrm{f}_r\left(\mathrm{L}_j\right)\mathrm{F}_m\left(\mathrm{L}_j\right) + \mathrm{f}_m\left(\mathrm{L}_j\right)\mathrm{F}_r(\mathrm{L}_j) \tag{5}$$

$$\mathrm{f}_r\left(\mathrm{L}_j\right) = \frac{1}{\sqrt{2\pi\sigma_r}} \exp\left(\frac{-\mathrm{h}_r^2}{2}\right) \tag{6}$$

$$\mathrm{f}_m\left(\mathrm{L}_j\right) = \frac{1}{\sqrt{2\pi\sigma_m}} \exp\left(\frac{-\mathrm{h}_m^2}{2}\right) \tag{7}$$

$$\mathrm{F}_r\left(\mathrm{L}_j\right) = \int_{-\infty}^{\mathrm{h}_r} \frac{1}{\sqrt{2\pi}} \exp\left(\frac{-\mu^2}{2}\right) \mathrm{d}\mu \tag{8}$$

$$\mathrm{F}_m\left(\mathrm{L}_j\right) = \int_{-\infty}^{\mathrm{h}_m} \frac{1}{\sqrt{2\pi}} \exp\left(\frac{-\mu^2}{2}\right) \mathrm{d}\mu \text{ and where} \tag{9}$$

$$\mathrm{h}_r = (\mathrm{L}_j - \beta_r' \mathrm{X}_{rj})/\sigma_r \tag{10}$$

$$\mathrm{h}_m = (\mathrm{L}_j - \beta_m' \mathrm{X}_{mj})/\sigma_m \tag{11}$$

Based on the work of Peltzman (1970), Barrios and Blanco (2003) further developed a model for the dynamic behavior of banks in regulatory and market regimes using the following partial adjustment model:

$$(\mathrm{CAP})_{i,t}(\mathrm{R}) = \alpha[\mathrm{R}_{i,t} + \mathrm{H}_{i,t}] + (1-\alpha)(\mathrm{CAP})_{i,t-1} + \tilde{\mathrm{e}}_{i,t},\ \tilde{\mathrm{e}}_{i,t} \rightarrow \mathrm{N}(0, \sigma_{\mathrm{e}}^2) \quad (12)$$

$$(\mathrm{CAP})_{i,t}(\mathrm{M}) = \beta(\mathrm{CAP})_{i,t}^{*} + (1-\beta)(\mathrm{CAP})_{i,t-1} + \tilde{\omega}_{i,t},\ \tilde{\omega}_{i,t} \rightarrow \mathrm{N}(0, \sigma_{\mathrm{w}}^2) \quad (13)$$

where the subscript *i* refers to banks and the subscript *t* refers to time period. α and β are the rate of adjustment coefficients to desired capital-to-asset ratios in the regulatory and market regimes, respectively. $\mathrm{R}_{i,t}$ represents the regulatory pressure for a particular bank at time *t* while $\mathrm{H}_{i,t}$ is the possible capital cushion as a caution against contingencies for the bank. $(\mathrm{CAP})_{i,t}^{*}$ is the expected optimal capital-to-assets ratio under a market regime. Error terms ($\tilde{\mathrm{e}}_{i,t}$ and $\tilde{\omega}_{i,t}$) are assumed to be uncorrelated.

In this paper, I reflect on the impact of Chinese banking regulation on different types of commercial banks' behavior by starting with the following regulatory model (equation 14) and market model (equation 15):

$$\begin{aligned}(\mathrm{CAP})_{i,t}(\mathrm{R}) = {} & \mathrm{a}_0 + (1-\alpha_1)(\mathrm{CAP})_{i,t-1} + \mathrm{a}_1\mathrm{REG}_{i,t} + \mathrm{a}_2(\mathrm{DEPOSIT})_{i,t} \\ & + \mathrm{a}_3(\mathrm{DEPOSIT})_{i,t}^2 + \mathrm{a}_4(\mathrm{INTERBANK})_{i,t} + \mathrm{a}_5(\mathrm{INTERBANK})_{i,t}^2 \\ & + \mathrm{a}_6(\mathrm{STDCAP})_{i,t-5} + \mathrm{a}_7(\mathrm{VARCAP})_{i,t-5} + \mathrm{a}_8(\mathrm{CUBCAP})_{i,t-5} \\ & + \mathrm{a}_9(\mathrm{LATA})_{i,t} + \tilde{\mathrm{e}}_{i,t} \qquad (14)\end{aligned}$$

(if bank i belongs to the regulatory model),

$$(\mathrm{CAP})_{i,t}(\mathrm{M}) = \mathrm{b}_0 + (1-\beta)(\mathrm{CAP})_{i,t-1} + \mathrm{b}_1(\mathrm{OPERCOST})_{i,t} + \mathrm{b}_2(\mathrm{OPERCOST})_{i,t}^2$$
$$+\mathrm{b}_3(\mathrm{VARROA})_{i,t-5} + \mathrm{b}_4(\mathrm{SIZE})_{i,t} + \mathrm{b}_5(\mathrm{SIZE})_{i,t}^2 + \mathrm{b}_6(\mathrm{RWATA})_{i,t}$$
$$+\mathrm{b}_7(\mathrm{LTD})_{i,t} + \mathrm{b}_8(\mathrm{LLOSS})_{i,t} + \mathrm{b}_9(\mathrm{TAX})_{i,t-1} + \sum_t \mathrm{b}_t(\mathrm{YEAR})_t + \widetilde{\omega}_{i,t} \qquad (15)$$

(if bank i belongs to the market model),

4.1.2. Definition of variables for the disequilibrium estimation

I then progressively add and alter interaction dummy terms to the regulatory factor, REG, to capture the impact of regulation on different types of banks. Specifically, I initially test to see whether the regulatory coefficient is indeed significant for my whole sample. I then proceed to examine if there is a difference dependent on whether the banks are under or well-capitalized, whether they are listed or not, whether the state is the largest shareholder for the bank and finally, by splitting the banks into 4 categories of ownership structure.

Table 4.1 summarizes the variables included in the disequilibrium estimation. The dependent variable in both systems is defined as: (1) the total capital to total assets ratio (CAP), (2) the total capital to risk-weighted assets (CAR). The first definition was applied by Shrieves and Dahl (1992) to investigate the relationship between changes in risk and capital. Their study finds a positive correlation between the changes in capital and risk. Rime (2001) also incorporates this capital definition (i.e. ratio of total capital to total assets) in his study to examine the adjustments in capital and risk at Swiss banks, when they get close to the minimum regulatory capital level. However, the second definition has become more popular and many studies (Jacques and Nigro, 1997; Aggarwal and Jacques, 1998;

Ediz et al., 1998; Cannata and Quagliariello, 2006; Saadaoui, 2011) have employed CAR to measure banks' capital since the application of risk-weighted capital standards.

I use bank deposit (DEPOSIT) and its quadratic form ($DEPOSIT^2$), interbank liabilities (INTERBANK) and its quadratic form ($INTERBANK^2$), optimal capital ratio (STDCAP/STDCAR, VARCAP/VARCAR, CUBCAP/CUBCAR) and liquid assets portion (LATA) as control variables. In the market model, I use the operating expense (OPERCOST) and its quadratic form ($OPERCOST^2$), profitability ratio (VARROA), bank size (SIZE) and its quadratic form ($SIZE^2$), measures of banks' risk structure[17] (including credit risk ratio (RWATA) and liquidity ratio (LTD)), asset quality (LLOSS), lagged tax rate (TAX) and year dummies (YEAR) to explain banks' capital level.

4.1.2.1 Definition of variables for the regulatory model

The regulatory model relates CAP/CAR to a set of variables:

(1) CBRC capital regulation: two regulation variables are used in this research study. The first regulatory variable (REG) is defined as the difference between a bank's own CAR and the CBRC capital regulation when CAR is above the CBRC regulatory threshold and 0 otherwise. This variable can have either positive or negative impacts on banks' capital level. REG is interacted with a set of the dummy variables, such as the UNLIST, NONSTATE, JOINT, LOCAL and FOREIGN, in order to examine whether regulation generates the same effects on different types of banks. The second regulatory variable

[17] When CAP is used as the dependent variable, I use both credit risk ratio (RWATA) and liquidity ratio (LTD) in the market model. When CAR is used as the dependent variable, only credit and illiquidity risk ratio (RA), the ratio of risk-weighted assets over the liquid assets, is used as one of the control variables to represent a bank's risk structure.

(REGU) is defined as the difference between the CBRC capital regulation and bank's own CAR when CAR is smaller than the CBRC regulatory threshold and 0 otherwise. I expect this variable to have a positive impact on a bank's capital level.

(2) The First Regulation interaction product term is REGUNLIST: the interaction product term of REG and the dummy variable for the unlisted banks (UNLIST_i). Here, UNLIST equals one if bank *i* is an unlisted bank, and 0 otherwise.

(3) The Second Regulation interaction product term is REGNONSTATE: the interaction product term of REG and the dummy variable for non- state-owned banks ($\mathrm{NONSTATE}_i$). Here, NONSTATE equals one, if bank *i* is not a state-owned bank whose largest shareholder is not the central state or the state-controlled legal entity and 0 otherwise.

(4) The Third Regulation interaction product term is REGJOINT: the interaction product term of REG and the dummy variable for the joint-equity banks (JOINT_i). Here, JOINT equals one if bank *i* is a joint-equity bank, and 0 otherwise.

(5) The Fourth Regulation interaction product term is REGLOCAL: the interaction product term of REG and the dummy variable for the local commercial banks (LOCAL_i). Here, LOCAL equals one if bank *i* is either a city bank or a rural bank, and 0 otherwise.

(6) The Fifth Regulatory interaction product term is REGFOREIGN: the interaction product term of REG and the dummy variable for the foreign banks ($\mathrm{FOREIGN}_i$). Here, FOREIGN equals one if bank *i* is a foreign bank, and 0 otherwise.

Table 4.1 Definitions and expected signs for variables used in the disequilibrium model

Panel A: Regulatory Model		
Variables List	**Definitions**	**Expected Sign**
CAP/CAR	The ratio of total capital to total assets or the ratio of total capital to risk-weighted assets.	
REG	The difference between bank's own CAR and the CBRC capital regulation when CAR is greater than or equal to the CBRC regulatory threshold and 0 otherwise.	/
REGU	The difference between the CBRC capital regulation and bank's own CAR, when CAR is less than the CBRC regulatory threshold and 0 otherwise.	+
REGUNLIST	The interaction product term of REG and the dummy variable for the unlisted banks ($UNLIST_i$). Here, UNLIST equals one if bank *i* is an unlisted bank and 0 otherwise.	/
REGNONSTATE	The interaction product term of REG and the dummy variable for the non- state-owned banks ($NONSTATE_i$). Here, NONSTATE equals one if bank *i* is a non- state-owned bank and 0 otherwise.	/
REGJOINT	The interaction product term of REG and the dummy variable for the joint-equity banks ($JOINT_i$). Here, JOINT equals one if bank *i* is a joint-equity bank and 0 otherwise.	/
REGLOCAL	The interaction product term of REG and the dummy variable for the local commercial banks ($LOCAL_i$). Here, LOCAL equals one if bank *i* is either a city bank or a rural bank and 0 otherwise.	/
REGFOREIGN	The interaction product term of REG and the dummy variable for foreign banks ($FOREIGN_i$). Here, FOREIGN equals one if bank *i* is a foreign bank, and 0 otherwise.	/
DEPOSIT	The natural log of total deposits.	+
$DEPOSIT^2$	Square of the natural log of total deposits.	-
INTERBANK	The natural log of interbank liabilities.	+
$INTERBANK^2$	Square of the natural log of interbank liabilities.	-
STDCAP/STDCAR	The standard deviation of the observed capital-to-assets ratios or capital-to-risk-weighted-assets ratios over the previous five years.	+
VARCAP/VARCAR	Variance of the observed capital-to-assets ratios or capital-to-risk-weighted assets ratios over the previous five years.	-
CUBCAP/CUBCAR	Cube standard deviation of the observed capital-to-assets ratios or capital-to-risk-weighted-assets ratios over the previous five years.	+
LATA	The ratio of liquid assets to total assets.	-
Panel B: Market Model		
CAP	The ratio of total capital to total assets.	
OPERCOST	The ratio of operating costs to total assets.	+
$OPERCOST^2$	Square of the ratio of operating costs to total assets.	-
VARROA	Variance of ROA over the previous five years.	+
SIZE	The natural log of total assets.	/
$SIZE^2$	Square of the natural log of total assets.	/
RWATA	The ratio of risk-weighted assets to total assets.	+
LIQUIDITY	The ratio of net loans to deposit and short-term funding.	+
RA	The ratio of risk-weighted assets to liquid assets.	+
LLOSS	The ratio of new provisions for loan losses to total gross loans.	+
TAX	The lagged ratio of taxes over income.	-
YEAR	Time effects are employed to control for macroeconomic effects	/

Note: (i) RWATA and LIQUIDITY are incorporated in the regressions as the control variables in the market model when CAP is the dependent variable; (ii) Only RA is included in the market model as one of the control variables when CAR is the dependent variable.

(7) Deposit: DEPOSIT is defined as the natural log of total deposits. This variable is employed to indicate that sanctions and penalties which are used to enforce capital rules would have a greater effect on big banks. Thus, I expect a positive impact of DEPOSIT on bank's capital ratio. In addition, their quadratic forms ($DEPOSIT^2$) is included in the regulatory model to capture the non-linear relationship associated with the observed capital ratio.

(8) Interbank liability: INTERBANK is defined as the natural log of total interbank liabilities. Similar to DEPOSIT, INTERBANK is used to indicate that banks with more interbank liabilities are forced to improve their capital to avoid the costs of breaching capital requirements. The quadratic form ($INTERBANK^2$) is included in the regulatory model to capture the non-linear relationship with the observed capital ratio.

(9) Optimal capital ratios: I use the standard deviation (STDCAP/STDCAR) of the observed capital ratio, its quadratic (VARCAP/VARCAR) and cube form (CUBCAP/CUBCAR) over the previous five years to describe their relationship with desired capital ratio based on the simulation exercises.

(10) Liquid assets portion: LATA is defined as the ratio of liquid assets over total assets. A high level of liquid assets portion prevents banks from going bankrupt in the case of temporary, unexpected, deposit withdrawals. Since liquid banks have less demand to enhance capital, the expected sign for this variable is negative.

4.1.2.2 Definition of variables for the market model

In contrast, under the market regime, CAP/CAR is described by another set of variables:

(1) Operating expense: as an indicator of efficiency and probability of bankruptcy, OPERCOST is defined as the ratio of operating costs to total assets. The higher the

operating cost, the higher the banks' demand for capital. Thus, this variable is expected to have a positive effect on banks' capital ratio. Furthermore, its quadratic form ($\mathrm{OPERCOST}^2$) is included in the market model.

(2) Profitability ratio: ROA and ROE are broadly used in academic literature to measure banks' operating performance. Here, I use the variance of ROA (VARROA) over the previous five years to reflect the fact that the greater the dispersion of retained earnings of the bank, the higher the demand of capital level to avoid bankruptcy.

(3) Bank size: SIZE is represented by the natural log of total assets. It may have negative effects on capital levels because larger banks have greater possibilities for diversification and an easier access to the capital markets compared with small banks. However, the "too big to fail" theory would indicate that large banks may have the incentive to take more risks, where this variable can have a positive impact on capital level. Similar to OPERCOST, I incorporate its quadratic form (SIZE^2) to capture the influences on banks' capital position.

(4) Credit risk: RWATA is the ratio of risk-weighted assets over total assets. High levels of credit risk are positively correlated with a high probability of failure and hence, the effect of this variable on the capital ratio is expected to be positive.

(5) Loan-to-Deposit ratio: LIQUIDITY is defined as the ratio of net loan to deposit and short-term funding, reflecting the banks' liquidity. A high level of LIQUIDITY indicates that banks might not have enough liquidity to cover any unforeseen, fund requirements and need more capital to prevent future risk.

(6) Credit and illiquidity risk: RA is defined as the ratio of risk-weighted assets over the liquid assets. This risk structure variable is used as the control variable in the market model when CAR is used as the dependent variable to replace the variables measuring

the credit risk (RWATA) and liquidity risk (LIQUIDITY). Notably, the higher the credit risk associated to loans is, the higher the capital ratio is in order to avoid the bank going bankrupt. Also, a high liquidity could reduce the banks' need for capital. Thus, I expect RA would have a positive effect on a bank's capital level.

(7) Asset quality: as a measure of loan portfolio quality, LLOSS is the ratio of new provisions for loan losses to total gross loans. The effect of this variable on capital should be positive due to the positive relationship between credit risk and bankruptcy probability.

(8) Tax Rate: as a proxy for the tax shield, TAX is defined as the lagged ratio of taxes over income. Because interest on debt is tax-deductible, this tax shield provides an incentive for banks to use more debt rather than using e equity in their financial structure. Thus, I expect this variable to have a negative effect on banks' capital ratio.

(9) Year dummy: time effects (YEAR) are employed to control for macroeconomic variables, such as the changes in interest rates, output, employment.

4.1.3. Probability estimation

The disequilibrium estimation mechanism not only provides the coefficient estimations for both the regulatory and market models but also classifies whether the observations come from a regulation regime or a market regime. The implied probability estimation can be written as follows:

$$(\mathrm{CAP})_{i,t} = \max[(\mathrm{CAP})_{i,t}(\mathrm{R}), (\mathrm{CAP})_{i,t}(\mathrm{M})] \quad (16)$$

Both $(\mathrm{CAP})_{i,t}(\mathrm{R})$ and $(\mathrm{CAP})_{i,t}(\mathrm{M})$ are not observed while only $(\mathrm{CAP})_{i,t}$ can be observed. The existence of the capital cushion is the major reason for such uncertainty. Otherwise, I would treat all observations greater than the regulation minimum as coming from the market regime. Furthermore, according to Gersovitz (1980), the estimated probability of a particular observation $(\mathrm{L_j}, \mathrm{X_{rj,}X_{mj}})$ coming from the regulatory model can be calculated as:

$$\mathrm{P}_{rj}\left(1\middle|\mathrm{L}_j, \mathrm{X}_{rj,}\mathrm{X}_{mj}\right) = \mathrm{f}_r F_m/(\mathrm{f}_r \mathrm{F}_m + \mathrm{f}_m F_r) \tag{17}$$

For every year, eq. (17) is used to predict the probability that each individual commercial bank belongs to the regulatory model. Compared with traditional estimation techniques, the disequilibrium estimation technique provides me with significant advantages for analyzing the impacts of capital requirements. Traditional estimation techniques, including ordinary least squares and linear dynamic panel data, rely heavily on single equation regressions. The basic assumption behind these methodologies is that only one captures all banking institutions' capital decisions. They do not allow regulation-based banks and market-based banks to coexist. However, the disequilibrium estimation overcomes this vital problem, given that it allows for each observation to come from the regulatory regime or market regime without prior information.

4.2. Commercial Banks' Risk Behavior in China

4.2.1. Simultaneous model with partial adjustment framework

In order to show that capital and risk decisions are determined simultaneously, my analysis of Chinese commercial banks' capital behaviour is based on the model developed by Shrieves and Dahl (1992). Two components are included in the observed changes in banks' capital and risk levels in this model:

$$\Delta \mathrm{CAP}_{i,t} = \Delta^{\mathrm{d}} \mathrm{CAP}_{i,t} + \mathrm{E}_{i,t} \tag{18}$$

$$\Delta \mathrm{RISK}_{i,t} = \Delta^{\mathrm{d}} \mathrm{RISK}_{i,t} + \mathrm{S}_{i,t} \tag{19}$$

where $\Delta \mathrm{CAP}_{i,t}$ and $\Delta \mathrm{RISK}_{i,t}$ are the observed changes in capital and risk levels, respectively, for bank *i* in period *t*. The $\Delta^{\mathrm{d}} \mathrm{CAP}_{i,t}$ and $\Delta^{\mathrm{d}} \mathrm{RISK}_{i,t}$ are the discretionary adjustments in capital and risk while $\mathrm{E}_{i,t}$ and $\mathrm{S}_{i,t}$ are exogenously determined factors.

Recognizing that banks may not be able to adjust their desired capital ratio and risk levels instantaneously, $\Delta^{\mathrm{d}} \mathrm{CAP}_{i,t}$ and $\Delta^{\mathrm{d}} \mathrm{RISK}_{j,t}$ are modeled using the partial adjustment framework. Thus, the discretionary changes in capital and risk for bank *i* are proportional to the difference between the target level in period *t* and the observed level in period *t*-1:

$$\Delta^{\mathrm{d}} \mathrm{CAP}_{i,t} = \alpha(\mathrm{CAP}^{*}_{i,t} - \mathrm{CAP}_{i,t-1}) \tag{20}$$

$$\Delta^{\mathrm{d}} \mathrm{RISK}_{i,t} = \beta(\mathrm{RISK}^{*}_{i,t} - \mathrm{RISK}_{i,t-1}) \tag{21}$$

where $\mathrm{CAP}^{*}_{i,t}$ and $\mathrm{RISK}^{*}_{i,t}$ are bank *i*'s target capital and risk levels, respectively.

Substituting equations (20) and (21) into equations (18) and (19), the observed changes in capital and risk can be expressed as:

$$\Delta\mathrm{CAP}_{i,t} = \alpha(\mathrm{CAP}^{*}_{i,t} - \mathrm{CAP}_{i,t-1}) + \mathrm{E}_{i,t} \quad (22)$$

$$\Delta\mathrm{RISK}_{i,t} = \beta(\mathrm{RISK}^{*}_{i,t} - \mathrm{RISK}_{i,t-1}) + \mathrm{S}_{i,t} \quad (23)$$

Thus, observed adjustments in capital and risk in period *t* are a function of the target capital and risk levels, the lagged capital and risk levels and any random, exogenous shocks.

4.2.2. Definitions of capital and risk

Following Rime (2001), I use two definitions of banks' capital, the total capital to assets ratio (CAP) and the total capital to risk-weighted assets ratio (CAR), as the dependent variables in the capital equation for the entire sample regression. Next, I use two regulatory variables (REGU and REG) to represent the regulation impacts on the under-capitalized and well-capitalized banks in a simultaneous system to examine the relationship between change in the capital level and credit risk ratio. As for the follow-up subsample regressions, only the first capital definition (CAP), is employed as the dependent variable in the capital equation.

However, measurement and definition for banks' risk is quite controversial. Though the literature suggests different options, all of them are subject to some weaknesses. For example, value at risk (VAR) is not regarded as a potential measure of credit risk since the data of the sample banks over the period examined is not available (Sudararajan et al., 2001). Following Shrieves and Dahl (1992), Jacques and Nigro (1997), Aggarwal and Jacques (2001), Rime (2001), Godlewski (2005), and Van Roy (2008), I define bank risk-taking (RISK) as the ratio of risk-weighted assets (RWA) to total assets (RWATA). This risk indicator (RWATA) supposes that the risk-weightings correctly reflect the economic risk of the different asset categories. The purpose for using this measure lies in the fact that portfolio risk is principally determined by the allocation of assets across the different risk categories. Nevertheless, the option of credit risk ratio can be criticized since the four risk buckets proposed by the Basel Committee could not fully capture credit risk (Jones, 2000). Thus, RWA could be treated as more of a measure of portfolio composition than of absolute credit risk (Roy, 2005).

4.2.3. Variables affecting changes in capital and changes in risk

Although it is not easy to observe the target capital and risk level of a bank in equations (22) and (23) directly, these targets should depend on some sets of observable variables which describe the bank's financial condition and the state of Chinese economy. I use the bank size (SIZE), profitability (ROA), asset quality (LLOSS), changes in the credit risk ratio (ΔRISK), and year dummies (YEAR) to approximate the target capital to assets ratio (CAP*). In addition , I employ SIZE, LLOSS, changes in the capital to assets ratio (ΔCAP),

and YEAR to proxy the target credit risk ratio (RISK*). Table 4.2 provides the detailed definition of all the variables employed in the simultaneous system.

4.2.3.1 Size

Bank size, measured by the natural log of total assets, is related to both banks' target capital and risk. Size can affect target capital and risk level due to its relationship with risk diversification, investment opportunities and access to equity capital markets.

4.2.3.2 Current profits

Current profits, measured by Return on Assets (ROA), can affect banks' target capital if banks choose to increase capital through retained earnings rather than share offering. In the existence of information asymmetry, equity issues could transmit negative information about the banks' value to the market.

4.2.3.3 Asset quality

Asset quality can affect banks' target risk and this paper uses the ratio of loan loss reserve to total assets (LLOSS) to measure asset quality. LLOSS represents capital that banks set to cover bad loans. Since increases in LLOSS will lead to decreases in the risk-weighted assets, LLOSS has a negative effect in the risk equation potentially.

4.2.3.4 Simultaneous changes in risk and changes in capital

Since banks' capital and risk choices are interdependent, this study uses the simultaneous system to estimate them concurrently. Shrieves and Dahl (1992) claim that the relative importance of the marginal benefits and marginal costs of asset risk and leverage will

decide whether changes in bank risk have a positive or negative relationship with the changes in bank capital. When banks' exploitation of the deposit, insurance subsidy dominates banks' behavior, I should observe a negative relationship between changes in risk and changes in capital and a lasting trend towards lower capital and higher risk levels. However, some combination of leverage- and risk-related cost factors will result in a positive relationship between changes in risk and changes in capital.

4.2.3.5 Year dummy variables

In order to measure the effects of macroeconomic and regulatory shocks in any given year, the simultaneous system includes dummy variables for each year, except 2004 to avoid perfect multi-collinearity.

4.2.4. Empirical specification

With the analysis of the above variables, one can rewrite the model of equation (22) and (23) as follows:

$$\Delta \mathrm{CAP}_{i,t} = \mathrm{c}_0 + \mathrm{c}_1(\mathrm{ROA})_{i,t} + \mathrm{c}_2(\mathrm{SIZE})_{i,t} + \mathrm{c}_3(\Delta \mathrm{RWATA})_{i,t} - \mathrm{c}_4(\mathrm{CAP})_{i,t-1} + \sum_t \mathrm{c}_t(\mathrm{YEAR})_t + \varepsilon_{1i,t} \quad (24)$$

$$\Delta \mathrm{RWATA}_{i,t} = \mathrm{d}_0 + \mathrm{d}_1(\mathrm{LLOSS})_{i,t} + \mathrm{d}_2(\mathrm{SIZE})_{i,t} + \mathrm{d}_3(\Delta \mathrm{CAP})_{i,t} - \mathrm{d}_4(\mathrm{RWATA})_{i,t-1} + \sum_t \mathrm{d}_t(\mathrm{YEAR})_t + \mathrm{v}_{1i,t} \quad (25)$$

where i and t are the bank index and time index, respectively. $\varepsilon_{1i,t}$ and $\nu_{1i,t}$ are Gaussian white noise with zero mean and constant variance. The main emphasis of this model is on the coefficients c_3 and d_3 which test the overall relationship between changes in capital and risk.

Since the right-hand side of both includes an endogenous variable, I estimate the system equations by using three stage least squares (3SLS) in order to get consistent parameters. This allows me to consider the simultaneous adjustments in capital and risk. In addition, 2SLS is asymptotically less efficient than 3SLS as it fails to exploit error correlation across equations.

4.3. Corporate Governance in Chinese Banks

Abundant studies investigate the relationship of bank performance and efficiency with their ownership structure. The banks' responses to regulation, which is reflected by their capital and credit risk ratio, are also well examined. However, few studies discuss the impacts of corporate governance on banks' risk decision to the regulation. My study tries to fill the gap in the literature by relating the bank's risk behaviours with the corporate governance factors. Specifically, I extend this research by adding corporate governance variables. I try to examine whether corporate governance, particularly for political connections, plays a crucial role in determining banks' risk.

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Table 4.2 Definitions and expected signs for variables used in the simultaneous models

Variables List	Definitions	Expected Sign
Panel A: Dependent variables		
ΔCAP/ΔCAR	The difference between the current and the lagged CAP or CAR.	
ΔRWATA	The difference between the current and the lagged RWATA.	
Panel B: Independent variables		
(1) Capital Equation		
ΔRWATA	The difference between the current and the lagged RWATA.	/
CAP_{t-1}/CAR_{t-1}	The lagged CAP/CAR.	-
REG	The difference between bank's own CAR and the CBRC capital regulation when CAR is greater than or equal to the CBRC regulatory threshold and 0 otherwise.	/
REGU	The difference between the CBRC capital regulation and bank's own CAR when CAR is smaller than the CBRC regulatory threshold and 0 otherwise.	/
SIZE	The natural log of total assets.	+
ROA	The ratio of net income to total average assets.	+
YEAR	Time effects are employed to control for macroeconomic variables, such as the changes in interest rates, output, employment, etc.	/
(2) Risk Equation		
ΔCAP/ΔCAR	The difference between the current and the lagged CAP or CAR.	/
$RWATA_{t-1}$	The lagged RWATA.	-
REG	The difference between bank's own CAR and the CBRC capital regulation when CAR is greater than or equal to the CBRC regulatory threshold and 0 otherwise.	/
REGU	The difference between the CBRC capital regulation and bank's own CAR when CAR is smaller than the CBRC regulatory threshold and 0 otherwise.	/
SIZE	The natural log of total assets.	-
LLOSS	The ratio of new provisions for loan losses to gross loans.	-
YEAR	Time effects are employed to control for macroeconomic variables, such as the changes in interest rates, output, employment, etc.	/

4.3.1. Corporate governance affecting changes in risk

In China's specific context, especially in such a relationship-based economy, I expect that political connections may help banks get round the binding capital regulation, by operating with lower capital ratio and higher credit risk. Since I know that most of the banks in China are well-capitalized banks due to the regulation influences, I am only interested in whether and how corporate governance alters banks' risk behaviors.

The variable of interest in this study is political connection. Francis et al. (2009) suggest that politically-connected firms reap significant, preferential benefits during the going-public process. They document that firms with greater political connections enjoy relatively higher offering price, lower under-pricing, and lower fixed costs. Tu et al. (2013) find that politically connected acquirers receive preferential treatment and acquire higher quality firms during the full privatization process. Firth et al. (2009) discover that political connections help firms to obtain bank loans.

Apart from political connections, I am also interested in how banks react to other corporate governance factors. Thus, I employ two sets of corporate governance variables. The first set is related to managerial experience. I use one important characteristic of the president in my model (president experience). The second set of corporate governance variables relates to the salient characteristics of the board. In this study, the board effectiveness is captured by the number of independent directors on the board (INDEP) and president duality (DUALITY). Table 4.3 provides detailed definitions for all the variables employed in the simultaneous system which examines the effects of corporate governance on banks' risk.

4.3.1.1 Political connection

Political connection (POLCON) is a dummy variable which equals 1 when the bank president currently holds or formerly held a position in the government or in the military and 0 otherwise. I expect that political ties tend to increase banks' risk.

4.3.1.2 President experience

President experience (TENURE) is defined as the number of years the president has worked in the top management position in the bank or with previous banks. When a president has worked for the bank for a longer period of time, he may have greater influence on the directors of the board, which may cause negative impacts on the board independence and monitoring effectiveness. On the other hand, people may place more trust in those banks whose presidents have substantial, top management experience. Thus, president experience may have positive or negative effects on banks' risk level.

4.3.1.3 Independent director

Independent director (INDEP) is the number of independent directors on the board. Independent directors are more likely to prevent the top executives from pursuing personal objectives and instead, force management to focus on firm value. Therefore, I expect that independent directors will have positive effects in reducing banks' risk.

Table 4.3 Definitions and expected signs for variables used in the simultaneous models: Corporate governance

Variables List	Definitions	Expected Sign
Panel A: Dependent variables		
ΔCAP	The difference between the current and the lagged CAP.	
ΔRWATA	The difference between the current and the lagged RWATA.	
Panel B: Independent variables		
(1) Capital Equation		
ΔRWATA	The difference between the current and the lagged RWATA.	/
CAP_{t-1}	The lagged CAP.	-
SIZE	The natural log of total assets.	+
ROA	The ratio of net income to total average assets.	+
YEAR	Time effects are employed to control for macroeconomic variables, such as changes in interest rates, output, employment, etc.	/
(2) Risk Equation		
ΔCAP	The difference between the current and the lagged CAP.	/
$RWATA_{t-1}$	The lagged RWATA.	-
POLCON	Political connection equals one when the bank president currently holds or formerly held a position in the government or in the military and 0 otherwise.	+
TENURE	President experience is defined as the number of years the bank president has worked in the top management position in the firm or with previous firms.	/
INDEP	Independent director is the number of independent directors on the board.	-
DUALITY	President duality equals one when the bank president is also the chairperson of the board and 0 otherwise.	+
SIZE	The natural log of total assets.	-
LLOSS	The ratio of new provisions for loan losses to gross loans.	-
YEAR	Time effects are employed to control for macroeconomic variables, such as changes in interest rates, output, employment, etc.	/

4.3.1.4 President duality

President duality (DUALITY) is a dummy variable, which is coded 1 when the president is also the chairperson of the board and 0 otherwise. As the effectiveness of board monitoring will be hindered when the decision making and control is determined by only one

individual, president duality may have negative effects on the banks' behaviors and lead to a higher level of credit risk.

4.3.2. Corporate governance affecting changes in risk

With the analysis of above variables, I can rewrite the model of equation (24) and (25) as follows:

$$\Delta \mathrm{CAP}_{i,t} = \mathrm{e}_0 + \mathrm{e}_1(\mathrm{ROA})_{i,t} + \mathrm{e}_2(\mathrm{SIZE})_{i,t} + \mathrm{e}_3(\Delta \mathrm{RWATA})_{i,t} - \mathrm{e}_4(\mathrm{CAP})_{i,t-1} + \sum_t \mathrm{e}_t(\mathrm{YEAR})_t + \varepsilon_{2i,t} \quad (26)$$

$$\Delta \mathrm{RWATA}_{i,t} = \mathrm{f}_0 + \mathrm{f}_1(\mathrm{LLOSS})_{i,t} + \mathrm{f}_2(\mathrm{SIZE})_{i,t} + \mathrm{f}_3(\Delta \mathrm{CAP})_{i,t} - \mathrm{f}_4(\mathrm{RWATA})_{i,t-1} + \mathrm{f}_5(\mathrm{POLCON})_{i,t} + \mathrm{f}_6(\mathrm{TENURE})_{i,t} + \mathrm{f}_7(\mathrm{INDEP})_{i,t} - \mathrm{f}_8(\mathrm{DUALITY})_{i,t} + \sum_t \mathrm{f}_t(\mathrm{YEAR})_t + \mathrm{v}_{2i,t} \quad (27)$$

where *i* and *t* are the bank index and time index, respectively. $\varepsilon_{2i,t}$ and $\mathrm{v}_{2i,t}$ are Gaussian white noise with zero mean and constant variance. The main emphasis of this model is on the coefficients f_5, f_6, f_7 and f_8 in the risk equation (equation 27), which test the effects of corporate governance on the banks' risk level. I am also interested in the relationship between change in capital (e_3) and change in risk (f_3).

I use the same methodology (3SLS) to estimate these system equations (equation 26 and equation 27). 3SLS is preferred to 2SLS as 2SLS fails to exploit error correlation across equations.

CHAPTER 5: EMPIRICAL RESULTS

This chapter provides the important, empirical results of this research thesis. Section 5.1 summarizes the results of disequilibrium estimation based on two capital definitions (CAP and CAR). The regulation variable (REG) is interacted with a series of dummy variables which describe the banks' capital adequacy, ownership structure and so forth, to investigate the regulatory influence on different types of banks. Section 5.2 discusses the simultaneous relationship between the adjustment in capital and risk based on the whole sample regressions, as well as the subsample regressions. Section 5.3 focuses on the impacts of corporate governance on the banks' risk behaviors. Empirical results based on the sub-sample regressions are provided which include a set of corporate governance variables in the risk equation. It also tries to test whether banks' react to regulation due to corporate governance factors or due to their own specific features.

5.1. Regression Results from the Switching Regime Estimation

5.1.1. Empirical results based on CAP

Tables 5.1 to 5.12 show the results of the disequilibrium estimation based on the regulation model and market model, respectively. In this study, I report 5 different groups of regression results to examine the effects of regulation for (1) entire sample of banks, (2) under-capitalized and well-capitalized banks, (3) listed and unlisted banks, (4) state-owned and non- state-owned banks and (5) different types of banks (i.e. the 'Big 5' banks, joint-equity banks, local banks, foreign banks). The variables of interest in this study are the

regulation pressure (REG and REGU) and the corresponding interaction product dummy terms (REGUNLIST, REGNONSTATE, REGJOINT, REGLOCAL and REGFOREIGN). In each group of regression, I provide empirical results of 5 estimations with the primary difference lying in the different combinations of linear and quadratic forms of the two control variables to capture the effects of sanctions and penalties for the purpose of enforcing the capital rules (DEPOSIT, $DEPOSIT^2$, INTERBANK, $INTERBANK^2$).

5.1.1.1 Regulation impacts for the entire sample of banks

For the first group regression, the key variable is the regulation pressure (REG) in the regulatory model. I try to test and see if the regulatory coefficient on REG is significant and positive for my entire sample of banks and find that it is (Table 5.1 Estimations 1 to 5). This result suggests that banks demand more capital as falling below the regulatory threshold is costly. Regarding the undercapitalized banks, the CBRC can require the bank to suspend all but low-risk activities, stop setting up new branches or starting new products and services. For significantly undercapitalized banks, the CBRC can require the bank to replace its senior management, or even close the bank. In fact all the coefficients in the regression achieve their predicted signs, although they are not always significant.

The coefficient (1-α) on the lagged capital ratio (CAP_{t-1}) is significantly positive and below 1 (stationary conditions). The average speed of the adjustment rate (α) to the target capital level in the regulatory model is around 0.67. This result suggests that Chinese banks increase their capital to the long term, equilibrium, target value and this adjustment rate shows a progressively increased pattern under the capital regulation rules. In fact, the CBRC regulation did allow for a transitory period but with a demandingly short, time

framework to achieve the regulatory minimum. This led to commercial banks being forced to adjust their capital ratio within a constricted period. Surprisingly, many banks were able to not only increase their capital levels but also supersede the minimum requirements in this short space of time. For example, in 2005, the ICBC, the CCB and the BOC reported capital adequacy ratios of 9.89%, 10.42% and 13.57% respectively, far above the regulatory minimum 8% required to be achieved by the end of 2006. The coefficients on INTERBANK (estimations 3 and 5) are significant with the predicted sign, indicating that banks with more interbank liabilities are forced to improve their capital conditions to avoid sanctions and penalties when breaching binding capital requirements.

In the market model (Panel A of Table 5.2), the coefficients (1-β) on the lagged capital ratios (CAP_{t-1}) are found to be significantly positive and below unity (stationary conditions). The average speed of the adjustment rate (β) in the market model is around 0.74, which is slightly higher than that of the regulatory model (0.67). As explained previously, the CBRC regulation allowed for a transitory period of adjustment to the regulatory minimum but within a constricted period.

Coefficients of VARROA are significantly positive in all but one case (Estimation 2), suggesting that banks with large fluctuations in their ROA have greater incentives to improve their capital level. SIZE has a significantly negative impact, indicating that large banks increase their capital ratios less than other banks. One plausible reason is that large banks can get access to capital markets easily so that they can operate with lower capital. The 'Too-Big-to-Fail' effect also suggests that large banks feel less pressure to increase their capital ratio. Furthermore, parameters for the quadratic form of bank size (SIZE^2) are

significantly positive in all the five estimations. RWATA, which measures the impacts of credit risk on a bank's capital level, also achieves the expected sign. It is significantly positive in all the 5 estimations, indicating that more capital is required in order to avoid the bank going bankrupt due to the higher credit risk associated to the loans. On the contrary, the lagged tax ratio (TAX) which measures the banks' tax burden is not statistically significant. I also ran various other estimations where I attempted to measure and account for foreign entrants and increased domestic competition into my market model regressions but none yielded significant, parameter results.

Finally, I find the regulatory regime dominates market forces in all my estimations. Focusing on Estimation 1 as a guide, the probability of the model belonging to the regulatory over the market regime is approximately 0.63. Despite the advent of foreign entrants and increased domestic competition, this result fits quite well with the general view people have of the banking industry in China still being primarily regulatory driven.

5.1.1.2 Regulation impacts for the under-capitalized and well-capitalized banks

In this subsection, all the 5 different estimations are re-run to determine if there is any difference in regulatory pressure on capital levels between under-capitalized and well-capitalized banks (Tables 5.3 and 5.4). The variables of particular interest in this group of estimation are REG and REGU in the regulatory model, which represent the regulation effects on the well-capitalized banks and the under-capitalized banks respectively.

Here, it is worth mentioning that the majority of banks in China are well-capitalized banks (more than 90% in my sample). In order to enhance bank capital level, the Chinese banking industry has made a lot of effort in recent years and has taken various effective measures.

First, Chinese banks have implemented the stock-holding system and offered stocks to the public. Listing on the stock exchange to raise money is an effective way to increase capital ratios. Adequate capital activates bad assets and makes those bad assets become valid assets which decreases the banks' burden and rapidly improves their operating management. For example, in October 2005, the China Construction Bank acted as a pioneer and issued shares to the public in Hong Kong. In June and July of 2007, the Bank of China got listed on the Hong Kong and ShangHai stock exchange. The funds raised by issuing H shares were 86 billion Hong Kong dollars while the funds raised by issuing A shares amounted to 20 billion RMB. During the same year, the Industrial and Commercial Bank of China simultaneously issued A shares and H shares to the public. The total financing amount exceeded 20 billion US dollars which refreshed the record again.

Table 5.1 Disequilibrium regression results for CAP (no interaction product terms): regulatory model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$\mathrm{CAP}_{t-1}(1-\alpha)$	0.33385(0.0000)[a]	0.36924(0.0000)[a]	0.31372(0.0000)[a]	0.32254(0.0000)[a]	0.31425(0.0000)[a]
REG_t	0.49464(0.0000)[a]	0.43681(0.0000)[a]	0.49561(0.0000)[a]	0.50134(0.0000)[a]	0.49740(0.0000)[a]
$\mathrm{DEPOSIT}_t$	0.00113(0.8443)		-0.00280(0.6179)	-0.00127(0.2253)	-0.00414(0.5090)
$\mathrm{DEPOSIT}_t^2$	-0.00005(0.8419)		0.00004(0.8485)		0.00012(0.6603)
$\mathrm{INTERBANK}_t$		0.00124(0.2130)	0.00125(0.0496)[b]	0.00180(0.1217)	0.00213(0.0995)[c]
$\mathrm{INTERBANK}_t^2$		-0.00005(0.3530)		0.00005(0.5487)	-0.00007(0.4683)
STDCAP_{t-5}	0.54006(0.5130)	0.38778(0.5841)	0.56701(0.4822)	0.57757(0.4660)	0.54470(0.4970)
VARCAP_{t-5}	-28.29500(0.5765)	-24.90530(0.6132)	-29.56820(0.5624)	-31.37610(0.5261)	-29.44480(0.5634)
CUBCAP_{t-5}	110.43300(0.9058)	125.60600(0.9003)	103.46500(0.9151)	122.39600(0.8943)	102.34200(0.9169)
LATA_t	0.00168(0.9062)	0.00625(0.5713)	-0.00663(0.6562)	-0.00562(0.6736)	-0.00530(0.7227)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00736(0.0000)[a]	0.00666(0.0000)[a]	0.00726(0.0000)[a]	0.00723(0.0000)[a]	0.00724(0.0000)[a]
Average probability	0.63030	0.66533	0.63337	0.63105	0.63149

Notes: (i) Dependent variable is CAP_t; (ii) p-value in parenthesis; (iii) a=significant at 1%, b=significant at 5%, c=significant at 10%.

Table 5.2 Disequilibrium regression results based on CAP (no interaction product terms): market model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAP_{t-1}(1-\beta)$	0.22467(0.0001)[a]	0.31432(0.0053)[a]	0.24798(0.0000)[a]	0.26610(0.0000)[a]	0.25030(0.0000)[a]
$OPERCOST_t$	-1.55317(0.3502)	-1.56904(0.7132)	-1.76300(0.3213)	-1.59151(0.4254)	-1.74256(0.3163)
$OPERCOST_t^2$	0.00249(0.6782)	0.00156(0.9212)	0.00325(0.6173)	0.00252(0.7370)	0.00311(0.6279)
$VARROA_{t-5}$	129.71500(0.0000)[a]	76.32460(0.4781)	120.51100(0.0000)[a]	96.78170(0.0005)[a]	115.94800(0.0000)[a]
$SIZE_t$	-0.03655(0.0000)[a]	-0.05793(0.0010)[a]	-0.03767(0.0001)[a]	-0.03807(0.0001)[a]	-0.03733(0.0001)[a]
$SIZE_t^2$	0.00138(0.0001)[a]	0.00218(0.0012)[a]	0.00142(0.0001)[a]	0.00144(0.0001)[a]	0.00141(0.0001)[a]
$RWATA_t$	0.15528(0.0000)[a]	0.19197(0.0000)[a]	0.15562(0.0000)[a]	0.15702(0.0000)[a]	0.15585(0.0000)[a]
$LIQUIDITY_t$	-0.00435(0.7658)	-0.00142(0.9599)	-0.00595(0.6819)	-0.00506(0.7341)	-0.00529(0.7151)
$LLOSS_t$	0.15311(0.5833)	-0.31505(0.5239)	0.13475(0.6372)	0.15171(0.6066)	0.14172(0.6180)
TAX_{t-1}	-0.00257(0.7505)	-0.00065(0.9723)	-0.00144(0.8573)	-0.00067(0.9357)	-0.00134(0.8671)
Year 2005	-0.02274(0.8917)	0.00269(0.9237)	-0.02128(0.7475)	-0.02144(0.8178)	-0.02165(0.8223)
Year 2006	-0.01123(0.8353)	-0.01916(0.5275)	-0.01273(0.5841)	-0.01196(0.7792)	-0.01217(0.6907)
Year 2007	-0.01140(0.8333)	-0.02311(0.4685)	-0.01243(0.5930)	-0.01069(0.8023)	-0.01191(0.6971)
Year 2008	0.00016(0.9977)	-0.00365(0.8986)	-0.00459(0.8436)	-0.00199(0.9627)	-0.00324(0.9155)
Year 2009	0.01555(0.7729)	0.00898(0.7482)	0.01392(0.5415)	0.01518(0.7204)	0.01460(0.6293)
Year 2010	0.01706(0.7518)	0.01221(0.6642)	0.01550(0.4993)	0.01678(0.6929)	0.01624(0.5927)
Year 2011	0.01835(0.7343)	0.01259(0.6720)	0.01686(0.4664)	0.01796(0.6735)	0.01753(0.5655)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00537(0.0000)[a]	0.00890(0.0000)[a]	0.00537(0.0000)[a]	0.00550(0.0000)[a]	0.00538(0.0000)[a]
Average probability	0.36970	0.33467	0.36663	0.36895	0.36851

Notes: (i) Dependent variable is CAP_t; (ii) p-value in parenthesis; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%.

Second, the Chinese government has increased fiscal capital and national investment. In 1988, the Chinese government carried out banking reform and injected capital into the state-owned banks for the first time. In order to supplement capital, the Ministry of Finance issued 270 billion special treasury securities to the ABC, BOC, CCB and ICBC. The second capital injection occurred in 2004, when the State Council announced shareholding reform for the BOC and the CCB and used 45 billion US dollar reserves to supplement their capital.

Third, banks have enhanced their capital ratios by increasing Tier 2 capital and issuing long-term subordinated debts. In November of 2003, the CBRC released the notice which required banks to include subordinated debts as Tier 2 capital and allowed banks to decide whether they needed to issue subordinated debts according to their own situation.

Fourth, Chinese banks have introduced overseas, strategic investors. In the process of Chinese banking reform, introducing foreign strategic investors, changing the single ownership structure and achieving diversity of the investment body have become the main approach allowing Chinese banks to open up and to increase capital adequacy. The introduction of a modern operating mechanism and good management style has boosted service improvement and business development in the competition. Healthy competition, in turn, brings the power of innovation and reform.

Last, sufficient bank capital and favorable capital adequacy ratios also benefit from the undeveloped capital market. Chinese banks do not have so much debt capital which could occupy capital adequacy ratios. Instead, they profited from this misfortune.

Regarding my regression results, looking at the regulatory model (Table 5.3), first, I find that the coefficients (1-α) on the lagged capital ratios (CAP_{t-1}) are significantly positive and below 1 (stationary conditions) in all cases for the regulatory model. Focusing on estimation 1 as a guide, the speed of the adjustment rate (α) to the target capital level in the regulatory model is around 0.72.

Second, although I note a significant and positive effect from well-capitalized banks (REG), the few under-capitalized banks in my sample show a negative and significant effect on their capital levels (REGU). This result alludes to what Jacques and Nigro (1997) showed, in that capital restrained banks can find it very problematic to raise their capital ratios. The impact from regulation can be very different dependent on the existing capitalization of the bank. This may be compounded in China with the fact that return on assets tends to be low (Garcia-Herrero et al., 2006 & 2009) and raising capital from external sources may be difficult.

Given that the bulk of Chinese banks (inclusive of my sample) are very well capitalized, I examine the individual cases where under-capitalization exists in my data. From this I find that of the 5 banks[18] (3 joint equity and 2 local banks) that were under-capitalized for a period of time, two were effectively bailed out by capital injections directly from the state or a state enterprise[19]. For example, the CAR of the China Everbright Bank was 7.19% in 2007, which is less than the 8% capital requirements. However, it became a well-

[18] China EverBright Bank, Shenzhen Development Bank, China Guangfa Bank, Xi'an City Commercial Bank and the Commercial Bank of Zhengzhou.
[19] Of the remaining banks, two issued sub-ordinated debt and one received a capital injection from a foreign bank buying into the company.

capitalized bank in 2008 with CAR equaled to 9.1% because of the capital injection by the State. On the 30th of November, 2007, the Central Huijin Investment Company formally injected 20 billion US dollars.

In the case of the Shenzhen Development Bank (SZDB), the CARs in 2005, 2006, 2007 and 2009 are below the CBRC risk-based capital requirement. In fact, the scale expansion of SZDB had come to a standstill because its capital level was always below the CBRC supervision red line. On 18th of August, 2011, SZDB announced a 20 billion RMB capital injection from the China Ping An, which significantly pushed up capital adequacy and solved the need for capital for the SZDB.

For the China Guangfa Bank, I find that its CARs in 2007 and 2009 were less than the capital requirement. On the 25th of September, 2008, the Guangfa Bank announced the issuance of 5 billion RMB subordinated debt, which successfully helped the Guangfa Bank's CAR to jump to more than 10%. The capital raised from the issuance of the subordinated debt was used to supplement the Guangfa Bank's Tier 2 capital, optimize the capital structure, increase the operating power and enhance its ability to guard against risk.

In the case of Xi'an city commercial bank, 0.1 billion shares were transferred from the largest shareholder, China Cinda Asset Management Corporation, to the Bank of Nova Scotia, on the 2nd September in 2009.

The CAR of the Commercial Bank of Zhengzhou was 7.12% in 2007, which is less than the 8% CBRC capital requirement. In order to improve its capital adequacy and alleviate the

urgent need for capital, the Commercial Bank of Zhengzhou issued 0.6 billion RMB of fixed-interest, subordinated debt with a term of 10 years on the 31st December, 2009. It would suggest that where there is a case of under-capitalization, it is not necessarily the banks themselves that rectify the problem but rather, in at least some cases, the state plays a significant role in ensuring capital adequacy requirements are met. None of the banks in my sample were under-capitalized from 2009 onwards.

In the market model (Table 5.4), the coefficients (1-β) on the lagged capital ratios (CAP_{t-1}) are found to be positive and below unity (stationary conditions), although not always significant (i.e. Estimation 5). Using Estimation 1 as a guide, the speed of the adjustment rate (β) in the market model is around 0.62, which is lower than that of the regulatory model (0.72). Second, coefficients of SIZE, $SIZE^2$ and RWATA are all statistically significant with the expected signs, which are consistent with the evidence I get from the first group estimations (See Table 5.2).

Regarding the probability estimation in this group regression, again, I find that the regulatory regime dominates the market regime in all the estimations. For instance, the average estimated probability of the observations belonging to the regulatory regime is around 0.73 while the observed capital ratios belonging to the market regime is approximately 0.27. This result is consistent with people's general view that the banking industry in China is primarily driven by a regulatory force.

Table 5.3 Disequilibrium regression results for CAP based on under-capitalized & well-capitalized banks: regulatory model.

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAP_{t-1}(1-\alpha)$	0.27813(0.0000)[a]	0.28332(0.0000)[a]	0.26962(0.0000)[a]	0.27324(0.0000)[a]	0.24929(0.0000)[a]
REG_t	0.36563(0.0000)[a]	0.36982(0.0000)[a]	0.36810(0.0000)[a]	0.37084(0.0000)[a]	0.34798(0.0000)[a]
$REGU_t$	-0.60292(0.0031)[a]	-0.57890(0.0099)[a]	-0.58568(0.0090)[a]	-0.61678(0.0080)[a]	-0.59859(0.0019)[a]
$DEPOSIT_t$	-0.00077(0.8829)		-0.00333(0.5290)	-0.00086(0.2531)	0.00028(0.0960)[c]
$DEPOSIT_t^2$	0.00003(0.8775)		0.00010(0.6106)		0.00005(0.1449)
$INTERBANK_t$		0.00026(0.8422)	0.00055(0.2531)	0.00001(0.9970)	-0.00951(0.8461)
$INTERBANK_t^2$		-0.00001(0.9129)		0.00004(0.6921)	0.00032(0.6187)
$STDCAP_{t-5}$	0.47205(0.1161)	0.48542(0.1113)	0.42729(0.1484)	0.48948(0.0927)[c]	0.43681(0.1175)
$VARCAP_{t-5}$	-17.54250(0.1395)	-18.75200(0.1216)	-15.95090(0.1824)	-18.53390(0.1025)	-14.24390(0.2077)
$CUBCAP_{t-5}$	110.59100(0.1991)	120.12300(0.1715)	99.76570(0.2548)	118.05300(0.1555)	85.84200(0.3087)
$LATA_t$	0.00564(0.5369)	0.00503(0.5693)	0.00340(0.7145)	0.00192(0.8354)	-0.00381(0.7024)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00620(0.0000)[a]	0.00621(0.0000)[a]	0.00618(0.0000)[a]	0.00616(0.0000)[a]	0.00570(0.0000)[a]
Average probability	0.73215	0.73077	0.73428	0.72668	0.71978

Notes: (i) Dependent variable is CAP_t; (ii) p-value in parenthesis; (iii) a=significant at 1%, b=significant at 5%, c=significant at 10%.

Table 5.4 Disequilibrium regression results for CAP based on under-capitalized & well-capitalized banks: market model.

Panel A. Coefficient Estimates

	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAP_{t-1}(1-\beta)$	0.38250(0.0311)[b]	0.38599(0.0256)[b]	0.37835(0.0305)[b]	0.34277(0.0417)[b]	0.30310(0.1091)
$OPERCOST_t$	-0.94192(0.7815)	-0.86416(0.7957)	-0.92554(0.7743)	-0.65506(0.8361)	-0.79999(0.8057)
$OPERCOST_t^2$	0.00005(0.9966)	-0.00012(0.9909)	0.00010(0.9923)	-0.00044(0.9654)	0.00009(0.9923)
$VARROA_{t-5}$	14.51150(0.8869)	12.41480(0.9021)	19.67020(0.8434)	54.27090(0.5402)	102.65400(0.1423)
$SIZE_t$	-0.06627(0.0030)[a]	-0.06716(0.0019)[a]	-0.06630(0.0027)[a]	-0.06333(0.0028)[a]	-0.04844(0.0461)[b]
$SIZE_t^2$	0.00253(0.0027)[a]	0.00256(0.0018)[a]	0.00253(0.0024)[a]	0.00242(0.0025)[a]	0.00181(0.0532)
$RWATA_t$	0.21360(0.0000)[a]	0.21210(0.0000)[a]	0.21305(0.0000)[a]	0.20021(0.0000)[a]	0.18892(0.0000)[a]
$LIQUIDITY_t$	0.04515(0.2646)	0.04440(0.2698)	0.04392(0.2749)	0.05059(0.2245)	0.05492(0.1042)
$LLOSS_t$	-0.17480(0.8354)	-0.18133(0.8260)	-0.20935(0.8002)	-0.21835(0.7972)	-0.22088(0.7658)
TAX_{t-1}	0.01720(0.4289)	0.01760(0.4099)	0.01695(0.4296)	0.01520(0.4379)	-0.00239(0.9054)
Year 2005	0.00748(0.9622)	0.00720(0.9682)	0.00642(0.9480)	0.00829(0.9739)	0.00824(0.9386)
Year 2006	-0.01894(0.9049)	-0.01912(0.9159)	-0.02021(0.8394)	-0.01634(0.9487)	-0.01197(0.9116)
Year 2007	-0.02090(0.9182)	-0.02030(0.9201)	-0.02327(0.9022)	-0.02318(0.9290)	-0.02821(0.9028)
Year 2008	-0.00187(0.9906)	-0.00206(0.9909)	-0.00367(0.9704)	0.00094(0.9971)	0.00003(0.9997)
Year 2009	0.01795(0.9095)	0.01771(0.9218)	0.01639(0.8679)	0.01915(0.9398)	0.01894(0.8594)
Year 2010	0.02484(0.8750)	0.02439(0.8924)	0.02303(0.8151)	0.02549(0.9199)	0.02867(0.7884)
Year 2011	0.02384(0.8802)	0.02355(0.8962)	0.02229(0.8216)	0.02504(0.9214)	0.02814(0.7935)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00929(0.0000)[a]	0.00917(0.0000)[a]	0.00921(0.0000)[a]	0.00928(0.0000)[a]	0.01129(0.0000)[a]
Average probability	0.26785	0.26923	0.26572	0.27332	0.28022

Notes: (i) Dependent variable is CAP_t; (ii) p-value in parenthesis; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%.

5.1.1.3 Regulation impacts for listed and unlisted banks

In this subsection, I start to compare the differences of regulation impacts between listed and unlisted banks. Estimations 1 to 5 from Tables 5.5 and 5.6 tabulate the results. The key variables in this group of regressions are the regulation pressure (REG) and its interaction product dummy term (REGUNLIST) in the regulatory model, which measure the regulation impacts on the unlisted banks relative to their listed counterparts.

In the regulatory model (Table 5.5), the coefficients (1-α) on the lagged capital ratios (CAP_{t-1}) are found to be significantly positive and below 1 (stationary conditions) in all cases. Based on the results from the estimations 1 to 5, the speed of the adjustment rate (α) to the target capital level in the regulatory model is around 0.72. Most of all, this group of estimation implies that coefficients for both of the regulation pressure variables (REG and REGULIST) are positive and statistically significant, indicating that a significantly stronger effect is felt on unlisted banks. Better information disclosure and less constrained equity flows are the most distinguishing features for the listed banks (Branco et al., 2006 and 2008; Qiang, 2006). The former is the precondition and basis to protect the right of the investor while the latter provides an efficient channel to effectively protect investors. Listing on the stock exchange could improve internal administrative controls, enhance market constraints and inevitably, strengthen official supervision (Cheng et al., 2013).

Table 5.5 Disequilibrium regression results for CAP based on listed & unlisted banks: regulatory model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAP_{t-1}(1-\alpha)$	0.29597(0.0000)[a]	0.27850(0.0000)[a]	0.27378(0.0000)[a]	0.28100(0.0000)[a]	0.26954(0.0000)[a]
REG_t	0.40697(0.0000)[a]	0.39818(0.0000)[a]	0.39888(0.0000)[a]	0.39582(0.0000)[a]	0.40270(0.0000)[a]
$REGUNLIST_t$	0.18559(0.0001)[a]	0.16359(0.0001)[a]	0.17944(0.0002)[a]	0.17138(0.0003)[a]	0.17938(0.0003)[a]
$DEPOSIT_t$	0.00676(0.2395)		0.00281(0.6354)	0.00050(0.6564)	0.00111(0.7547)
$DEPOSIT_t^2$	-0.00020(0.3748)		-0.00009(0.6766)		-0.00001(0.8165)
$INTERBANK_t$		0.00105(0.3835)	0.00086(0.1372)	0.00134(0.2417)	0.00205(0.4488)
$INTERBANK_t^2$		3.13E-06(0.9668)		-0.00003(0.7177)	-0.00006(0.8878)
$STDCAP_{t-5}$	0.32732(0.2390)	0.36593(0.1422)	0.33665(0.1988)	0.34260(0.1618)	0.33177(0.2084)
$VARCAP_{t-5}$	-14.17720(0.1585)	-15.47030(0.0642)[c]	-14.18030(0.1315)	-15.39180(0.0522)[c]	-14.12990(0.1241)
$CUBCAP_{t-5}$	90.84100(0.2055)	101.34800(0.0879)[c]	91.51050(0.1710)	101.95500(0.0686)[c]	91.77730(0.1594)
$LATA_t$	0.00447(0.7265)	-0.00055(0.9597)	0.00070(0.9540)	0.00149(0.8931)	0.00261(0.8344)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00677(0.0000)[a]	0.00667(0.0000)[a]	0.00674(0.0000)[a]	0.00673(0.0000)[a]	0.00671(0.0000)[a]
Average probability	0.63709	0.66938	0.66430	0.66505	0.65918

Notes: (i) Dependent variable is CAP_t; (ii) p-value in parenthesis; (iii) a=significant at 1%, b=significant at 5%, c=significant at 10%.

Table 5.6 Disequilibrium regression results for CAP based on listed & unlisted banks: market model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAP_{t-1}(1-\beta)$	0.14043(0.0938)[c]	0.12995(0.1498)	0.13242(0.1508)	0.14473(0.1461)	0.14818(0.1179)
$OPERCOST_t$	-2.45692(0.1938)	-2.39067(0.1679)	-2.31397(0.1642)	-2.26452(0.2691)	-2.04444(0.3000)
$OPERCOST_t^2$	0.00440(0.5354)	0.00495(0.3950)	0.00462(0.4042)	0.00433(0.5481)	0.00372(0.5876)
$VARROA_{t-5}$	135.79800(0.0000)[a]	106.54500(0.0042)[a]	106.59300(0.0054)[a]	104.95800(0.0075)[a]	104.56800(0.0058)[a]
$SIZE_t$	-0.04311(0.0000)[a]	-0.04702(0.0000)[a]	-0.04698(0.0000)[a]	-0.04661(0.0000)[a]	-0.04608(0.0000)[a]
$SIZE_t^2$	0.00163(0.0000)[a]	0.00178(0.0000)[a]	0.00178(0.0000)[a]	0.00177(0.0000)[a]	0.00175(0.0000)[a]
$RWATA_t$	0.18382(0.0000)[a]	0.20604(0.0000)[a]	0.20573(0.0000)[a]	0.20544(0.0000)[a]	0.19999(0.0000)[a]
$LIQUIDITY_t$	-0.00972(0.5049)	-0.01098(0.4788)	-0.01327(0.4016)	-0.01536(0.3635)	-0.01032(0.5203)
$LLOSS_t$	0.10284(0.6297)	0.16777(0.5358)	0.15506(0.5803)	0.12847(0.6581)	0.15389(0.5832)
TAX_{t-1}	-0.00771(0.3909)	-0.01877(0.0939)	-0.01782(0.1159)	-0.01733(0.1341)	-0.01732(0.1184)
Year 2005	-0.01591(0.8461)	-0.01856(0.9785)	-0.01627(0.8058)	-0.01745(0.9735)	-0.01772(0.8794)
Year 2006	-0.01175(0.8124)	-0.01163(0.8737)	-0.01210(0.7878)	-0.01090(0.8711)	-0.01155(0.7929)
Year 2007	-0.01249(0.8020)	-0.01489(0.8391)	-0.01631(0.7194)	-0.01435(0.8317)	-0.01445(0.7441)
Year 2008	0.00059(0.9905)	-0.01183(0.8884)	-0.01221(0.8041)	-0.00758(0.9107)	-0.00794(0.8566)
Year 2009	0.01757(0.7229)	0.01675(0.8182)	0.01632(0.7146)	0.01711(0.7994)	0.01624(0.7095)
Year 2010	0.01812(0.7146)	0.01531(0.8337)	0.01489(0.7391)	0.01563(0.8165)	0.01508(0.7298)
Year 2011	0.01990(0.6882)	0.01734(0.8123)	0.01731(0.6990)	0.01778(0.7917)	0.01694(0.6987)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00482(0.0000)[a]	0.00498(0.0000)[a]	0.00496(0.0000)[a]	0.00505(0.0000)[a]	0.00503(0.0000)[a]
Average probability	0.36291	0.33062	0.33570	0.33495	0.34082

Notes: (i) Dependent variable is CAP_t; (ii) p-value in parenthesis; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%.

For the unlisted banks, according to Estimation 5, I find that regulation increases the capital level by 17.94 percentage points more than the listed banks. Part of the reason for the difference may also be due to the desire to meet listing requirements, given there is an overall push to move banks to be publicly listed. For example, unlisted banks need to initiate the public share offering. For the unlisted banks, (1) their total registered capital should be no less than 50 million RMB, (2) they should have been operating for more than three years and they need to have made continuous profits in the last three years, (3) they need to have a clear listing purpose, etc. Thus, unlisted banks may work harder than the listed banks and strictly follow the regulatory requirements in order to meet the qualifications to get listed.

Finally, it is worth noting that most of the listed banks are state-owned banks while unlisted banks are the non- state-owned banks. The difference in the ownership structure could also help to explain the stronger regulation impacts imposed on the unlisted banks. For instance, the majority of the listed banks in my sample (69%) have the state as their major shareholder. Laeven and Levine (2009) noticed that there was a significant impact on bank operations dependent on the largest shareholder. This may also play a role in my case and as such, the fourth group estimation (see Section 5.1.1.4) shows what happens if I partition the sample into banks where the major shareholder is the state and where it is not.

In the market model (Table 5.6), the coefficients (1-β) on the lagged capital ratios (CAP_{t-1}) is positive and below 1 (stationary conditions), however, only at estimation 1 according to the results from this group of estimation. Regarding the adjustment speed rate, my results suggest that it is around 0.86. I also find that coefficients of VARROA, SIZE, $SIZE^2$ and

RWATA are all statistically significant with the expected signs. For example, VARROA is significantly positive in all the 5 estimations, indicating that banks with large variations in their ROA need more capital. Moreover, parameters of SIZE and its quadratic form ($SIZE^2$) have statistically significant impacts on banks' capital level which is consistent with the 'Too-Big-to-Fail' theory. Last, RWATA is positive and significant at 99% confidence level through Estimations 1 to 5 which suggests that higher credit risk associated with loans would increase banks' need for capital.

When I compare the estimated probability of the observations from the regulatory regime with those from the market regime, my evidence shows that the average estimated probability of the observation from the regulatory model relative to the market model is around 0.66, which is in favor of the dominance of the regulatory force.

5.1.1.4 Regulation impacts for the state-owned and non- state-owned banks

I now turn my interest to whether the impact from regulatory pressure makes a difference based on ownership structure. 5 different regressions results (Tables 5.7 to 5.8) are reported in this subsection which show quite similar and consistent results with the previous empirical evidence. The variables of particular interest in this group estimation are the regulation pressure variable (REG) and its interaction product term (REGNONSTATE) in the regulation regime which try to capture the regulatory impacts on the state-owned banks and non- state-owned banks.

As for the results from the regulatory model (Estimations 1 to 5 in Table 5.7), interestingly, the interaction dummy for when the state is a major shareholder, REGNONSTATE, is

insignificant. In trying to determine why this is so, I take a closer look at my sample and notice that there are 3 banks that are listed but which do not have significant state ownership that seem to be driving this result. These 3 banks are local banks with significant local government ownership but little central government shareholding. They are the Bank of Beijing, the Bank of Nanjing and the Bank of Ningbo. When I remove these three banks from my sample and re-run the regression, I find that REGNONSTATE is indeed significant at the 95 percent confidence level (Estimations 1 to 5 of Table 5.9), indicating that non-state-owned banks do seem to react more than state-owned banks to changes in capital requirements. Since Table 5.7 and Table 5.9 report quite similar regression results, I focus on my explanations of the evidence from Table 5.9.

The coefficients (1-α) on the lagged capital ratios (CAP_{t-1}) are found to be significantly positive and below 1 (stationary conditions) in all cases. Based on the results from the estimations 1 to 5, the average speed of the adjustment rate (α) to the target capital level in the regulatory model is around 0.75. One of the control variables, DEPOSIT is statistically significant and positive in Estimation 1 although only at 10% significant level. This result suggests that sanctions and penalties which are used to enforce capital rules would have a greater effect on big banks. The variance and cub standard deviation of the observed capital ratios over the previous five years ($VARCAP_{t-5}$ and $CUBCAP_{t-5}$) are significant, with correct sign in Estimations 1 to 5, reflecting the validity of my theoretical regulatory model once again.

In the market model (Table 5.10), I notice that the coefficients (1-β) on the lagged capital ratios (CAP_{t-1}) are positive and below 1 (stationary conditions) in all the estimations. Using

Estimation 1 as a guide, I find that speed of the adjustment rate (β) to the desired capital level is about 0.89 which is higher than that from the regulatory model[20]. With respect to the control variables, such as VORROA, SIZE, $SIZE^2$ and RWATA, they are statistically significant with the expected sign. Moreover, TAX has significant and negative impacts on banks' capital level in Estimations 1, 2 and 4, suggesting that this tax shield induces banks to use more debt rather than to use equity in their financial structure.

Regarding the probability estimation (Estimations 1 to 5 from Table 5.9 and 5.10) for both the regulatory regime and the market regime, I find that the probability of the model coming from the regulation regime is 0.64 while the probability of the model coming from the market regime is 0.36. These results indicate that regulation dominates the banking sector and works as the root driver for the improvement of the banks' capital level.

[20] According to the Estimation 1 from Table 5.1.1I, the speed of the adjustment rate (α) to the desired capital level in the regulatory model is approximately 0.75.

Table 5.7 Disequilibrium regression results for CAP based on state ownership (full sample regression): regulatory model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAP_{t-1}(1-\alpha)$	0.35229(0.0000)a	0.34415(0.0000)a	0.31678(0.0000)a	0.34839(0.0000)a	0.31689(0.0000)a
REG_t	0.43297(0.0000)a	0.43839(0.0000)a	0.43028(0.0000)a	0.44142(0.0000)a	0.43398(0.0000)a
$REGNONSTATE_t$	0.08701(0.1910)	0.09123(0.1547)	0.08392(0.1819)	0.08112(0.2166)	0.07966(0.2312)
$DEPOSIT_t$	0.00135(0.8201)		-0.00398(0.4888)	-0.00037(0.7432)	0.00191(0.4260)
$DEPOSIT_t^2$	-0.00003(0.9139)		0.00012(0.6015)		-0.00005(0.5079)
$INTERBANK_t$		0.00164(0.1930)	0.00122(0.0589)	0.00149(0.2468)	-0.00503(0.1673)
$INTERBANK_t^2$		-0.00006(0.5051)		-0.00004(0.6963)	0.00018(0.6062)
$STDCAP_{t-5}$	0.60358(0.4589)	0.61611(0.4100)	0.60041(0.4376)	0.55712(0.4668)	0.57625(0.4608)
$VARCAP_{t-5}$	-33.55490(0.5016)	-35.24480(0.4430)	-32.06700(0.5102)	-33.66180(0.4831)	-31.57150(0.5196)
$CUBCAP_{t-5}$	117.67600(0.8975)	131.86400(0.8720)	110.35800(0.9039)	129.51600(0.8812)	109.74300(0.9053)
$LATA_t$	-0.00105(0.9438)	-0.00383(0.7867)	-0.00620(0.6835)	-0.00751(0.6032)	-0.00525(0.7344)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00727(0.0000)a	0.00714(0.0000)a	0.00716(0.0000)a	0.00710(0.0000)a	0.00716(0.0000)a
Average probability	0.63420	0.63173	0.64302	0.61913	0.64048

Notes: (i) Dependent variable is CAP_t; (ii) p-value in parenthesis; (iii) a=significant at 1%, b=significant at 5%, c=significant at 10%.

Table 5.8 Disequilibrium regression results for CAP based on state ownership (full sample regression): market model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAP_{t-1}(1-\beta)$	0.23591(0.0001)[a]	0.25230(0.0000)[a]	0.24920(0.0001)[a]	0.24956(0.0000)[a]	0.24865(0.0001)[a]
$OPERCOST_t$	-1.59768(0.3130)	-1.52366(0.3613)	-1.67882(0.3527)	-1.57557(0.2705)	-1.69361(0.3315)
$OPERCOST_t^2$	0.00224(0.6932)	0.00189(0.7548)	0.00288(0.6642)	0.00205(0.6804)	0.00285(0.6562)
$VARROA_{t-5}$	112.28300(0.0001)[a]	96.69130(0.0006)[a]	113.01600(0.0001)[a]	96.37560(0.0007)[a]	112.70700(0.0000)[a]
$SIZE_t$	-0.03644(0.0001)[a]	-0.03709(0.0001)[a]	-0.03770(0.0001)[a]	-0.03588(0.0002)[a]	-0.03741(0.0001)[a]
$SIZE_t^2$	0.00137(0.0001)[a]	0.00139(0.0001)[a]	0.00142(0.0002)[a]	0.00135(0.0003)[a]	0.00141(0.0002)[a]
$RWATA_t$	0.15707(0.0000)[a]	0.15795(0.0000)[a]	0.15701(0.0000)[a]	0.15341(0.0000)[a]	0.15694(0.0000)[a]
$LIQUIDITY_t$	-0.00447(0.7632)	-0.00533(0.7252)	-0.00605(0.6882)	-0.00136(0.9260)	-0.00558(0.7101)
$LLOSS_t$	0.17992(0.5025)	0.19294(0.4794)	0.12865(0.6583)	0.20834(0.4365)	0.13231(0.6463)
TAX_{t-1}	-0.00107(0.9032)	-0.00012(0.9890)	-0.00104(0.8996)	-0.00202(0.8217)	-0.00126(0.8799)
Year 2005	-0.02056(0.7870)	-0.02446(0.9175)	-0.02300(0.8962)	-0.02542(0.9399)	-0.02215(0.8592)
Year 2006	-0.01198(0.7496)	-0.01260(0.6278)	-0.01238(0.6880)	-0.01076(0.8286)	-0.01206(0.7021)
Year 2007	-0.01024(0.7852)	-0.01043(0.6882)	-0.01151(0.7089)	-0.00825(0.8682)	-0.01135(0.7188)
Year 2008	0.00251(0.9465)	0.00239(0.9262)	-0.00259(0.9329)	0.00440(0.9294)	-0.00181(0.9542)
Year 2009	0.01583(0.6711)	0.01548(0.5452)	0.01459(0.6326)	0.01700(0.7315)	0.01474(0.6366)
Year 2010	0.01757(0.6385)	0.01686(0.5125)	0.01614(0.5981)	0.01844(0.7102)	0.01634(0.6018)
Year 2011	0.01877(0.6175)	0.01831(0.4810)	0.01754(0.5692)	0.01956(0.6944)	0.01772(0.5737)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00560(0.0000)[a]	0.00570(0.0000)[a]	0.00548(0.0000)[a]	0.00581(0.0000)[a]	0.00549(0.0000)[a]
Average probability	0.36580	0.36827	0.35698	0.38087	0.35952

Notes: (i) Dependent variable is CAP_t; (ii) p-value in parenthesis; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%.

Table 5.9 Disequilibrium regression results for CAP based on state ownership (delete 3 local banks): regulatory model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$\mathrm{CAP}_{t-1}(1-\alpha)$	0.25109(0.0000)[a]	0.25185(0.0000)[a]	0.24655(0.0000)[a]	0.25470(0.0000)[a]	0.24402(0.0000)[a]
REG_t	0.48270(0.0000)[a]	0.45291(0.0000)[a]	0.44189(0.0000)[a]	0.44828(0.0000)[a]	0.44585(0.0000)[a]
$\mathrm{REGNONSTATE}_t$	0.14589(0.0365)[b]	0.12778(0.0218)[b]	0.15943(0.0115)[b]	0.14016(0.0354)[b]	0.15583(0.0204)[b]
$\mathrm{DEPOSIT}_t$	0.01215(0.0822)[c]		0.00301(0.6385)	0.00045(0.7143)	0.00089(0.8977)
$\mathrm{DEPOSIT}_t^2$	-0.00043(0.1231)		-0.00011(0.6588)		-0.00001(0.9760)
$\mathrm{INTERBANK}_t$		0.00168(0.1548)	0.00089(0.1377)	0.00171(0.1540)	0.00149(0.3183)
$\mathrm{INTERBANK}_t^2$		-0.00005(0.5510)		-0.00006(0.4906)	-0.00005(0.6227)
STDCAP_{t-5}	0.38237(0.1586)	0.30384(0.1777)	0.31337(0.2097)	0.28299(0.2171)	0.29530(0.2342)
VARCAP_{t-5}	-14.73580(0.1132)	-15.15800(0.0288)[b]	-14.44590(0.0610)[c]	-14.96090(0.0307)[b]	-14.25180(0.0668)[c]
CUBCAP_{t-5}	93.41810(0.1563)	103.57600(0.0353)[b]	96.50050(0.0762)[c]	103.43800(0.0336)[b]	96.48520(0.0775)[c]
LATA_t	0.00914(0.5072)	0.00742(0.5137)	0.00713(0.5832)	0.00895(0.4455)	0.00936(0.4707)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00687(0.0000)[a]	0.00665(0.0000)[a]	0.00671(0.0000)[a]	0.00669(0.0000)[a]	0.00670(0.0000)[a]
Average probability	0.61272	0.64356	0.64334	0.64312	0.64023

Notes: (i) Dependent variable is CAP_t; (ii) p-value in parenthesis; (iii) a=significant at 1%, b=significant at 5%, c=significant at 10%.

Table 5.10 Disequilibrium regression results for CAP based on state ownership (delete 3 local banks): market model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAP_{t-1}(1-\beta)$	0.10941(0.2401)	0.06700(0.4251)	0.13795(0.1960)	0.10423(0.2719)	0.15085(0.1682)
$OPERCOST_t$	-2.03450(0.1110)	-2.34607(0.3186)	-1.77279(0.4064)	-2.00488(0.3686)	-1.75007(0.3711)
$OPERCOST_t^2$	0.00369(0.3746)	0.00421(0.6329)	0.00280(0.7069)	0.00329(0.6851)	0.00265(0.6954)
$VARROA_{t-5}$	135.05400(0.0000)[a]	146.48200(0.0000)[a]	103.57000(0.0070)[a]	128.08300(0.0001)[a]	105.52500(0.0057)[a]
$SIZE_t$	-0.04221(0.0000)[a]	-0.04722(0.0000)[a]	-0.04567(0.0000)[a]	-0.04575(0.0000)[a]	-0.04369(0.0000)[a]
$SIZE_t^2$	0.00160(0.0000)[a]	0.00179(0.0000)[a]	0.00173(0.0000)[a]	0.00174(0.0000)[a]	0.00166(0.0000)[a]
$RWATA_t$	0.18802(0.0000)[a]	0.20511(0.0000)[a]	0.20008(0.0000)[a]	0.20201(0.0000)[a]	0.19788(0.0000)[a]
$LIQUIDITY_t$	-0.00571(0.6988)	-0.00924(0.5683)	-0.00741(0.6578)	-0.00859(0.5992)	-0.00751(0.6567)
$LLOSS_t$	0.10196(0.6401)	0.11114(0.6439)	0.13625(0.6205)	0.11917(0.6364)	0.13275(0.6395)
TAX_{t-1}	-0.01803(0.0443)[b]	-0.01810(0.0656)[c]	-0.01798(0.1099)	-0.01819(0.0762)[c]	-0.01712(0.1299)
Year 2005	-0.01630(0.8968)	-0.02941(0.9978)	-0.01920(0.9846)	-0.03576(1.0000)	-0.01995(0.9536)
Year 2006	-0.00982(0.9066)	-0.01223(0.8525)	-0.01136(0.8672)	-0.01063(0.8885)	-0.01063(0.9013)
Year 2007	-0.01298(0.8774)	-0.01595(0.8097)	-0.01429(0.8341)	-0.01454(0.8490)	-0.01377(0.8727)
Year 2008	0.00002(0.9998)	-0.00305(0.9630)	-0.00370(0.9565)	-0.00140(0.9852)	-0.00137(0.9873)
Year 2009	0.01793(0.8310)	0.01700(0.7951)	0.01680(0.8038)	0.01761(0.8168)	0.01706(0.8418)
Year 2010	0.01673(0.8422)	0.01616(0.8052)	0.01574(0.8162)	0.01668(0.8263)	0.01611(0.8507)
Year 2011	0.01889(0.8221)	0.01837(0.7794)	0.01749(0.7964)	0.01852(0.8075)	0.01776(0.8357)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00502(0.0000)[a]	0.00482(0.0000)[a]	0.00514(0.0000)[a]	0.00493(0.0000)[a]	0.00521(0.0000)[a]
Average probability	0.38728	0.35644	0.35666	0.35688	0.35977

Notes: (i) Dependent variable is CAP_t; (ii) p-value in parenthesis; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%.

5.1.1.5 Regulation impacts for different types of banks

In this section, I categorize my sample banks into four groups based on different types: 'Big 5' banks, joint-equity banks, local banks[21] and foreign banks. I then conduct a closer examination of bank types with the emphasis on explaining why the local banks may react differently.

This subsection is structured as follows. First, I provide a brief introduction and background information about the three types of domestic banks in China. Next, the empirical evidence about the differences between these major four groups of banks is presented and explained thoroughly (Tables 5.11 and 5.12). The variables of particular interest for this group estimation are the regulation pressure (REG) and its relevant interaction product dummy terms (REGJOINT, REGLOCAL and REGFOREIGN) in the regulatory model. They represent the regulatory influences on capital level for the 'Big 5' large-sized state-owned commercial banks, medium-sized national joint-equity commercial banks, small-sized local commercial banks, and the foreign commercial banks.

So far, China's banking system is comprised of three tiers of domestic banks (Lin and Zhang, 2009). The first-tier consists of the 'Big 5' state-owned commercial banks while the 12 national-level domestic joint-equity banks constitute the second-tier. The city-level commercial banks, along with the joint venture banks and solely foreign banks, make up the third-tier in the industry.

[21] The first three groups of banks are domestic banks.

Regarding the 'Big 5' state-owned commercial banks, they are the main body of the commercial banking system in China and their loan and capital sizes occupy t absolute, monopolistic positions. Their business coverage is extensive and multivariate which represents the rich capital and power in the Chinese financial sector.

As for the national joint-equity commercial banks, they are referred to as the banks which have the non- state-owned capital and, a shareholding system compared to the public ownership character of the state-owned commercial banks. They are funded by state-owned enterprise, foreign companies and private companies, etc. There are 12 national joint-equity commercial banks[22] in total so far, which are approved by the People's bank of China (PBC) and they have developed a commercial financial service all over China.

With respect to the local commercial banks, they are referred to as the banking financial institutions whose business coverage is restricted by region. Local commercial banks in China include the urban banks, urban credit cooperatives, rural banks and rural credit cooperatives. Although local banks have made considerable progress in recent years, they still cannot compare with the state-owned banks and joint-equity banks in terms of the scale of assets, institutional quantity and total staff numbers, etc.

Urban commercial banks are the local joint-equity banks which are built up on the basis of city credit cooperatives' liquidation through absorbing local finance and companies' buying in. Since city commercial banks also belong to the joint-equity banks, their statutory

[22] They are referred to as the China Citic Bank, Everbright Bank, Huaxia Bank, Guangdong Development Bank, China Merchants Bank, Shanghai Development Bank, Industrial Bank, Minsheng Bank, Evergrowing Bank, Zheshang Bank, Bohai Bank and Ping'an Bank.

business scope is the same as that for the state-owned banks and national joint-equity banks. Their basic function is to circulate funds for the development of the local economy as well as to provide financial services for the small and medium city enterprises, which separates them from the state-owned banks and national joint-equity banks. City commercial banks are an important component and special group of the Chinese banking industry, which grew out of city credit cooperatives formed in the 1980s. The business direction of the time was to provide financial support for small and medium enterprises as well as to pave the way for the development of the local economy. During the middle 1990s, central authorities established the city commercial banks based on the city credit cooperatives. Thus, city commercial banks were created under special, historical conditions in China.

As a special group, city commercial banks present the following properties in terms of size and operation. First of all, their overall scale is relatively small due to their geographical restrictions. For example, the total asset scale for most of the city banks in China is below 20 billion RMB. Thus, city banks basically belong to the small and medium banks. Second, their development has strong dependence on the local government and local economy. The results of a survey in 2004 show that, urban commercial banks with good business performance are primarily located in the prosperous regions, especially in the eastern region. There are some important reasons to explain such phenomenon. For instance, the local government has sufficient revenue which will have smaller negative impacts on the city banks. Next, there are a large number of small and medium enterprises with strong profitability. City banks are very willing to serve a loan. In addition, the average per capita income is high, the credit culture is developed and the local government has a strong protection consciousness with respect to private property. Economic growth is the ground

of financial development while most of the city banks are located in developed central cities which have the most valuable customers. These advantages provide a good foundation for the city banks to expand their business.

Rural commercial banks are the local financial institutions with a share-holding system which is composed of the collective investment of farmers, rural industrial and commercial households, corporate legal entities and other economic organizations. They primarily are the rural credit unions' affiliates, such as rural commercial banks, town banks and rural credit cooperatives located in different provinces, regions and cities. In the regions with developed economies and a high degree of integration of urban and rural areas, the concept of "Farmers, Rural Areas, and Agriculture Production" has changed a lot. In these areas, the agriculture proportion is quite low and is less than 5% in some areas. The farmers who are served by the credit cooperatives, although their identities have not changed, are for the most part no longer engaged in agricultural production and labor which is predominately in traditional planting and cultivating. They require less support services for agriculture. For the credit cooperatives located in those areas, shareholding reform can be conducted and rural commercial banks can be established.

Now, I turn to discuss the regression results for this final group regression and identify whether differences exist between the 4 major bank types (Tables 5.11 and 5.12). I set the 'Big 5' banks as being the base (REG). I find that the regulatory pressure (REG_t) coefficient is always positive and significant at 1% in all the 5 different estimations, suggesting that regulation generates the expected effects on the 'Big 5' state-owned banks. For example, if all else remains unchanged, regulation will increase the capital level for the

‘Big 5’ state-owned banks by 41.90% (Estimation 1). The possible reason is that big banks pursue all lines of banking business throughout mainland China and overseas and they have the incentive to signal to both bank regulators and the market that they are in compliance with the regulation and seeking a reduction in regulatory costs.

For the first regulation interaction term (REGJOINT), there is a positive and significant effect on banks’ capital level above and beyond that of the ‘Big 5’ banks, indicating that regulation has a relatively stronger impact by a factor of 15.85% based on Estimation 1. As joint-equity banks have a relatively lower capital buffer compared to all the other bank types, it may suggest that they have a slightly greater incentive to improve their capital level to avoid potential expensive costs for breaching the capital standard.

The insignificant coefficient of the second regulation interaction term (REGLOCAL) suggests local commercial banks behave the same as the ‘Big 5’ in regard to regulatory pressure. Although local banks are quite small in terms of asset scale, they have many competitive edges relative to the large state-owned banks. For example, they have large customer development space, geographic advantage, less redundant and inefficient employees and incentive mechanisms with obvious efficiency.

For foreign banks (REGFOREIGN), there is a positive and significant impact on banks’ capital level. In the case of estimation 1, regulation will increase the capital level for foreign banks by 20.73 percentage points more than for the ‘Big 5’ banks. Since foreign banks are very heavily capitalized, the likely reason why they seem to react more to regulatory change is from a signaling effect.

Furthermore, as already presented in the last four groups of estimations, the coefficients (1-α) on the lagged capital ratios (CAP_{t-1}) are significantly positive and below unity (stationary conditions) in all cases. Based on the regression results from the Estimations 1 to 5, the average speed of adjustment rate (α) to the target capital level is around 0.72. On the contrary, other control variables, such as the linear and quadratic forms of bank deposit and interbank liabilities (DEPOSIT, $DEPOSIT^2$, INTERBANK, and $INTERBANK^2$), optimal capital ratios from the simulation exercises (STDCAP, VARCAP and CUBCAP) and liquid assets portion (LATA) are insignificant, although most of them achieve the expected signs.

In the market model (Table 5.12), my empirical evidence implies that the coefficients (1-β) on the lagged capital ratios (CAP_{t-1}) are positive and below 1 (stationary conditions) in all the estimations which presents the same pattern as the previous four group estimations. Based on the regression results from Estimations 1 to 5, I find that the average speed of the adjustment rate (β) to the target capital ratio is about 0.76, which is slightly higher than what I get from the regulatory model (0.75). Moreover, VORROA, SIZE, $SIZE^2$ and RWATA are all statistically significant at 1% significant level and achieve the correct signs.

Table 5.11 Disequilibrium regression results for CAP based on different bank types: regulatory model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAP_{t-1}(1-\alpha)$	0.28063(0.0000)[a]	0.27721(0.0000)[a]	0.27828(0.0000)[a]	0.28098(0.0000)[a]	0.27729(0.0000)[a]
REG_t	0.41897(0.0001)[a]	0.43877(0.0000)[a]	0.41102(0.0001)[a]	0.42446(0.0000)[a]	0.41050(0.0001)[a]
$REGJOINT_t$	0.15849(0.0938)[c]	0.14348(0.0469)[b]	0.16044(0.0888)[c]	0.15637(0.0426)[b]	0.17059(0.0779)[c]
$REGLOCAL_t$	0.06377(0.5295)	0.03806(0.6361)	0.07073(0.4864)	0.05748(0.5031)	0.06936(0.4992)
$REGFOREIGN_t$	0.20727(0.0360)[b]	0.16548(0.0442)[b]	0.20347(0.0383)[b]	0.19212(0.0450)[b]	0.19805(0.0481)[b]
$DEPOSIT_t$	0.00323(0.7045)		0.00085(0.9220)	0.00068(0.3375)	-0.00221(0.8150)
$DEPOSIT_t^2$	-0.00010(0.7755)		-0.00002(0.9507)		0.00012(0.7638)
$INTERBANK_t$		0.00114(0.3329)	0.00032(0.5941)	0.00111(0.4453)	0.00135(0.3148)
$INTERBANK_t^2$		-0.00005(0.5592)		-0.00007(0.5595)	-0.00008(0.4182)
$STDCAP_{t-5}$	0.68407(0.4552)	0.67048(0.4686)	0.66645(0.4672)	0.67578(0.4548)	0.61655(0.5035)
$VARCAP_{t-5}$	-33.86230(0.6005)	-34.03430(0.6011)	-33.15700(0.6146)	-34.58310(0.5832)	-31.84530(0.6231)
$CUBCAP_{t-5}$	137.22300(0.9210)	151.13300(0.9126)	130.05800(0.9267)	149.69300(0.9101)	128.48000(0.9258)
$LATA_t$	-0.00665(0.6507)	-0.00726(0.6172)	-0.00765(0.6136)	-0.00627(0.6700)	-0.00539(0.7164)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00676(0.0000)[a]	0.00674(0.0000)[a]	0.00675(0.0000)[a]	0.00672(0.0000)[a]	0.00672(0.0000)[a]
Average probability	0.61042	0.61294	0.61478	0.61008	0.61288

Notes: (i) Dependent variable is CAP_t; (ii) p-value in parenthesis; (iii) a=significant at 1%, b=significant at 5%, c=significant at 10%.

Table 5.12 Disequilibrium regression results for CAP based on different bank types: market model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAP_{t-1}(1-\beta)$	0.23883(0.0000)[a]	0.24412(0.0000)[a]	0.24006(0.0000)[a]	0.24162(0.0000)[a]	0.23944(0.0000)[a]
$OPERCOST_t$	-1.52350(0.2996)	-1.63121(0.2852)	-1.56436(0.3034)	-1.59816(0.2768)	-1.61121(0.2739)
$OPERCOST_t^2$	0.00243(0.6326)	0.00270(0.6167)	0.00256(0.6295)	0.00256(0.6182)	0.00265(0.6072)
$VARROA_{t-5}$	112.64600(0.0000)[a]	111.60100(0.0000)[a]	113.18600(0.0000)[a]	110.54400(0.0000)[a]	113.59900(0.0000)[a]
$SIZE_t$	-0.03831(0.0000)[a]	-0.03801(0.0000)[a]	-0.03819(0.0000)[a]	-0.03804(0.0000)[a]	-0.03761(0.0001)[a]
$SIZE_t^2$	0.00144(0.0001)[a]	0.00143(0.0000)[a]	0.00143(0.0001)[a]	0.00143(0.0000)[a]	0.00141(0.0001)[a]
$RWATA_t$	0.15417(0.0000)[a]	0.15505(0.0000)[a]	0.15486(0.0000)[a]	0.15494(0.0000)[a]	0.15515(0.0000)[a]
$LIQUIDITY_t$	-0.00831(0.5844)	-0.00754(0.6147)	-0.00812(0.5937)	-0.00797(0.5977)	-0.00820(0.5889)
$LLOSS_t$	0.08581(0.7479)	0.09405(0.7274)	0.08859(0.7432)	0.09100(0.7317)	0.09379(0.7245)
TAX_{t-1}	-0.00291(0.7205)	-0.00265(0.7463)	-0.00294(0.7212)	-0.00291(0.7234)	-0.00316(0.6991)
Year 2005	-0.02665(0.9804)	-0.03510(0.9972)	-0.02806(0.9837)	-0.02576(0.9725)	-0.02452(0.9198)
Year 2006	-0.01192(0.8161)	-0.01181(0.8009)	-0.01217(0.7647)	-0.01163(0.8270)	-0.01199(0.7435)
Year 2007	-0.01190(0.8165)	-0.01172(0.8023)	-0.01205(0.7668)	-0.01153(0.8286)	-0.01206(0.7419)
Year 2008	-0.00009(0.9986)	-0.00056(0.9904)	-0.00079(0.9844)	0.00031(0.9963)	-0.00049(0.9892)
Year 2009	0.01510(0.7675)	0.01507(0.7465)	0.01480(0.7141)	0.01528(0.7732)	0.01481(0.6837)
Year 2010	0.01593(0.7554)	0.01605(0.7310)	0.01569(0.6983)	0.01617(0.7607)	0.01569(0.6667)
Year 2011	0.01762(0.7310)	0.01767(0.7058)	0.01738(0.6688)	0.01782(0.7376)	0.01744(0.6336)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00561(0.0000)[a]	0.00557(0.0000)[a]	0.00560(0.0000)[a]	0.00561(0.0000)[a]	0.00560(0.0000)[a]
Average probability	0.38958	0.38706	0.38522	0.38992	0.38712

Notes: (i) Dependent variable is CAP_t; (ii) p-value in parenthesis; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%.

When I compare the probability of the observations belonging to the regulation regime with that of belonging to the market model, my evidence supports the dominance of the regulatory force (0.61) which is 22.44 percentage points more than that of the market force (0.39).

5.1.2. Empirical results based on CAR

In this section, I will present and explain the empirical results when the risk-adjusted capital ratio (CAR) is used as the alternative, dependent variable. As I addressed in Chapter IV, both total capital to total asset ratio (CAP) and total capital to risk-weighted asset ratio (CAR) are widely used in previous banking studies. The former are used by Shrieves and Dahl (1992), and Rime (2001). The latter become more popular along with the introduction of the risk-based, binding, capital standards (Jacques and Nigro, 1997; Aggarwal and Jacques, 1998; Ediz et al., 1998; Cannata and Quagliariello, 2006; Saadaoui, 2011).

First, I examine the regression results for the entire sample of banks with the emphasis put on the parameter of the regulation pressure variable (REG). In the regulatory model (Table 5.13), I find that the regulation variable has a positive and significant impact on banks' capital level in all the 5 estimations. The optimal capital ratios from the simulation exercises, STDCAR, VARCAR and CUBCAR, are statistically significant with the expected signs in Estimation 4. This result supports the validity of the derived regulatory model from the theory. In the market model (Table 5.14), the control variables, VORROA, the linear and quadratic forms of bank size (SIZE and $SIZE^2$) and lagged tax ratio (TAX) have statistically significant and expected influences on banks' capital level. For example,

the positive coefficients on VORROA from Estimations 1 to 5 suggest that more capital is needed by the banks which experience large variations in their ROA. The negative effects of banks size on their capital level coincides with the 'Too-big-to-fail' theory. The negative parameter on the lagged tax ratio (TAX) indicates that banks tend to use more debt rather than equity in their financial structure due to the tax shield. Last, the average speed of the adjustment rate to the target capital level is around 0.76 under the regulation regime while this adjustment rate is about 0.85 under the market regime.

Second, I discuss the differences in regulation pressure between the under-capitalized and well-capitalized banks. In the regulatory model (Table 5.15), REG is positive and statistically significant, indicating that binding, capital requirements generate an active influence on the well-capitalized banks. That is to say, well-capitalized banks react to the regulation by increasing their capital adequacy level as a buffer against shocks to equity, although they are not explicitly constrained by the binding, capital requirement. A possible explanation is that well-capitalized banks try to signal to both the market and bank regulators that they not only meet but clearly exceed the minimum, regulatory, capital standards.

Table 5.13 Disequilibrium regression results for CAR (no interaction product terms): regulatory model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$\mathrm{CAR}_{t-1}(1-\alpha)$	0.24466(0.0000)[a]	0.24208(0.0000)[a]	0.24458(0.0000)[a]	0.24571(0.0000)[a]	0.24366(0.0000)[a]
REG_t	0.92638(0.0000)[a]	0.91059(0.0000)[a]	0.92537(0.0000)[a]	0.90039(0.0000)[a]	0.92556(0.0000)[a]
$\mathrm{DEPOSIT}_t$	0.01065(0.1753)		0.01052(0.1912)	-0.00030(0.8083)	0.00093(0.3611)
$\mathrm{DEPOSIT}_t^2$	-0.00047(0.1542)		-0.00047(0.1520)		-0.00007(0.3564)
$\mathrm{INTERBANK}_t$		0.00189(0.2001)	0.00010(0.8801)	0.00189(0.1530)	0.00863(0.6400)
$\mathrm{INTERBANK}_t^2$		-0.00015(0.1081)		-0.00013(0.1689)	-0.00037(0.6162)
STDCAR_{t-5}	0.32598(0.4230)	0.30491(0.4305)	0.32507(0.4299)	0.33391(0.0736)[c]	0.30717(0.4417)
VARCAR_{t-5}	-9.32859(0.4250)	-9.47224(0.3763)	-9.38961(0.4252)	-10.07840(0.0038)[a]	-9.09503(0.4321)
CUBCAR_{t-5}	23.48370(0.7910)	26.42900(0.7472)	23.82590(0.7899)	32.06390(0.0802)[c]	22.26430(0.8006)
LATA_t	0.02029(0.1822)	0.02321(0.1170)	0.01874(0.2305)	0.02479(0.0799)[c]	0.01985(0.2129)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00861(0.0000)[a]	0.00861(0.0000)[a]	0.00855(0.0000)[a]	0.00827(0.0000)[a]	0.00856(0.0000)[a]
Average probability	0.68394	0.68277	0.68322	0.68424	0.68204

Notes: (i) Dependent variable is CAR_t; (ii) p-value in parenthesis; (iii) a=significant at 1%, b=significant at 5%, c=significant at 10%.

Table 5.14 Disequilibrium regression results for CAR (no interaction product terms): market model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAR_{t-1}(1-\beta)$	0.14518(0.0000)[a]	0.15256(0.0001)[a]	0.14738(0.0000)[a]	-0.00735(0.8954)	0.14859(0.0001)[a]
$OPERCOST_t$	-2.70485(0.0774)[c]	-2.61844(0.1955)	-2.83261(0.0657)[c]	-3.08959(0.2497)	-2.85114(0.0694)[c]
$OPERCOST_t^2$	0.00593(0.3560)	0.00552(0.5441)	0.00631(0.3343)	0.00697(0.5615)	0.00637(0.3416)
$VARROA_{t-5}$	121.95600(0.0053)[a]	120.48700(0.0086)[a]	120.44800(0.0057)[a]	118.92700(0.1994)	120.35900(0.0062)[a]
$SIZE_t$	-0.03675(0.0000)[a]	-0.03540(0.0000)[a]	-0.03676(0.0000)[a]	-0.04229(0.0000)[a]	-0.03631(0.0000)[a]
$SIZE_t^2$	0.00141(0.0000)[a]	0.00136(0.0000)[a]	0.00141(0.0000)[a]	0.00161(0.0000)[a]	0.00140(0.0000)[a]
RA_t	0.00022(0.8655)	0.00022(0.8695)	0.00022(0.8664)	0.00061(0.6203)	0.00023(0.8637)
$LLOSS_t$	-0.35535(0.2293)	-0.36239(0.2489)	-0.34664(0.2479)	-0.46876(0.2190)	-0.34630(0.2547)
TAX_{t-1}	-0.01821(0.0525)[c]	-0.01864(0.0626)[c]	-0.01743(0.0577)[c]	-0.02597(0.0117)[b]	-0.01741(0.0615)[c]
Year 2005	-0.04452(0.9990)	-0.03132(0.9576)	-0.05023(1.0000)	-0.04180(0.8773)	-0.04068(0.9835)
Year 2006	-0.03456(0.9532)	-0.03368(0.9617)	-0.03408(0.9847)	-0.04340(0.9619)	-0.03562(0.9798)
Year 2007	-0.01546(0.9447)	-0.01530(0.9790)	-0.01548(0.9929)	-0.02463(0.6865)	-0.01529(0.9743)
Year 2008	0.01375(0.9508)	0.01377(0.9811)	0.01361(0.9938)	0.01084(0.8562)	0.01371(0.9769)
Year 2009	0.01412(0.9494)	0.01366(0.9812)	0.01411(0.9935)	0.01841(0.7570)	0.01406(0.9763)
Year 2010	0.02059(0.9263)	0.02025(0.9722)	0.02052(0.9906)	0.02262(0.7038)	0.02052(0.9654)
Year 2011	0.02488(0.9111)	0.02446(0.9664)	0.02480(0.9887)	0.02811(0.6369)	0.02478(0.9583)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00419(0.0000)[a]	0.00421(0.0000)[a]	0.00420(0.0000)[a]	0.00445(0.0000)[a]	0.00420(0.0000)[a]
Average probability	0.31606	0.31723	0.31678	0.31576	0.31796

Notes: (i) Dependent variable is CAR_t; (ii) p-value in parenthesis; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%.

On the contrary, the CBRC regulation does not have the expected effects on the capital level for the under-capitalized banks. Instead, a negative impact on the capital level is found for the undercapitalized banks (Estimations 2 and 3). Nevertheless, this result does not go against the notion that risk-based capital has an impact on undercapitalized banks. In fact, it indicates that mildly undercapitalized banks would experience relatively large increases in their capital ratio either by raising capital or reducing risk-weighted assets, while the most severely undercapitalized banks may experience relatively small increases in their capital ratio (Jacques and Nigro, 1997). One possible explanation for this is that because constrained banks have a low ROA and the high expense of raising capital from external sources. Severely undercapitalized banks may have an extremely limited ability to meet the risk-based standards by raising capital, while mildly undercapitalized banks may be relatively more successful in raising their capital ratio.

In the market model (Table 5.16), I find that VORROA, SIZE, $SIZE^2$, RA, and TAX have the expected impacts on the capital level. For instance, the positive parameter of RA, which is employed to measure the credit risk and illiquidity risk, implies that more capital is required when the bank is related to the higher credit risk of providing loans and suffers from the problem of inadequate liquidity.

Table 5.15 Disequilibrium regression results for CAR based on under-capitalized & well-capitalized banks: regulatory model.

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAR_{t-1}(1-\alpha)$	0.16535(0.0002)[a]	0.00693(0.5878)	-0.02283(0.2030)	0.15838(0.0006)[a]	0.16589(0.0002)[a]
REG_t	0.92617(0.0000)[a]	1.02818(0.0000)[a]	1.07874(0.0000)[a]	0.90812(0.0000)[a]	0.92174(0.0000)[a]
$REGU_t$	-1.09944(0.1496)	-0.95657(0.0000)[a]	-0.85769(0.0000)[a]	-1.09244(0.1498)	-1.10364(0.1410)
$DEPOSIT_t$	0.01210(0.0589)[c]		-0.00157(0.5785)	-0.00050(0.6148)	0.00088(0.2103)
$DEPOSIT_t^2$	-0.00054(0.0441)[b]		0.00003(0.8066)		-0.00007(0.2032)
$INTERBANK_t$		0.00051(0.1403)	0.00050(0.1091)	0.00193(0.1614)	0.00994(0.6341)
$INTERBANK_t^2$		-0.00004(0.1859)		-0.00014(0.1401)	-0.00044(0.5804)
$STDCAR_{t-5}$	0.36438(0.3203)	0.06755(0.3741)	0.03833(0.6135)	0.33985(0.3537)	0.34807(0.3315)
$VARCAR_{t-5}$	-8.11058(0.4326)	-1.72068(0.1347)	-1.78760(0.1255)	-8.02310(0.4481)	-7.86661(0.4357)
$CUBCAR_{t-5}$	19.50410(0.8021)	5.74506(0.0931)[c]	6.72242(0.0576)[c]	20.21460(0.8101)	18.87280(0.8034)
$LATA_t$	0.01528(0.2053)	-0.00019(0.9745)	0.00725(0.2793)	0.02010(0.1016)	0.01706(0.1703)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00717(0.0000)[a]	0.00166(0.0000)[a]	0.00245(0.0000)[a]	0.00726(0.0000)[a]	0.00720(0.0000)[a]
Average probability	0.67348	0.55834	0.56235	0.67252	0.67541

Notes: (i) Dependent variable is CAR_t; (ii) p-value in parenthesis; (iii) a=significant at 1%, b=significant at 5%, c=significant at 10%.

Table 5.16 Disequilibrium regression results for CAR based on under-capitalized & well-capitalized banks: market model.

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAR_{t-1}(1-\beta)$	0.16399(0.0000)[a]	0.17271(0.0086)[a]	0.22247(0.0002)[a]	0.17984(0.0000)[a]	0.16113(0.0000)[a]
$OPERCOST_t$	-2.87200(0.1250)	-3.73837(0.1230)	-1.02594(0.6101)	-2.40501(0.1787)	-2.60985(0.2073)
$OPERCOST_t^2$	0.00631(0.4528)	0.01249(0.0887)[c]	0.00309(0.6101)	0.00466(0.5455)	0.00545(0.5622)
$VARROA_{t-5}$	118.58600(0.0119)[b]	119.15200(0.0012)[a]	117.21300(0.0019)[a]	120.11400(0.0206)[b]	119.61500(0.0110)[b]
$SIZE_t$	-0.03516(0.0000)[a]	-0.03203(0.0207)[b]	-0.04857(0.0002)[a]	-0.03266(0.0000)[a]	-0.03541(0.0000)[a]
$SIZE_t^2$	0.00135(0.0000)[a]	0.00114(0.0392)[b]	0.00173(0.0010)[a]	0.00126(0.0000)[a]	0.00137(0.0000)[a]
RA_t	0.00025(0.8357)	0.00179(0.2426)	0.00250(0.0550)[c]	0.00023(0.8490)	0.00019(0.8819)
$LLOSS_t$	-0.26951(0.4370)	0.00860(0.9842)	0.12405(0.7318)	-0.26854(0.4703)	-0.32680(0.3374)
TAX_{t-1}	-0.01812(0.0669)[c]	0.01121(0.3631)	0.01164(0.2168)	-0.02070(0.0563)[c]	-0.01883(0.0605)[c]
Year 2005	-0.01517(0.9151)	-0.04263(0.8840)	-0.03619(0.8394)	-0.02267(0.9054)	-0.02364(0.9869)
Year 2006	-0.01490(0.9165)	-0.02470(0.8511)	-0.03045(0.8267)	-0.02231(0.9070)	-0.02308(0.9872)
Year 2007	-0.00504(0.9717)	-0.02182(0.8764)	-0.01244(0.9219)	-0.01291(0.9460)	-0.01332(0.9926)
Year 2008	0.02232(0.8751)	-0.00009(0.9994)	-0.00861(0.9519)	0.01354(0.9434)	0.01388(0.9923)
Year 2009	0.02443(0.8634)	0.04853(0.7024)	0.04465(0.7230)	0.01497(0.9374)	0.01524(0.9915)
Year 2010	0.03068(0.8288)	0.05242(0.6799)	0.05270(0.6758)	0.02139(0.9106)	0.02172(0.9879)
Year 2011	0.03488(0.8059)	0.04956(0.6971)	0.05603(0.6573)	0.02553(0.8934)	0.02597(0.9856)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00428(0.0000)[a]	0.01200(0.0000)[a]	0.01151(0.0000)[a]	0.00426(0.0000)[a]	0.00417(0.0000)[a]
Average probability	0.32652	0.44166	0.43765	0.32748	0.32459

Notes: (i) Dependent variable is CAR_t; (ii) p-value in parenthesis; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%.

Next, I try to compare the regulation impacts on the listed banks with those on the unlisted banks (Tables 5.17 and 5.18). In this case, I set listed banks as the base (REG) and find that both of the regulatory pressure variables (REG and REGUNLISTED) have positive and significant impacts on banks' capital ratios. Particularly, using Estimation 1 as an example, the influence on the unlisted banks is more than on the unlisted banks by the factor of 18.29%. The desire of being listed and different ownership structure of the unlisted banks may explain why they follow the capital rules more strictly compared with their listed rivals.

For the fourth group regression, my focus is to investigate whether regulation has the same effects on the state-owned banks as that on the non- state-owned banks (Tables 5.19 and 5.20). Similarly, in the full sample regression, I find that difference of regulation pressure on the state-owned banks and non- state-owned banks is not significant (Table 5.19). Nevertheless, when I delete 3 local banks with more local government ownership from the original whole sample, I find that regulation has stronger effects on the non- state-owned banks relative to the state-owned banks (Table 5.21). A closer examination of bank types in the follow-up empirical analysis may explain why the local banks react differently.

Table 5.17 Disequilibrium regression results for CAR based on listed & unlisted banks: regulatory model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAR_{t-1}(1-\alpha)$	0.25556(0.0000)[a]	0.23797(0.0000)[a]	0.26240(0.0000)[a]	0.25060(0.0000)[a]	0.23334(0.0000)[a]
REG_t	0.82212(0.0000)[a]	0.83781(0.0000)[a]	0.81927(0.0000)[a]	0.81255(0.0000)[a]	0.86591(0.0000)[a]
$REGUNLIST_t$	0.18286(0.0011)[a]	0.13562(0.0205)[b]	0.19163(0.0017)[a]	0.16104(0.0087)[a]	0.16247(0.0113)[b]
$DEPOSIT_t$	0.01671(0.0320)[b]		0.01822(0.0380)[b]	0.00170(0.2736)	0.00007(0.1014)
$DEPOSIT_t^2$	-0.00065(0.0439)[b]		-0.00068(0.0495)[b]		-0.00005(0.1411)
$INTERBANK_t$		0.00145(0.3633)	-0.00054(0.4670)	0.00149(0.3137)	0.01658(0.9765)
$INTERBANK_t^2$		-0.00008(0.4435)		-0.00014(0.2233)	-0.00062(0.7815)
$STDCAR_{t-5}$	0.28214(0.4628)	0.31121(0.4006)	0.31260(0.3925)	0.26704(0.4325)	0.22802(0.5519)
$VARCAR_{t-5}$	-8.28740(0.4647)	-9.68232(0.3742)	-8.86086(0.3923)	-8.55836(0.3821)	-7.97969(0.4841)
$CUBCAR_{t-5}$	19.61610(0.8214)	24.98720(0.7869)	21.89810(0.7853)	23.65600(0.7594)	21.46390(0.8206)
$LATA_t$	0.01747(0.2178)	0.01931(0.1873)	0.02058(0.1595)	0.02547(0.0717)[c]	0.01596(0.2990)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00801(0.0000)[a]	0.00815(0.0000)[a]	0.00806(0.0000)[a]	0.00818(0.0000)[a]	0.00794(0.0000)[a]
Average probability	0.68771	0.67801	0.68479	0.68181	0.67009

Notes: (i) Dependent variable is CAR_t; (ii) p-value in parenthesis; (iii) a=significant at 1%, b=significant at 5%, c=significant at 10%.

Table 5.18 Disequilibrium regression results for CAR based on listed & unlisted banks: market model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAR_{t-1}(1-\beta)$	0.14732(0.0000)[a]	0.17347(0.0000)[a]	0.14577(0.0000)[a]	0.15251(0.0000)[a]	0.15941(0.0000)[a]
$OPERCOST_t$	-2.96366(0.0542)[c]	-2.65770(0.1470)	-3.04613(0.0882)[c]	-2.76357(0.0977)[c]	-1.96723(0.1740)
$OPERCOST_t^2$	0.00667(0.3123)	0.00539(0.5009)	0.00706(0.3646)	0.00604(0.4022)	0.00268(0.6114)
$VARROA_{t-5}$	119.60500(0.0094)[a]	120.43900(0.0257)[b]	119.49100(0.0088)[a]	120.38700(0.0106)[b]	118.69700(0.0291)[b]
$SIZE_t$	-0.03869(0.0000)[a]	-0.03525(0.0000)[a]	-0.03882(0.0000)[a]	-0.03715(0.0000)[a]	-0.03680(0.0000)[a]
$SIZE_t^2$	0.00148(0.0000)[a]	0.00135(0.0000)[a]	0.00149(0.0000)[a]	0.00143(0.0000)[a]	0.00141(0.0000)[a]
RA_t	0.00037(0.7745)	0.00035(0.7684)	0.00040(0.7559)	0.00034(0.7945)	0.00037(0.7528)
$LLOSS_t$	-0.35034(0.2103)	-0.24446(0.4620)	-0.35351(0.1876)	-0.35217(0.2166)	-0.30303(0.3445)
TAX_{t-1}	-0.01708(0.0739)[c]	-0.02094(0.0783)[c]	-0.01698(0.0784)[c]	-0.01876(0.0696)[c]	-0.02150(0.0739)[c]
Year 2005	-0.03810(0.9588)	-0.03142(0.9526)	-0.03347(0.8428)	-0.03044(0.7537)	-0.03410(0.8787)
Year 2006	-0.03503(0.9417)	-0.03645(0.9822)	-0.03480(0.9139)	-0.03313(0.9115)	-0.02654(0.2837)
Year 2007	-0.01528(0.9568)	-0.01504(0.9753)	-0.01526(0.8604)	-0.01476(0.7844)	-0.01565(0.4715)
Year 2008	0.01344(0.9620)	0.01361(0.9777)	0.01358(0.8753)	0.01435(0.7883)	0.01286(0.5415)
Year 2009	0.01466(0.9586)	0.01505(0.9753)	0.01443(0.8674)	0.01496(0.7795)	0.01381(0.5064)
Year 2010	0.02064(0.9417)	0.02046(0.9665)	0.02023(0.8149)	0.02091(0.6957)	0.01906(0.3599)
Year 2011	0.02520(0.9289)	0.02503(0.9590)	0.02497(0.7728)	0.02548(0.6339)	0.02276(0.2765)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00425(0.0000)[a]	0.00452(0.0000)[a]	0.00420(0.0000)[a]	0.00424(0.0000)[a]	0.00454(0.0000)[a]
Average probability	0.31229	0.32199	0.31521	0.31819	0.32991

Notes: (i) Dependent variable is CAR_t; (ii) p-value in parenthesis; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%.

Table 5.19 Disequilibrium regression results for CAR based on state ownership (full sample regression): regulatory model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$\mathrm{CAR}_{t-1}(1-\alpha)$	0.23910(0.0000)[a]	0.22989(0.0000)[a]	0.23974(0.0000)[a]	0.23628(0.0000)[a]	0.23762(0.0000)[a]
REG_t	0.82888(0.0000)[a]	0.81769(0.0000)[a]	0.83002(0.0000)[a]	0.81181(0.0000)[a]	0.83658(0.0000)[a]
$\mathrm{REGNONSTATE}_t$	0.10626(0.2975)	0.13037(0.1636)	0.11423(0.2692)	0.12776(0.1704)	0.09625(0.3610)
$\mathrm{DEPOSIT}_t$	0.00638(0.4842)		0.00663(0.4785)	0.00037(0.7815)	0.00084(0.6325)
$\mathrm{DEPOSIT}_t^2$	-0.00027(0.5042)		-0.00028(0.4856)		-0.00006(0.6524)
$\mathrm{INTERBANK}_t$		0.00119(0.5270)	0.00013(0.8521)	0.00117(0.5318)	0.00487(0.7007)
$\mathrm{INTERBANK}_t^2$		-0.00007(0.5894)		-0.00008(0.5468)	-0.00020(0.7027)
STDCAR_{t-5}	0.33041(0.4077)	0.36402(0.3771)	0.34776(0.3917)	0.32995(0.3966)	0.32618(0.3600)
VARCAR_{t-5}	-9.69178(0.3943)	-10.83010(0.3656)	-10.12620(0.3840)	-10.00030(0.3762)	-9.71346(0.3431)
CUBCAR_{t-5}	27.33170(0.7513)	30.17100(0.7437)	27.76420(0.7520)	27.65090(0.7479)	27.56270(0.7290)
LATA_t	0.02072(0.1521)	0.01940(0.2198)	0.01929(0.2216)	0.02151(0.1687)	0.02019(0.1912)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00839(0.0000)[a]	0.00841(0.0000)[a]	0.00846(0.0000)[a]	0.00848(0.0000)[a]	0.00839(0.0000)[a]
Average probability	0.69405	0.68033	0.68657	0.68530	0.69210

Notes: (i) Dependent variable is CAR_t; (ii) p-value in parenthesis; (iii) a=significant at 1%, b=significant at 5%, c=significant at 10%.

Table 5.20 Disequilibrium regression results for CAR based on state ownership (full sample regression): market model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAR_{t-1}(1-\beta)$	0.15077(0.0000)[a]	0.16790(0.0000)[a]	0.14824(0.0000)[a]	0.15280(0.0001)[a]	0.15120(0.0000)[a]
$OPERCOST_t$	-2.95656(0.1298)	-2.65586(0.1543)	-2.81682(0.0704)[c]	-2.85236(0.0794)[c]	-2.89472(0.1159)
$OPERCOST_t^2$	0.00661(0.4557)	0.00550(0.5032)	0.00624(0.3441)	0.00635(0.3601)	0.00642(0.4348)
$VARROA_{t-5}$	121.21200(0.0115)[b]	120.64000(0.0193)[b]	120.46000(0.0072)[a]	120.40600(0.0088)[a]	120.82900(0.0121)[b]
$SIZE_t$	-0.03696(0.0000)[a]	-0.03582(0.0000)[a]	-0.03742(0.0000)[a]	-0.03655(0.0000)[a]	-0.03641(0.0000)[a]
$SIZE_t^2$	0.00142(0.0000)[a]	0.00137(0.0000)[a]	0.00144(0.0000)[a]	0.00140(0.0000)[a]	0.00140(0.0000)
RA_t	0.00031(0.8073)	0.00032(0.8019)	0.00025(0.8504)	0.00027(0.8399)	0.00024(0.8512)
$LLOSS_t$	-0.25900(0.4370)	-0.29646(0.3660)	-0.35233(0.2396)	-0.32971(0.2883)	-0.26143(0.4437)
TAX_{t-1}	-0.01774(0.0702)[c]	-0.01977(0.0775)[c]	-0.01774(0.0616)[c]	-0.01810(0.0664)[c]	-0.01815(0.0682)[c]
Year 2005	-0.05464(1.0000)	-0.03993(0.9884)	-0.04896(1.0000)	-0.04389(0.9988)	-0.03174(0.9178)
Year 2006	-0.03193(0.9563)	-0.03931(0.9955)	-0.04743(1.0000)	-0.03618(0.9803)	-0.03580(0.9759)
Year 2007	-0.03334(0.9910)	-0.01532(0.9679)	-0.01555(0.9916)	-0.01533(0.9699)	-0.05543(1.0000)
Year 2008	0.01364(0.9812)	0.01331(0.9721)	0.01349(0.9927)	0.01375(0.9730)	0.01367(0.9634)
Year 2009	0.01480(0.9796)	0.01444(0.9697)	0.01420(0.9924)	0.01436(0.9718)	0.01463(0.9608)
Year 2010	0.02095(0.9712)	0.02026(0.9575)	0.02042(0.9890)	0.02057(0.9596)	0.02092(0.9440)
Year 2011	0.02533(0.9652)	0.02475(0.9481)	0.02486(0.9866)	0.02499(0.9509)	0.02519(0.9325)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00429(0.0000)[a]	0.00445(0.0000)[a]	0.00423(0.0000)[a]	0.00427(0.0000)[a]	0.00430(0.0000)[a]
Average probability	0.30595	0.31967	0.31343	0.31470	0.30790

Notes: (i) Dependent variable is CAR_t; (ii) p-value in parenthesis; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%.

Table 5.21 Disequilibrium regression results for CAR based on state ownership (delete 3 local banks): regulatory model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$\mathrm{CAR}_{t-1}(1-\alpha)$	0.25459(0.0000)[a]	0.23613(0.0000)[a]	0.27174(0.0000)[a]	0.23944(0.0000)[a]	0.25092(0.0000)[a]
REG_t	0.84604(0.0000)[a]	0.81526(0.0000)[a]	0.87183(0.0000)[a]	0.79513(0.0000)[a]	0.86522(0.0000)[a]
$\mathrm{REGNONSTATE}_t$	0.15992(0.0876)[c]	0.16157(0.0568)[c]	0.13796(0.1652)	0.19948(0.0182)[b]	0.16155(0.1083)
$\mathrm{DEPOSIT}_t$	0.01623(0.0595)[c]		0.02131(0.0271)[b]	0.00161(0.3078)	0.01689(0.1264)
$\mathrm{DEPOSIT}_t^2$	-0.00064(0.0819)[c]		-0.00082(0.0384)[b]		-0.00064(0.1703)
$\mathrm{INTERBANK}_t$		0.00143(0.3761)	-0.00060(0.4367)	0.00150(0.3095)	0.00006(0.9789)
$\mathrm{INTERBANK}_t^2$		-0.00007(0.5056)		-0.00013(0.2656)	-0.00004(0.7993)
STDCAR_{t-5}	0.38453(0.0716)[c]	0.34586(0.0725)[c]	0.32334(0.1270)	0.34407(0.0891)[c]	0.41403(0.3029)
VARCAR_{t-5}	-10.98030(0.0209)[b]	-10.88990(0.0054)[a]	-9.73085(0.0288)[b]	-10.66160(0.0238)[b]	-11.38860(0.3417)
CUBCAR_{t-5}	34.63850(0.2126)	35.07860(0.1003)	30.38070(0.1856)	34.08140(0.2887)	31.64750(0.7452)
LATA_t	0.01886(0.1702)	0.02228(0.0998)[c]	0.01883(0.2161)	0.02608(0.0587)[c]	0.01868(0.2407)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00778(0.0000)[a]	0.00789(0.0000)[a]	0.00777(0.0000)[a]	0.00780(0.0000)[a]	0.00817(0.0000)[a]
Average probability	0.67470	0.67910	0.66045	0.67751	0.67065

Notes: (i) Dependent variable is CAR_t; (ii) p-value in parenthesis; (iii) a=significant at 1%, b=significant at 5%, c=significant at 10%.

Table 5.22 Disequilibrium regression results for CAR based on state ownership (delete 3 local banks): market model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAR_{t-1}(1-\beta)$	-0.00679(0.9089)	-0.01559(0.7919)	-0.00640(0.9067)	-0.01535(0.7934)	0.14782(0.0000)[a]
$OPERCOST_t$	-3.46341(0.0601)[b]	-3.36890(0.1410)	-4.02442(0.0235)[b]	-3.49263(0.0825)[c]	-2.96635(0.0679)
$OPERCOST_t^2$	0.00818(0.2764)	0.00777(0.4350)	0.01012(0.1537)	0.00817(0.3299)	0.00670(0.3368)
$VARROA_{t-5}$	109.27300(0.1812)	108.45500(0.2738)	109.22100(0.0989)[c]	108.61400(0.2384)	108.58400(0.0184)[b]
$SIZE_t$	-0.04406(0.0000)[a]	-0.04366(0.0000)[a]	-0.04044(0.0000)[a]	-0.04406(0.0000)[a]	-0.03758(0.0000)[a]
$SIZE_t^2$	0.00167(0.0000)[a]	0.00165(0.0000)[a]	0.00154(0.0000)[a]	0.00167(0.0000)[a]	0.00144(0.0000)[a]
RA_t	0.00056(0.6612)	0.00053(0.6622)	0.00074(0.5663)	0.00058(0.6366)	0.00030(0.8132)
$LLOSS_t$	-0.54292(0.1376)	-0.48956(0.2303)	-0.64922(0.0178)[b]	-0.53343(0.1672)	-0.34820(0.2147)
TAX_{t-1}	-0.02310(0.0183)[b]	-0.02568(0.0119)[b]	-0.02005(0.0267)[b]	-0.02413(0.0153)[b]	-0.01665(0.0718)[c]
Year 2005	-0.04838(0.9736)	-0.04162(0.6465)	-0.04224(0.9521)	-0.04019(0.7442)	-0.03049(0.8104)
Year 2006	-0.04120(0.8801)	-0.04554(0.9743)	-0.04582(0.9948)	-0.04564(0.9876)	-0.03426(0.9266)
Year 2007	-0.02200(0.8713)	-0.02577(0.4043)	-0.01534(0.9168)	-0.02408(0.8277)	-0.01435(0.9019)
Year 2008	0.01102(0.9353)	0.01008(0.7319)	0.01253(0.9320)	0.01115(0.9195)	0.01439(0.9016)
Year 2009	0.01824(0.8929)	0.01770(0.5391)	0.01888(0.8977)	0.01845(0.8670)	0.01539(0.8948)
Year 2010	0.02286(0.8660)	0.02191(0.4461)	0.02350(0.8728)	0.02292(0.8352)	0.02125(0.8552)
Year 2011	0.02888(0.8313)	0.02804(0.3323)	0.02922(0.8423)	0.02899(0.7926)	0.02630(0.8214)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00439(0.0000)[a]	0.00439(0.0000)[a]	0.00460(0.0000)[a]	0.00440(0.0000)[a]	0.00424(0.0000)[a]
Average probability	0.32530	0.32090	0.33955	0.32249	0.32935

Notes: (i) Dependent variable is CAR_t; (ii) p-value in parenthesis; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%.

With respect to the fifth group regression, I compare and analyze the regulation impacts on the current 4 major types of banks in China (Tables 5.23 and 5.24). Similarly, I find that regulation pressure has positive effects on the capital level for the 'Big 5' banks in the regulation model. However, other regulatory interaction product terms, such as the REGJOINT, REGLOCAL and REGFOREIGN are insignificant. That is to say, regulation has the same impacts on the joint-equity banks, local banks and foreign banks as that on the 'Big 5' banks. On the other hand, in the market model, VARROA, SIZE, $SIZE^2$ and TAX are significant with expected signs in all the 5 estimations. Regarding the speed of the adjustment rate to the target capital level, my evidence suggests that the adjustment rate in the regulation model (0.76) is relatively lower than that in the market model (0.87). Finally, since the regulatory impacts on these 4 types of banks are not significantly different, I prefer the original specifications which use CAP as the dependent variable (see Section 5.1.1).

Table 5.23 Disequilibrium regression results for CAR based on different bank types: regulatory model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAP_{t-1}(1-\alpha)$	0.24455(0.0000)[a]	0.24410(0.0000)[a]	0.24382(0.0000)[a]	0.24271(0.0000)[a]	0.24456(0.0000)[a]
REG_t	0.90472(0.0000)[a]	0.82937(0.0000)[a]	0.89847(0.0000)[a]	0.83162(0.0000)[a]	0.90741(0.0000)[a]
$REGJOINT_t$	0.02304(0.8659)	0.08580(0.4516)	0.02661(0.8481)	0.09769(0.4280)	0.02908(0.8426)
$REGLOCAL_t$	0.01589(0.9130)	0.08824(0.4539)	0.02180(0.8829)	0.08745(0.5026)	0.01129(0.9421)
$REGFOREIGN_t$	0.03853(0.7963)	0.08282(0.5278)	0.04338(0.7764)	0.08808(0.5594)	0.03221(0.8409)
$DEPOSIT_t$	0.01141(0.3161)		0.01119(0.3581)	0.00037(0.7970)	0.00083(0.4729)
$DEPOSIT_t^2$	-0.00050(0.3107)		-0.00048(0.3460)		-0.00008(0.4845)
$INTERBANK_t$		0.00129(0.4497)	-0.00007(0.9209)	0.00138(0.4193)	0.00940(0.6801)
$INTERBANK_t^2$		-0.00009(0.4383)		-0.00011(0.3850)	-0.00039(0.5900)
$STDCAP_{t-5}$	0.34437(0.4001)	0.31880(0.1095)	0.32617(0.4331)	0.29176(0.5142)	0.33007(0.4549)
$VARCAP_{t-5}$	-9.76998(0.4053)	-9.90930(0.0212)[b]	-9.45073(0.4206)	-9.14296(0.4627)	-9.58774(0.4308)
$CUBCAP_{t-5}$	25.74390(0.7713)	31.64040(0.2055)	25.48830(0.7751)	25.80270(0.7811)	25.48240(0.7793)
$LATA_t$	0.01837(0.2492)	0.02209(0.1365)	0.01934(0.2412)	0.02103(0.1852)	0.01975(0.2325)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00853(0.0000)[a]	0.00841(0.0000)[a]	0.00856(0.0000)[a]	0.00854(0.0000)[a]	0.00855(0.0000)[a]
Average probability	0.68399	0.68506	0.68345	0.68079	0.68115

Notes: (i) Dependent variable is CAR_t; (ii) p-value in parenthesis; (iii) a=significant at 1%, b=significant at 5%, c=significant at 10%.

Table 5.24 Disequilibrium regression results for CAR based on different bank types: market model

Panel A. Coefficient Estimates					
	Estimation 1	Estimation 2	Estimation 3	Estimation 4	Estimation 5
$CAR_{t-1}(1-\beta)$	0.14666(0.0001)[a]	0.05567(0.2645)	0.14731(0.0000)[a]	0.15026(0.0001)[a]	0.14938(0.0001)[a]
$OPERCOST_t$	-2.92968(0.0579)[c]	-2.50021(0.3793)	-2.84732(0.0578)[c]	-2.95251(0.0807)[c]	-2.86731(0.0649)[c]
$OPERCOST_t^2$	0.00667(0.3052)	0.00507(0.7016)	0.00637(0.3121)	0.00668(0.3657)	0.00641(0.3316)
$VARROA_{t-5}$	120.24600(0.0059)[a]	119.08000(0.0476)[b]	120.11700(0.0063)[a]	120.09600(0.0069)[a]	120.22800(0.0071)[a]
$SIZE_t$	-0.03698(0.0000)[a]	-0.04137(0.0000)[a]	-0.03753(0.0000)[a]	-0.03645(0.0000)[a]	-0.03638(0.0000)[a]
$SIZE_t^2$	0.00142(0.0000)[a]	0.00157(0.0000)[a]	0.00144(0.0000)[a]	0.00140(0.0000)[a]	0.00140(0.0000)[a]
RA_t	0.00024(0.8556)	0.00043(0.7411)	0.00023(0.8622)	0.00025(0.8481)	0.00025(0.8508)
$LLOSS_t$	-0.34008(0.2542)	-0.49879(0.0867)[c]	-0.34539(0.2395)	-0.32530(0.2894)	-0.34628(0.2508)
TAX_{t-1}	-0.01692(0.0633)[c]	-0.02419(0.0275)[b]	-0.01756(0.0604)[c]	-0.01745(0.0658)[c]	-0.01732(0.0663)[c]
Year 2005	-0.04455(0.9989)	-0.04498(0.9788)	-0.03186(0.7554)	-0.03309(0.9260)	-0.03276(0.9672)
Year 2006	-0.04253(0.9983)	-0.05752(1.0000)	-0.04052(0.9926)	-0.05142(1.0000)	-0.05547(1.0000)
Year 2007	-0.01550(0.9645)	-0.01962(0.8504)	-0.01601(0.8280)	-0.01532(0.9432)	-0.01517(0.9842)
Year 2008	0.01358(0.9689)	0.01117(0.9145)	0.01322(0.8567)	0.01391(0.9484)	0.01376(0.9857)
Year 2009	0.01417(0.9675)	0.01547(0.8817)	0.01368(0.8517)	0.01439(0.9466)	0.01408(0.9854)
Year 2010	0.02059(0.9528)	0.02083(0.8412)	0.01999(0.7847)	0.02071(0.9232)	0.02061(0.9786)
Year 2011	0.02490(0.9430)	0.02593(0.8030)	0.02432(0.7397)	0.02493(0.9077)	0.02486(0.9742)
Panel B. Estimated standard error and average estimated probability					
Standard error (σ)	0.00420(0.0000)[a]	0.00419(0.0000)[a]	0.00419(0.0000)[a]	0.00419(0.0000)[a]	0.00421(0.0000)[a]
Average probability	0.31601	0.31494	0.31655	0.31921	0.31885

Notes: (i) Dependent variable is CAR_t; (ii) p-value in parenthesis; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%.

Finally, in all the 5 different groups' estimations, my results show quite similar and consistent results, indicating the dominance of the regulation force over the market force. Specifically, in the case of the first group regression, my evidence shows that the estimated probability for the model belonging to the regulation regime is approximately 68.32%. In the second case, concerning regulation impacts on the under-capitalized and well-capitalized banks, the probability of the observations coming from the regulation regime is around 62.84%. The third group estimation, which examines the regulation influence on the listed and unlisted banks, shows that the estimated probability of the model coming from the regulation regime (68.05%) is over twice that of it coming from the market regime (31.95%). The fourth group regression presents the same results as the previous three groups of regression which supports the leading role of regulation and implies that the Chinese banking sector is the under the control of legal, binding effects. The last group regression, which compares the differences in the regulation impacts on the four major types of banks, provides the evidence that the regulation factor works as the driving force for the improvements in the Chinese banks' capital level.

5.2. Risk-taking Behavior for Banks with Different Ownership Structure

I now turn my attention to investigating the relationship that may exist between change in capital and change in risk for these groups of banks, given that I have already noticed a difference in how these banks react to regulatory change in the disequilibrium model. This way I can examine whether regulation has the same risk control effect for banks with different ownership structures.

This subsection is organized as follows. First, I will provide the empirical results of the relationship between change in capital and risk, based on two different definitions for capital ratios (CAP and CAR). Two groups' regressions are estimated and their corresponding empirical results are presented. In the first step, I provide the regression results based on ΔCAP/ΔCAR and ΔRWATA for the whole sample. In the next step, two regulatory variables (REG and REGU), capturing the regulatory influences on the well-capitalized and under-capitalized banks, are added into the simultaneous systems.

In the successive regressions, I split the entire sample into different groups and try to analyze whether regulation has the same binding power for banks with different ownership structures in terms of their credit risk-taking. It is worth noticing that only the first capital ratio definition, CAP (the total capital to total assets ratio) is used in the following subsample regressions. In the first subsample regression, I try to identify the reactions of the listed and unlisted banks' risk-taking behaviors to the capital requirements. In the second subsample regression, I compare and examine the different behaviors towards credit risk brought about by the compulsory regulation between the state-owned banks and non-state-owned banks. In the third subsample regression, I attempt to work out whether binding capital requirements have the same risk control effects on the 4 major types of banks in China.

5.2.1. Relationship between changes in capital and risk: whole sample regression

5.2.1.1 Results based on the ΔCAP /ΔCAR and ΔRWATA

Table 5.25 provides the results of the simultaneous equations when the ratio of banks' capital (CAP/CAR) and the ratio of RWA to total assets (RWATA) are used as the dependent variables in the simultaneous systems.

Table 5.25 Simultaneous regression based on ΔCAP/ΔCAR and ΔRWATA

Panel A: Simultaneous regression based on ΔCAP and ΔRWATA		
	ΔCAP_t	$\Delta RWATA_t$
ΔCAP_t		-6.16499(0.0001)[a]
$\Delta RWATA_t$	-0.00236(0.4506)	
CAP_{t-1}	-0.24022(0.0001)[a]	
$RWATA_{t-1}$		-0.91761(0.0001)[a]
$SIZE_t$	-0.00062(0.2992)	-0.00382(0.5250)
ROA_t	0.06048(0.6793)	
$LLOSS_t$		1.15091(0.3312)
Panel B: Simultaneous regression based on ΔCAR and ΔRWATA		
	ΔCAR_t	$\Delta RWATA_t$
ΔCAR_t		-0.86262(0.0433)[b]
$\Delta RWATA_t$	-0.01345(0.0102)[b]	
CAR_{t-1}	-0.43349(0.0001)[a]	
$RWATA_{t-1}$		-0.72220(0.0001)[a]
$SIZE_t$	-0.00210(0.0332)[b]	-0.00717(0.2203)
ROA_t	0.67972(0.0782)[c]	
$LLOSS_t$		-0.59421(0.7493)

Notes: (i) Dependent variables in Panel A are ΔCAP and ΔRWATA while dependent variables in Panel B are ΔCAR and ΔRWATA; (ii) p-values in parentheses; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%; (iv) Each system of equations is estimated by 3SLS with time dummies (Year); (v) ΔCAP is the difference between the current and the lagged CAP; ΔCAR is the difference between the current and the lagged CAR; ΔRWATA is the difference between the current and the lagged RWATA; SIZE is the natural log of total assets; ROA is the ratio of net income to total average assets; LLOSS is the ratio of new provisions for loan losses to gross loans; YEAR dummies are also included but not reproduced in the table.

First of all, I look at the results based on ΔCAP and ΔRWATA, which indicate a negative relationship between banking capital movements and changes in credit risk from 2004 to 2011. Specifically, the change in credit risk ratio (ΔRWATA) does not have any impact on

the change in capital level (ΔCAP) in the capital equation. It is the change in capital ratio (ΔCAP) that has a negative and significant impact on the change in the credit risk ratio (ΔRWATA) in the risk equation. That is to say, Chinese banks adjust risk when capital changes but they do not adjust capital when risk changes. An increase of 1 percentage point in a bank's CAP leads to a decrease of 6.16 percentage points in its credit-risk ratio, ceteris paribus. Since regulation is the driving force for the changes in the total capital level, this result also indicates that regulation generates the expected effects for banks in terms of credit risk control. Furthermore, I notice that parameter estimates on lagged capital and risk are significantly negative, suggesting that Chinese banks were adjusting their capital and risk to desired levels relatively rapidly from 2004 to 2011.

Second, I turn to the interrelationship between ΔCAR and ΔRWATA. In the capital equation, my results suggest that the change in credit risk ratio (ΔRWATA) has a significantly negative impact on the change in the credit risk ratio (ΔCAR). An increase of 1 percentage point in the credit risk ratio will decrease the capital ratio by about 0.01 percentage points. For the controlling variables, SIZE has a significantly negative impact, indicating that large Chinese banks increase the ratio of their capital to RWA less than other banks. One plausible reason is that large banks can get access to capital markets easily so that they can operate with lower capital. The 'Too-Big-to-Fail' effect also suggests that large banks feel less pressure to increase their capital ratio. Current earnings (ROA) have a significant and positive impact on capital, indicating that profitable banks can improve their capitalization more easily through retained earnings. The parameter on the lagged capital is negative and significant, indicating that Chinese banks have adjusted their capital ratios very rapidly to desired levels since 2004.

In the risk equation, I find that the change in capital (ΔCAR) is negatively related with the change in the credit risk ratio (ΔRWATA). An increase of 1 percentage point in the capital ratio will cause a decrease in the credit risk ratio by about 0.86 percentage points. The parameter on lagged risk is negative and significant, indicating that Chinese banks were adjusting their risk to desired levels fast from 2004 to 2011. In this case, a significantly negative association between change in capital and risk is identified. Furthermore, such coordination of capital and risk adjustments runs from capital to risk and vice versa.

5.2.1.2 Results based on the ΔCAP/ΔCAR and ΔRWATA: two regulatory pressure variables

The primary differences between the regression at the second step and the regression from the previous step are two regulatory pressure variables (REG and REGU), which capture the regulation influences on the capital level for the well-capitalized and under-capitalized banks. They are included in both the capital equation and risk equation. Table 5.26 presents the results based on the ΔCAP and ΔRWATA, which indicate that the adjustment in capital is negatively related with the adjustment in risk. The first regulatory pressure variable (REG) has a significantly positive effect on capital but no impact on risk. Ceteris paribus, well-capitalized banks increase their capital by 16.6 percentage points more than other banks. Since regulation dominates the changes in the banks' capital level, I expect that the decrease in the credit risk ratio is due to the regulation impacts.

However, the second regulation variable (REGU) has no impacts on banks' capital ratios and risk-taking behaviors, which is contrary to my expectations. This result also implies that Chinese banking regulation only generates the expected effects for the well-capitalized

banks. More effective and stringent capital standards are required to improve the poor capital condition for the under-capitalized banks. Here, I need to emphasis that most of the banks in China are well-capitalized banks. For example, in the case of the domestic banks, if their capital levels fall below the minimum capital threshold, they will usually get a capital injection directly from either the central state or large, state-owned enterprises. In the case of the foreign banks, all the foreign banks could be classified as well-capitalized banks whose capital ratios are over twice the CBRC minimum capital ratio. The parameters on lagged capital and credit risk are negative and significant, indicating that Chinese banks were adjusting their capital and risk to desired levels fast from 2004 to 2011.

With respect to the overall relationship between ΔCAP and ΔRWATA, I observe a negative and significant relationship between changes in capital and changes in risk. In the case of the relationship between ΔCAP and ΔRWATA, an increase of 1 percentage point in the total capital to assets ratio, decreases the credit risk by about 6.21 percentage points while a same increase in the credit risk ratio causes a decrease in CAP by about 0.007 percentage points.

Table 5.26 Simultaneous regressions based on ΔCAP/ΔCAR and ΔRWATA (with REG and REGU)

Panel A: Simultaneous regression based on ΔCAP and ΔRWATA (with REG and REGU)		
	ΔCAP_t	$\Delta RWATA_t$
ΔCAP_t		-6.21251(0.0001)[a]
$\Delta RWATA_t$	-0.00670(0.0269)[b]	
REG_t	0.16590(0.0001)[a]	-0.07040(0.8116)
$REGU_t$	-0.21561(0.1063)	-0.07324(0.9587)
CAP_{t-1}	-0.28296(0.0001)[a]	
$RWATA_{t-1}$		-0.92100(0.0001)[a]
$SIZE_t$	0.00010(0.8618)	-0.00516(0.4089)
ROA_t	-0.01259(0.9080)	
$LLOSS_t$		-0.86209(0.3610)
Panel B: Simultaneous regression based on ΔCAR and ΔRWATA (with REG and REGU)		
	ΔCAR_t	$\Delta RWATA_t$
ΔCAR_t		0.40516(0.1324)
$\Delta RWATA_t$	-0.00002(0.9559)	
REG_t	0.99873(0.0001)[a]	1.13915(0.0001)[a]
$REGU_t$	-0.99515(0.0001)[a]	1.38174(0.2723)
CAR_{t-1}	-0.99814(0.0001)[a]	
$RWATA_{t-1}$		-0.74735(0.0001)[a]
$SIZE_t$	0.00026(0.0004)[a]	-0.00114(0.8402)
ROA_t	0.03311(0.2821)	
$LLOSS_t$		-0.26942(0.8881)

Notes: (i) Dependent variables in Panel A are ΔCAP and ΔRWATA while dependent variables in Panel B are ΔCAR and ΔRWATA; (ii) p-values in parentheses; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%; (iv) Each system of equations is estimated by 3SLS with time dummies (Year); (v) ΔCAP is the difference between the current and the lagged CAP; ΔCAR is the difference between the current and the lagged CAR; ΔRWATA is the difference between the current and the lagged RWATA; REG: the difference between the bank's own CAR and the CBRC capital regulation when CAR is greater than or equal to the CBRC regulatory threshold, and 0 otherwise; REGU: the difference between the CBRC capital regulation and bank's own CAR when CAR is less than the CBRC regulatory threshold, and 0 otherwise; SIZE is the natural log of total assets; ROA is the ratio of net income to total average assets; LLOSS is the ratio of new provisions for loan losses to gross loans; YEAR dummies are also included but not reproduced in the table.

Now, I turn to discussing the relationship between the adjustments in capital and risk (Panel B of Table 5.26) based on ΔCAR and ΔRWATA. In this case, I find that the change in the credit risk ratio (ΔRWATA) does not have any significant impact on the change in the capital level (ΔCAR) and the change in capital (ΔCAP) is not significantly correlated with the change in risk (ΔRWATA). Moreover, the two regulatory pressure variables report unexpected and contradictory results. For REG, although it has positive effects on the

capital ratio for the well-capitalized banks, it also increases their credit risk. With respect to REGU, representing the regulatory pressure placed on the under-capitalized banks, it shows a significantly negative effect on banks' capital level and no effects on the credit risk ratio. In a word, as these coefficients in this system imply awkward dynamics of capital and credit risk ratio in response to the binding capital requirements, I thus prefer the original specification, which uses ΔCAP and ΔRWATA (Panel A Table 5.26).

5.2.2. Relationship between changes in capital and risk: subsample regressions

In this subsection, I present the empirical evidence on a set of subsample regressions, based on different ownership structure. As mentioned before, only the first capital definition, CAP (the ratio of total capital over total assets) is employed as the dependent variable in the following subsample regression. The first estimation tries to investigate the relationship between change in capital and risk for the listed and unlisted banks. While the second group regression concentrates on risk behaviors for the state-owned and non- state-owned banks. The third group estimation investigates the differences among these 4 major bank types in terms of credit risk ratio.

5.2.2.1 Results about ΔCAP and ΔRWATA: listed vs. unlisted banks

Table 5.27 provides the empirical results of the relationship between changes in the capital level and changes in credit risk ratio based on ΔCAP and ΔRWATA for both listed banks and unlisted banks. On the one hand, in the case of the listed banks (Panel A of Table 5.27), I find that the change in capital (ΔCAP) does not have any impact on the change in the credit risk ratio (ΔRWATA) in the risk equation. In the capital equation, current earnings

(ROA) have a significant and positive impact on capital, indicating that profitable banks can improve their capitalization more easily through retained earnings.

On the other hand, in the case of the unlisted banks (Panel B of Table 5.27), I find that the change in capital (ΔCAP) has a negative impact on the change in the credit risk ratio (ΔRWATA) in the risk equation. Since regulation is the driving force for the changes in the total capital level, this result indicates that regulation generates the expected effects for the unlisted banks in terms of credit risk control. A greater need to signal credit control to the market, plus possible ambitions to list (relating to financial accounting, corporate governance, risk management, and asset size requirements) may induce them to more closely monitor their risk levels. Furthermore, these banks may also find it harder to depend on the state, as the central government ownership of unlisted banks tends to be very small, as shown in Table 3.2E. This different ownership structure may also explain why unlisted banks make a greater effort to reduce their credit risk. Last, in the capital equation, I find that size has a negative impact on the total capital level. It must be pointed out that most of the unlisted banks are small banks. Their relatively smaller asset scale and difficulties in accessing capital markets may explain why they operate with lower capital (Li et al., 2009).

Table 5.27 Simultaneous regressions based on ΔCAP and ΔRWATA: listed vs. unlisted banks

	ΔCAP_t	$\Delta RWATA_t$
Panel A: Listed banks		
ΔCAP_t		-0.82688(0.1347)
$\Delta RWATA_t$	-0.00337(0.9590)	
CAP_{t-1}	-0.48597(0.0001)[a]	
$RWATA_{t-1}$		-0.25365(0.0002)[a]
$SIZE_t$	0.00092(0.3408)	-0.00198(0.5794)
ROA_t	1.55713(0.0014)[a]	
$LLOSS_t$		0.09746(0.9432)
Panel B: Unlisted banks		
ΔCAP_t		-6.34698(0.0001)[a]
$\Delta RWATA_t$	-0.00199(0.5754)	
CAP_{t-1}	-0.24157(0.0001)[a]	
$RWATA_{t-1}$		-0.93243(0.0001)[a]
$SIZE_t$	-0.00313(0.0457)[b]	-0.02244(0.1723)
ROA_t	-0.08761(0.6170)	
$LLOSS_t$		0.57664(0.6923)

Notes: (i) Dependent variables are ΔCAP and ΔRWATA, respectively; (ii) p-values in parentheses; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%; (iv) Each system of equations is estimated by 3SLS with time dummies (Year); (v) ΔCAP is the difference between the current and the lagged CAP; ΔRWATA is the difference between the current and the lagged RWATA; SIZE is the natural log of total assets; ROA is the ratio of net income to total average assets; LLOSS is the ratio of new provisions for loan losses to gross loans; YEAR dummies are also included but not reproduced in the table.

5.2.2.2 Results for ΔCAP and ΔRWATA: state ownership

Table 5.28 summarizes the empirical results of the relationship between changes in capital level and changes in credit risk ratio, dependent on whether the state is the largest shareholder. My results suggest that it is the non-state owned banks that show a significant reaction in altering their credit risk downwards.

Panel A of Table 5.28 presents the regression results based on ΔCAP and ΔRWATA for the state-owned banks only. In this case, I cannot find any statistically significant association between the change in capital and risk. Nevertheless, for the non- state-owned banks (Panel B of Table 5.28), I find that the change in capital (ΔCAP) has a negative impact on the change in the credit risk ratio (ΔRWATA) in the risk equation. Such coordination of capital

and risk adjustments runs only from capital to risk and not vice versa in the case of the non-state-owned banks. Ceteris paribus, an increase of 1 percentage point in the total capital to assets ratio decreases the credit risk by about 6.30 percentage points. As I have already shown that regulation is the major reason for the improvement of the total capital level, this result further indicates that regulation effectively controls the non- state-owned banks' risk behaviors.

Table 5.28 Simultaneous regressions based on ΔCAP and ΔRWATA: state ownership

	ΔCAP_t	$\Delta RWATA_t$
Panel A: State-owned banks (where central state is the largest shareholder)		
ΔCAP_t		-1.12177(0.1606)
$\Delta RWATA_t$	-0.10315(0.1437)	
CAP_{t-1}	-0.41901(0.0001)[a]	
$RWATA_{t-1}$		-0.31912(0.0008)[a]
$SIZE_t$	0.00130(0.3721)	-0.00369(0.4215)
ROA_t	0.62248(0.2077)	
$LLOSS_t$		-0.56613(0.7038)
Panel B: Non state-owned banks		
ΔCAP_t		-6.29909(0.0001)[a]
$\Delta RWATA_t$	-0.00220(0.5374)	
CAP_{t-1}	-0.24058(0.0001)[a]	
$RWATA_{t-1}$		-0.92090(0.0001)[a]
$SIZE_t$	-0.00201(0.1151)	-0.00828(0.5249)
ROA_t	-0.05945(0.7368)	
$LLOSS_t$		1.71085(0.2321)

Notes: (i) Dependent variables are ΔCAP and ΔRWATA, respectively; (ii) p-values in parentheses; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%; (iv) Each system of equations is estimated by 3SLS with time dummies (Year); (v) ΔCAP is the difference between the current and the lagged CAP; ΔRWATA is the difference between the current and the lagged RWATA; SIZE is the natural log of total assets; ROA is the ratio of net income to total average assets; LLOSS is the ratio of new provisions for loan losses to gross loans; YEAR dummies are also included but not reproduced in the table.

5.2.2.3 Results for ΔCAP and ΔRWATA: different bank types

In Table 5.29, I split the results between the 'Big 5' banks, joint-equity banks, local banks, and foreign banks. First, in the cases of the 'Big 5' banks and joint-equity banks (Panels A and B of Table 5.29), I find that the change in capital (ΔCAP) does not have any impact on

the change in the credit risk ratio (ΔRWATA). It is worth mentioning that more than half (58%) of the joint-equity banks have the central government, or a state-owned enterprise, as their major shareholder. So, although I have ascertained that change in capital is likely to be driven by the CBRC regulation, its impact on credit risk is not particularly widespread. I find that banks with significant, central government, shareholding interests still face a certain degree of credit risk. Also, it has previously been documented that the major borrowers of banks with significant state ownership are the state-owned enterprises (Ferri, 2009; Garcia-Herrero et al., 2009; Lin, 2011), whose inefficient operation mechanism determines the loans' recovery risk. Even for the state-owned companies whose stockholding system has been established, most of them come from monopolized industries with less competition pressure, lower operating efficiency, and poorer ability of repayment.

In the case of the local commercial banks (Panel C of Table 5.29), my results suggest that changes in the capital (ΔCAP) have a significant and negative effect on the changes in credit risk (ΔRWATA). For example, in the ΔRWATA equation, an increase of 1 percentage point in a bank's CAP leads to a decrease of 4.12 percentage points in its credit-risk ratio. However, despite being relatively small compared to the larger banks, they account for at least 10% of total financing in China. Also, the proportion of local government debt in the small banks is generally quite high. This raises the question of the relationship local government has with local banks. When credit conditions are tight and large banks cannot provide enough credit supply, local government tends to place more pressure on the local banks on which they could impose greater executive influence (Jiang, 2013). Small banks' own systemic risk might be an incentive for them to more closely follow the CBRC regulation to reduce their risk. A second reason is that most of the local

banks are unlisted banks, as well as non-state-owned banks. This could explain why regulation has a stronger impact on their risk portfolio, which is consistent with my previous results. The only other major distinguishing feature of this group of local banks in my sample, relative to the other types of banks, is that they have higher loan loss ratios. I re-ran the model using a number of alternative measures for loan loss ratios and asset quality but they were not significant.

Third, my study shows an interesting result with respect to the foreign banks (Panel D of Table 5.29). I find that the impact of change in capital (ΔCAP) on the change in the credit risk ratio (ΔRWATA) is not significant. Given that foreign banks are extremely well capitalized to begin with, it is likely that they do not feel the pressure to alter their risk exposure.

5.3. Corporate Governance Influences on Banks' Risk

In this section, I not only investigate the effects of the corporate governance variables on banks' risk but also examine whether the consideration of the corporate governance variables would affect the relationship between change in capital and change in risk.

Table 5.29 Simultaneous regressions based on ΔCAP and ΔRWATA: different bank types

	ΔCAP_t	$\Delta RWATA_t$
Panel A: 'Big 5' banks		
ΔCAP_t		-0.27082(0.7189)
$\Delta RWATA_t$	-0.27190(0.1247)	
CAP_{t-1}	-0.92208(0.0021)[a]	
$RWATA_{t-1}$		-0.24402(0.0124)[a]
$SIZE_t$	0.00033(0.9197)	0.00335(0.6864)
ROA_t	0.93118(0.2415)	
$LLOSS_t$		1.39526(0.4347)
Panel B: Joint-equity banks		
ΔCAP_t		-0.44160(0.1574)
$\Delta RWATA_t$	-0.06478(0.2984)	
CAP_{t-1}	-0.54598(0.0001)[a]	
$RWATA_{t-1}$		-0.27613(0.0015)[a]
$SIZE_t$	0.00053(0.7645)	0.00048(0.9481)
ROA_t	1.53205(0.0075)[a]	
$LLOSS_t$		-1.27334(0.4190)
Panel C: Local banks (including urban and rural commercial banks)		
ΔCAP_t		-4.11851(0.0126)[b]
$\Delta RWATA_t$	0.00068(0.7884)	
CAP_{t-1}	-0.51194(0.0001)[a]	
$RWATA_{t-1}$		-0.97940(0.0001)[a]
$SIZE_t$	-0.00190(0.1210)	-0.04010(0.0043)[a]
ROA_t	0.46639(0.0344)[b]	
$LLOSS_t$		-1.31591(0.3965)
Panel D: Foreign banks		
ΔCAP_t		-0.86694(0.8711)
$\Delta RWATA_t$	0.05666(0.5575)	
CAP_{t-1}	-0.14603(0.2537)	
$RWATA_{t-1}$		-0.45949(0.2028)
$SIZE_t$	-0.00431(0.5844)	0.00211(0.9422)
ROA_t	-0.14659(0.9143)	
$LLOSS_t$		7.39985(0.5780)

Notes: (i) Dependent variables are ΔCAP and ΔRWATA, respectively; (ii) p-values in parentheses; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%; (iv) Each system of equations is estimated by 3SLS with time dummies (Year); (v) ΔCAP is the difference between the current and the lagged CAP; ΔRWATA is the difference between the current and the lagged RWATA; SIZE is the natural log of total assets; ROA is the ratio of net income to total average assets; LLOSS is the ratio of new provisions for loan losses to gross loans; YEAR dummies are also included but not reproduced in the table.

In order to do this, I re-run the sub-sample regressions by adding some new variables in the risk equation. As mentioned before, only the first capital definition, CAP (the ratio of total capital over total assets) is employed as the dependent variable in the following subsample regressions. The first estimation tries to investigate whether and how corporate governance

variables would influence the risk behaviors for the listed and unlisted banks. The second group regression compares the differences of risk behaviors between the state-owned and non-state-owned banks. The final group estimation investigates the effects of the corporate governance variables on the risk ratios for the 4 major bank types in China: the 'Big 5' banks, national joint-equity banks, local banks and foreign banks.

5.3.1. The effects of corporate governance on banks' risk: listed vs. unlisted banks

In this sub-section, I try to examine the impacts of corporate governance factors on the risk for both listed banks and unlisted banks. The relevant results are shown in Table 5.30. The variables of interest are corporate governance factors (POLCON, TENURE, INDEP and DUALITY) in the risk equation. In the case of the listed banks (Panel A of Table 5.30), I find that the change in the risk (ΔRWATA) does not have any impact on the change in the capital (ΔCAP) in the risk equation, which is consistent with the results I get from the previous section. Second, among all the corporate governance variables, I find that only bank president experience (TENURE) has significant effects in reducing banks' risk, suggesting that president experience generates positive impacts in terms of helping banks to tackle difficulties and control risks. In the capital equation, current earnings (ROA) have a significant and positive impact on capital, indicating that profitable banks can improve their capitalization more easily through retained earnings.

Table 5.30 Corporate governance and banks' risk: listed vs. unlisted banks

	ΔCAP_t	$\Delta RWATA_t$
Panel A: Listed banks		
ΔCAP_t		-0.92625(0.2076)
$\Delta RWATA_t$	0.03784(0.4137)	
$POLCON_t$		0.02064(0.1303)
$TENURE_t$		-0.00493(0.0302)[b]
$INDEP_t$		0.00309(0.5320)
$DUALITY_t$		0.03867(0.2425)
CAP_{t-1}	-0.46706(0.0001)[a]	
$RWATA_{t-1}$		-0.39554(0.0001)[a]
$SIZE_t$	0.00025(0.8016)	-0.00760(0.1324)
ROA_t	1.85375(0.0003)[a]	
$LLOSS_t$		-0.46463(0.7738)
Panel B: Unlisted banks		
ΔCAP_t		-0.61033(0.0649)[c]
$\Delta RWATA_t$	-0.13054(0.0690)[c]	
$POLCON_t$		-0.00629(0.4828)
$TENURE_t$		-0.00096(0.6213)
$INDEP_t$		-0.00223(0.3975)
$DUALITY_t$		0.01303(0.3309)
CAP_{t-1}	-0.54504(0.0001)[a]	
$RWATA_{t-1}$		-0.22484(0.0006)[a]
$SIZE_t$	0.00117(0.5811)	0.00398(0.5789)
ROA_t	0.77442(0.0094)[a]	
$LLOSS_t$		-1.71875(0.0547)[b]

Notes: (i) Dependent variables are ΔCAP and ΔRWATA, respectively; (ii) p-values in parentheses; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%; (iv) Each system of equations is estimated by 3SLS with time dummies (Year); (v) ΔCAP is the difference between the current and the lagged CAP; ΔRWATA is the difference between the current and the lagged RWATA; POLCON is the dummy variable, which equals 1 when the bank president currently holds or formerly held a position in the government or in the military and 0 otherwise; TENURE is the number of years the bank president has worked in the top management position in the bank or with previous banks; INDEP is the number of independent directors on the board; DUALITY equals one when the bank president is also the chairperson of the board and 0 otherwise; SIZE is the natural log of total assets; ROA is the ratio of net income to total average assets; LLOSS is the ratio of new provisions for loan losses to gross loans; YEAR dummies are also included but not reproduced in the table.

In the case of the unlisted banks (Panel B of Table 5.30), first and foremost, the change in capital (ΔCAP) has significantly negative impacts on the change in the risk ratio (ΔRWATA). As I believe regulation works as the root driver in enhancing banks' capital adequacy, this negative association between change in capital and change in risk also

implies that regulation effectively reduces banks' risk. However, I fail to find any statistically significant relationship between the corporate governance variables and change in risk. Last, I find that LLOSS has significant negative impacts on banks' risk, suggesting that increases in LLOSS leads to a decrease in risk-weighted assets. On the other hand, I find ROA has a significant, positive influence on the change in the capital equation in the case of the unlisted banks.

To sum up, I try to examine the impacts of the corporate governance variables on the change in bank risk by adding them into the original regressions. I find that most of the corporate governance variables do not have significant impacts on banks' risk behavior. For example, only president working experience effectively reduces listed banks' risk. Furthermore, I find that the regulation only reduces risk for the unlisted banks. As my regression with corporate governance does not show the difference from that without the corporate governance variables, I believe that the regulation works for the unlisted banks only because of their own specific features.

5.3.2. The effects of corporate governance on banks' risk: state ownership

Table 5.31 summarizes the empirical results about the impacts of the corporate governance variables on banks' risk level as well as the relationship between change in capital and change in the risk ratio, dependent on whether the state is the largest shareholder. Consistent with the results from the previous section, I find that it is the non-state owned banks that show a significant reaction in altering their risk downwards.

Table 5.31 Corporate governance and banks' risk: state ownership

	ΔCAP_t	$\Delta RWATA_t$
Panel A: State-owned banks (where central state is the largest shareholder)		
ΔCAP_t		-1.05447(0.1974)
$\Delta RWATA_t$	-0.06907(0.2513)	
$POLCON_t$		0.00948(0.3850)
$TENURE_t$		0.00016(0.9352)
$INDEP_t$		0.00107(0.8051)
$DUALITY_t$		0.01234(0.7256)
CAP_{t-1}	-0.42833(0.0001)[a]	
$RWATA_{t-1}$		-0.37777(0.0008)[a]
$SIZE_t$	0.00219(0.1182)	0.00190(0.7343)
ROA_t	0.84546(0.1172)	
$LLOSS_t$		0.35684(0.8590)
Panel B: Non- state-owned banks		
ΔCAP_t		-0.61528(0.0302)[b]
$\Delta RWATA_t$	-0.05378(0.3657)	
$POLCON_t$		-0.01206(0.2854)
$TENURE_t$		-0.00151(0.4461)
$INDEP_t$		-0.00190(0.5273)
$DUALITY_t$		0.02304(0.1573)
CAP_{t-1}	-0.57244(0.0001)[a]	
$RWATA_{t-1}$		-0.20214(0.0001)[a]
$SIZE_t$	0.00155(0.3194)	0.00907(0.1012)
ROA_t	0.93380(0.0043)[a]	
$LLOSS_t$		-1.90055(0.0272)[b]

Notes: (i) Dependent variables are ΔCAP and ΔRWATA, respectively; (ii) p-values in parentheses; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%; (iv) Each system of equations is estimated by 3SLS with time dummies (Year); (v) ΔCAP is the difference between the current and the lagged CAP; ΔRWATA is the difference between the current and the lagged RWATA; POLCON is the dummy variable, which equals 1 when the bank president currently holds or formerly held a position in the government or in the military and 0 otherwise; TENURE is the number of years the bank president has worked in the top management position in the bank or with previous banks; INDEP is the number of independent directors on the board; DUALITY equals one when the bank president is also the chairperson of the board and 0 otherwise; SIZE is the natural log of total assets; ROA is the ratio of net income to total average assets; LLOSS is the ratio of new provisions for loan losses to gross loans; YEAR dummies are also included but not reproduced in the table.

Panel A of Table 5.31 presents the regression results based on ΔCAP and ΔRWATA for the state-owned banks with the consideration of the corporate governance variables. In this case, none of the corporate governance variables influence banks' risk behavior. Moreover,

I can- not find any statistically significant association between change in capital and change in risk as well.

When I look at the results for the non- state-owned banks (Panel B of Table 5.31), I find that the change in capital (ΔCAP) has a negative impact on the change in the risk ratio (ΔRWATA) in the risk equation. Moreover, such coordination of capital and risk adjustments runs only from capital to risk and not vice versa in the case of the non- state-owned banks. Ceteris paribus, an increase of 1 percentage point in the total capital to assets ratio decreases the banks' risk by about 6.21 percentage points. I have already shown that regulation is the major reason for the improvement of the total capital level and this result further indicates that regulation effectively controls the non- state-owned banks' risk behaviors. Last, I find that LLOSS has significant negative impacts on banks' risk, suggesting that increases in LLOSS lead to a decrease in risk-weighted assets. In the capital equation, I find ROA has a significant and positive influence on the capital level in the capital equation, indicating that profitable banks can enhance their capital level more easily through retained earnings.

In general, when I add the corporate governance factors into the risk equation of this system, I find that all these variables do not have a significant influence on bank's risk and they do not change the relationship between capital and risk, relative to results from section 5.2.2.3. Thus, I believe that regulation works for the non- state-owned banks solely due to their own specific characteristics.

5.3.3. The effects of corporate governance on banks' risk: different bank types

Table 5.32 summarizes the impacts of the corporate governance factors on different types of banks' risk behaviors. I find that it is only the local banks that reduce their risk ratio while other types of banks do not show significant difference in their risk-taking behaviors even though I take into account corporate governance factors. This result is consistent with my previous evidence shown in section 5.2.2.3 and also implies that Chinese banks alter their portfolio risk due to their own specific features rather than corporate governance impacts.

In the case of the 'Big 5' banks (Panel A of Table 5.32), I find that president experience (TENURE) has the expected and negative effects on the banks' risk level, indicating that a well-experienced president could help banks tackle problems and improve their performance. However, in this sub-sample regression, I fail to find the evidence that the change in capital (ΔCAP) significantly affects the change in risk (ΔRISK) even when I control the corporate governance factors. Notice that I do not include DUALITY in the risk equation as this variable equals 0 for all the observations in this sub-sample. Nevertheless, I do control DUALITY for the rest of the sub-sample regressions as I believe this variable is important and should capture the change in the banks' risk.

Table 5.32 Corporate governance and banks' risk: different bank types

	ΔCAP_t	$\Delta RWATA_t$
Panel A: 'Big 5' banks		
ΔCAP_t		-0.11706(0.8605)
$\Delta RWATA_t$	-0.02333(0.7861)	
$POLCON_t$		0.01593(0.1551)
$TENURE_t$		-0.01346(0.0091)[a]
$INDEP_t$		0.00116(0.8279)
CAP_{t-1}	-0.65961(0.0022)[a]	
$RWATA_{t-1}$		-0.17501(0.0894)[c]
$SIZE_t$	-0.00124(0.6198)	0.01414(0.2199)
ROA_t	0.89563(0.3011)	
$LLOSS_t$		-1.68210(0.4840)
Panel B: Joint-equity banks		
ΔCAP_t		-0.59332(0.1125)
$\Delta RWATA_t$	-0.04595(0.3441)	
$POLCON_t$		0.00620(0.7098)
$TENURE_t$		-0.00345(0.2101)
$INDEP_t$		-0.00279(0.6327)
$DUALITY_t$		0.06897(0.0554)[c]
CAP_{t-1}	-0.55508(0.0001)[a]	
$RWATA_{t-1}$		-0.31994(0.0020)[a]
$SIZE_t$	0.00032(0.8510)	0.00803(0.4560)
ROA_t	1.53399(0.0070)[a]	
$LLOSS_t$		-1.87188(0.2680)
Panel C: Local banks (including urban and rural commercial banks)		
ΔCAP_t		-1.32971(0.0320)[b]
$\Delta RWATA_t$	-0.09502(0.2648)	
$POLCON_t$		0.00047(0.9674)
$TENURE_t$		-0.00056(0.7931)
$INDEP_t$		-0.00158(0.6121)
$DUALITY_t$		0.01574(0.3134)
CAP_{t-1}	-0.51028(0.0001)[a]	
$RWATA_{t-1}$		-0.21887(0.0010)[a]
$SIZE_t$	0.00290(0.2071)	0.00849(0.2183)
ROA_t	0.67537(0.0891)[c]	
$LLOSS_t$		-1.52964(0.1142)

Notes: (i) Dependent variables are ΔCAP and ΔRWATA, respectively; (ii) p-values in parentheses; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%; (iv) Each system of equations is estimated by 3SLS with time dummies (Year); (v) ΔCAP is the difference between the current and the lagged CAP; ΔRWATA is the difference between the current and the lagged RWATA; POLCON is the dummy variable, which equals 1 when the bank president currently holds or formerly held a position in the government or in the military and 0 otherwise; TENURE is the number of years the bank president has worked in the top management position in the bank or with previous banks; INDEP is the number of independent directors on the board; DUALITY equals one when the bank president is also the chairperson of the board and 0 otherwise; SIZE is the natural log of total assets; ROA is the ratio of net income to total average assets; LLOSS is the ratio of new provisions for loan losses to gross loans; YEAR dummies are also included but not reproduced in the table; (vi) In the case of the 'Big 5' banks, notice that I do not include DUALITY because this variable always equals 0 and does not show any variation in this sub-sample.

	ΔCAP_t	$\Delta RWATA_t$
Panel D: Foreign banks		
ΔCAP_t		-2.63510(0.2742)
$\Delta RWATA_t$	0.08652(0.1805)	
$POLCON_t$		1.07573(0.0862)c
$TENURE_t$		-0.04734(0.4291)
$INDEP_t$		-0.17466(0.0947)c
$DUALITY_t$		0.16117(0.3345)
CAP_{t-1}	-0.12669(0.1362)	
$RWATA_{t-1}$		-0.55622(0.0223)b
$SIZE_t$	-0.00667(0.3620)	0.05827(0.2315)
ROA_t	2.45700(0.4959)	
$LLOSS_t$		14.77250(0.2276)

Notes: (i) Dependent variables are ΔCAP and ΔRWATA, respectively; (ii) p-values in parentheses; (iii) a= significant at 1%, b= significant at 5%, c= significant at 10%; (iv) Each system of equations is estimated by 3SLS with time dummies (Year); (v) ΔCAP is the difference between the current and the lagged CAP; ΔRWATA is the difference between the current and the lagged RWATA; POLCON is the dummy variable, which equals 1 when the bank president currently hold or formerly held a position in the government or in the military and 0 otherwise; TENURE is the number of years the bank president has worked in the top management position in the bank or with previous banks; INDEP is the number of independent directors on the board; DUALITY equals one when the bank president is also the chairperson of the board and 0 otherwise; Size is the natural log of total assets; ROA is the ratio of net income to total average assets; LLOSS is the ratio of new provisions for loan losses to gross loans; YEAR dummies are also included but not reproduced in the table.

In the case of the national joint-equity banks (Panel B of Table 5.32), I find that the duality of the bank president (DUALITY) significantly increases the banks' risk, suggesting that the effectiveness of board monitoring might be impeded when one individual is endowed with decision making and control. Again, I fail to find evidence which supports that there is a significant relationship between change in capital (ΔCAP) and change in risk (ΔRISK).

For the local banks (Panel C of Table 5.32), none of the corporate governance factors affects banks' risk level. However, I find that the change in the banks' capital level (ΔCAP) still has significant and negative impacts on banks' risk (ΔRISK). This empirical result is consistent with my previous results as well, indicating that banks' own specific

characteristics and ownership structure play a key role in explaining Chinese banks' risk behavior when they follow binding capital rules.

With respect to the foreign banks (Panel D of Table 5.32), first, I find that political connection (POLCON) has the expected and positive effects on banks' risk. This result is consistent with my hypothesis which claims that political connection is positively related with a bank's credit risk. Second, the number of independent directors on the board (INDEP) has the expected and negative impacts on banks' risk, indicating that independent directors effectively prevent the top executives from pursuing personal objectives and instead, force management to focus on firm value. However, the change in capital (ΔCAP) does not significantly affect the change in risk (ΔRISK) even when I control the corporate governance factors.

To sum up, although I find some corporate governance variables have significant explanatory power on banks' risk in these sub-groups regressions, it is different types of banks' idiosyncrasies themselves that determine the relationship between capital and risk.

CHAPTER 6: CONCLUSION

6.1. Key Findings

This doctoral research focuses on special issues relating to the impacts of Chinese banking capital requirements and corporate governance on banks' capital and risk-taking behaviors. The key findings in the three interrelated projects which are presented in Chapter 5 jointly contribute to inform the three research questions and contribute to the three literature gaps formerly discussed in Chapter 1.

In response to the first research question, the investigation into the varying effects of the CBRC regulation conducted in the first project (Chapter 5, section 5.1) shows that regulatory pressure has significantly positive and differential impacts on capital for different types of banks. In my first group estimation, I find that regulation is significant and has positive impacts on the bank's capital ratio for my entire sample of banks. In my further estimation which determines if there is any difference in regulatory pressure on capital levels between under-capitalized and well-capitalized banks, I note a significant and positive effect from well-capitalized banks while the few under-capitalized banks in my sample show a negative and significant effect on their capital levels. This result reflects the desire of well-capitalized banks to maintain larger buffers of capital and to signal to both regulators and the capital market that they can clearly exceed the regulatory capital standards. However, I cannot find similar effects of the CBRC regulatory capital requirements on under-capitalized banks, which is consistent with the finding of Jacques and Nigro (1997) that regulation may have negative effects on the capital ratios of banks

with insufficient risk-based capital. The implicit insurance created by the state ownership of the Chinese banking system may give these banks an incentive to operate without actively enhancing their capital.

Next, I examine whether the impact from regulatory pressure makes a difference based on ownership structure. Empirical evidence indicates that regulation has a stronger positive influence on capital ratios for unlisted banks, non- state-owned banks, joint-stock banks and foreign banks but a relatively weaker, positive influence on the capital ratios of the 'Big 5' banks, and local banks (i.e. city and rural commercial banks). Therefore, I believe that ownership structure does play an important role in banks' capital adequacy level.

For the second project (See Chapter 5, section 5.2), I adopt a simultaneous equations model to examine the adjustments in capital and risk by banks when they approach the minimum regulatory capital level. I find that regulation does not have any impact on the risk ratio for banks where the state is the largest shareholder; it only has the expected and negative effect on risk levels for predominately non-state owned banks and unlisted banks (which primarily are the local and rural commercial banks). Therefore, banks with a large degree of state ownership still face a certain degree of credit risk, which may be due to the dual-agency issue of being both the owner and regulator of these banks (Allen et al, 2008; Dobson and Kashyap, 2006). Even state-owned companies whose stockholding and governance processes have been established, come for the most part from monopolized industries with less competition pressure, lower operating efficiency, and poorer ability of repayment. I believe it is the banks that are still partly state-owned that are in the greatest

need of better risk processes, yet it seems regulation up till now has had the least impact on this category of bank.

In response to the third research question (See Chapter 5, section 5.3), I not only investigate the effects of the corporate governance variables on banks' risk but also examine whether consideration of the corporate governance variables would affect the relationship between change in capital and change in risk. Specifically, I re-run the sub-sample regressions which are used in Chapter 5, section 5.2 by controlling some new variables into the risk equation. My results suggest that although some corporate governance variables have significant explanatory power on banks' risk, it is different types of banks' idiosyncrasies themselves rather than the corporate governance factors that determine the relationship between capital and risk. Specifically, I find that, (1) president working experience reduces the risk for the unlisted banks and the 'Big 5' banks, (2) the number of independent directors on the board effectively reduces the risk in foreign banks. On the other hand, president duality and political connections respectively increase the risk in the joint-equity banks and foreign banks. Last, my results are robust as controlling the corporate governance factors does not change the relationship between capital and risk for all the sub-groups regressions.

In summary, the results of this doctoral research confirm the positive effects of current banking policy in raising banks' capital adequacy. It also points out the weakness of capital regulation in decreasing banks' credit risk, especially for state-owned banks. It naturally raises concerns about risk management in large banks, especially the state-controlled banks.

6.2. Significance/Contribution of the Thesis

6.2.1. Contribution to knowledge

From a theoretical perspective, this thesis satisfactorily addresses the gaps in the extant literature on capital requirements, particularly in the strand of empirical studies focusing on Chinese commercial banks.

In particular, this research makes a significant contribution to the body of knowledge of the Chinese banks' capital adequacy and credit risk level. In fact, the examination of the role of capital requirements helps to address the fundamental question of how banks react to binding standards. Specifically, I find that (1) the CBRC regulation has differential, positive effects on the improvement of Chinese banks' capital adequacy, (2) changes in banks' credit risk and capital ratios are significantly, negatively related for predominately non- state-owned banks, indicating that the CBRC regulation is less effective in risk control for the state-controlled banks, and (3) it is banks' idiosyncrasies themselves rather than the corporate governance factors that determines the relationship between capital and risk.

In addition, this thesis can significantly contribute to other areas in finance literature. Firstly, it expands the empirical literature on the impacts of binding, capital requirements on commercial banks' behavior by providing Chinese evidence which clearly shows the positive effects of the CBRC regulation as expected by policy-makers. Furthermore, this research shows that banks simultaneously adjust capital adequacy and credit risk level, given the significant and negative inter-relationship between the changes in capital and the

changes in credit risk which exist in the non- state-owned banks. Secondly, there are other issues of interest which have been addressed in the context of the consideration of the three independent projects. Specifically, the analysis of the differential impacts of the CBRC regulation on commercial banks' behavior contributes to the literature which focuses on examining the international, capital requirements, particularly in regard to those studies which aim at providing empirical evidence for the application of the Basel Accords.

In short, the evidence presented in this thesis not only extends our understanding of Chinese banking regulation but also contributes to the existing literature by providing both theoretical insights and empirical evidence into many important research topics. However, it is important to note that the key focus of this thesis has been to highlight some practical implications of current Chinese banking policy. In addition, it is important to note that this thesis has been structured to encompass three independent projects which were conducted on different samples and in different settings. This allows for an inclusive examination into different aspects of the CBRC regulation and ensures that its implications for capital adequacy and risk-taking behavior are fully explored. Indeed, it can be argued that the validity of my findings has been enhanced significantly since the key research questions have been empirically examined through various data sets employed in the three projects constituting this thesis.

6.2.2. Contribution to practice

Due to the nature of the analysis conducted in the three projects, which was to some extent focusing on providing empirical evidence of China based on previous well-established

models and widely-used methodologies, some important conclusions regarding Chinese banking policy and regulations can be achieved from the analysis produced by these projects. The findings presented in these projects confirm the positive effects of government policies on capital enhancement. However, they also challenge the banking committee to come up with better plans to improve the performance of state-owned banks in terms of risk. In fact, more Chinese specific variables should be used in those models to capture the Chinese banks' unique character. Since the Chinese government plays an absolutely vital role in determining banks' operation, farsighted policies are clearly important and highly recommended by bankers and economists.

The last two projects, which examine the relationship between banks' capital and risk as well as the effects of corporate governance factors on banks' risk, not only show that regulation has varying impacts on banks' capital level but also proves that banks' own idiosyncrasies are the primary reason for their risk behavior responding to binding, capital regulation although corporate governance factors do have explanatory power to some extent. The last two projects differ from the first project due to the following reasons. First and foremost, the first project focuses on the effects of regulation on banks' capital level. Regarding the last two studies, the topic is based on the effects of regulation on banks' risk level, through examining the simultaneous relationship between capital and risk as well as the impacts of corporate governance factors. Furthermore, I manually collect the data for the last project from banks' annual reports and online information.

6.3. Limitations

While previous chapters discuss in great detail the limitations pertaining to each project, this section is devoted to discussing some of the key limitations of this research as a whole.

First, the major limitation of this research lies largely in the limited number of commercial banks in the projects involved, although I have tried to use a full sample. The problem as far as the small sample is concerned, is whether I can achieve stable results and unbiased reference from the limited data.

Second, I have to acknowledge that although the key findings reported in this doctoral research help to shed light on the effectiveness and validity of the CBRC banking regulation in terms of enhancing banks' capital, my conclusion nevertheless can only be taken as empirical evidence rather than pointing out the clear direction of the regulation. It is because the establishment and implementation of any banking regulation and monetary policy needs careful consideration, detailed planning and thorough implementation.

6.4. Areas for Future Research

Other than the key research areas and the associated, important issues emphasized in this thesis, the research also sheds light on several opportunities for future studies which are outlined as follows.

6.4.1. Modeling the demand for loans to the private sector

Macroeconomic models introduced in textbooks underestimate the important role of credit aggregates in macroeconomic analysis. However, there are some reasons to explain why developments in credit markets, particularly in bank lending markets, may play a key role in the economy. For example, a long tradition exists in economic theory of investigating the interaction between real and financial variables and hence, between credit developments and business cycle fluctuations. Moreover, recent progress in the literature about information asymmetries in credit markets has highlighted the significance of a "credit channel" for the transmission of monetary policy. In fact, empirical evidence supports the link between excessive credit growth and the emergence of asset price misalignments which may finally cause macroeconomic instability. Generally speaking, substantial information on the state of the economy, particularly on the strength of inflationary pressures, can be obtained from the developments of bank credit.

Past research, such as Hofmann (2004), analyses the determinants of credit to the private sector for 16 industrialized countries since 1980. Based on Johansen's approach to co-integration analysis, they show that the long-term development of credit cannot be interpreted by standard, credit demand factors, i.e. real GDP and the real interest rate. Nevertheless, as long as real property prices are added into the system, long-term relationships linking real credit positively to real GDP and real property prices and negatively to the real interest rate can be identified. This means that property prices determine the long-term borrowing capacity of the private sector, which should be taken into consideration in explaining the long- term movements in bank lending. In addition, a

standard Cholesky decomposition, impulse response analysis reveals that there is a significant two-way dynamic interaction between bank credit and property prices. Innovations in property prices have extremely significant and persistent, positive, dynamic impacts on bank lending which may lead to significant and constant cycles in bank lending and hence, be the possible explanation for the persistent, financial cycles observed in the past.

The study of Calza et al. (2006) employs multivariate, co-integration techniques to estimate a model which provides a quantitative benchmark for assessing conjunctural developments in loans to the area-wide private sector. Furthermore, the comparison between realized loans and the path indicated by the model could give policy makers useful information about the emergence of financial imbalances, about the state of the economy, particularly about the strength of inflationary pressures, as well as the effect of monetary policy on credit demand. An application of the model, which explores the issue of the leading indicator properties of loan developments for inflation, particularly investigates whether the error-correction term of the model can be used to predict changes in euro area inflation. In order to do so, they follow the methodology of Hamilton and Kim (2002) which is commonly applied to the assessment of the utility of the yield spread to forecast future activity.

The important research question in relation to the impact of aggregate loans on monetary policy has not yet been clearly addressed within the scope of this research on China. Therefore, this issue is worth further investigation in order to enhance our understanding of monetary policy and gain insight into the changes of inflation in China. Based on the

methodology used by Calza (2006), we could model the stock of loans to the private sector as a function of real GDP, a nominal lending rate and the inflation rate. The long-term interrelation connecting the stock of real loans to a small set of macroeconomic variables could be estimated using Johansen co-integration techniques. Finally, recursive Chow tests for parameter constancy could be used to assess the stability of the dynamic equations of the model.

As mentioned before, connections between credit-related indicators and inflation can stem from the correlations between credit aggregates, economic activity and asset prices. Particularly, the loan surplus or deficiency can potentially include useful information for forecasting inflation since it provides an indication of how much the stock of bank lending in the economy deviates from the equilibrium level. For example, a large loan overhang could represent a situation of excessive accumulation of credit in the economy which may reveal correspondingly possible inflation pressures. Here, I would investigate more formally whether the estimated error-correction term contains reliable information on future changes in inflation. For the purpose of doing so, I could conduct an empirical analysis based on the approach proposed by Hamilton and Kim (2002), which is commonly used in the studies on the usefulness of the yield spread to predict future economic growth.

6.4.2. Banks' regulatory capital buffer and the business cycle

In the absence of adjustment costs in capital ratio, banks would never hold excess capital required either by the regulators or by the market. While in the presence of costly adjustments costs, banks with capital less than the regulatory capital requirements may face

repeated regulatory penalties or even be shut down since they are not able to react in a timely manner. Therefore, banks, especially those whose capital ratio is very volatile, prefer to hold an excess capital buffer to reduce the probability of falling below the legal capital requirements.

The capital buffer theory suggests that low-capitalized banks would choose to rebuild a proper capital buffer by simultaneously increasing capital and reducing risk. On the other hand, well-capitalized banks try to maintain their capital buffer by increasing capital when risk increases and lowering capital when risk decreases. This suggests that the relationship of adjustments in capital and risk is negative for low-capitalized banks while it is positive for well-capitalized banks. In a word, the buffer theory suggests that banks try to hold a capital buffer on top of the regulatory minimum in order to avoid the breach of minimum capital requirements. Thus, low-capitalized banks are expected to rebuild a proper capital buffer and well-capitalized banks are predicted to maintain their capital buffers. As a consequence, two hypotheses are proposed according to the buffer theory. First, banks with low capital buffers have a relatively fast adjustment rate of capital compared with banks with high capital buffers. Second, banks coordinate the adjustments for capital and risk in order to avoid the violation of the binding capital standards.

Jokipii and Milne (2008) investigate the relationship between European bank capital buffers and the business cycle by using unbalanced, panel data from 1997 to 2004. They conclude that capital buffers co-move positively for banks in the accession countries. In contrast, they co-move negatively with the business cycle for banks in the EU15 countries. In addition, the business cycle is found to be negatively related with the capital buffers of

large banks and commercial and savings banks while positively related with capital buffers for co-operative and smaller banks.

Stolz and Wedow (2011) investigate the impacts of the business cycle on the regulatory capital buffers of German local banks from 1993–2004. They find strong evidence that capital buffers behave counter-cyclically over the business cycle. Furthermore, low-capitalized banks react differently to the business cycle than well-capitalized banks. For instance, banks with low capital buffers reduce capital and raise risk-weighted assets both in booms and busts. However, well-capitalized banks try to maintain capital buffers and risk-weighted assets in booms. During busts, they increase capital buffers by raising capital and simultaneously reducing risk-weighted assets. The evidence suggests that low-capitalized banks do not catch up with their well-capitalized peers but fall further behind over the observation period, indicating that their low capitalization does not drive them to avoid lending.

Hence, it would be interesting to investigate how business cycles relate with t capital buffers for Chinese commercial banks. By following the methodology used in the study of Stolz and Wedow (2011), the generalized method of moments (GMM) estimator suggested by Blundell and Bond (1998) will be used in my future research project, which would control for the bank-specific component of the error term. Meantime, this so called system-GMM avoids the weak instrument problem that the Arellano and Bond (1991) estimator would face, given the near unit root process of my data as well. In my study, banks' capital buffer (BUF) would be defined as the Basel capital to risk-weighted assets ratio minus the 8

percent regulatory minimum[23]. Apart from analyzing the impacts of business cycle fluctuations on capital buffers, I could also examine the driving forces of this effect by decomposing the capital buffer into capital and risk-weighted assets and then analyzing the effect of business cycle fluctuations on both components.

6.5. Concluding Remarks

In conclusion, this research makes a valuable contribution to the field of Chinese banking research by investigating the responsibility of the CBRC to supervise and regulate commercial banks' behavior. Three independent research projects conducted as part of this doctoral research show important findings in relation to banks' capital level, risk control and corporate governance, highlighting the key role of Chinese banking capital requirements. My results jointly show that, (1) The CBRC capital regulation has differential impacts on different banks' capital level, (2) banks seem to alter their risk level differently according to their different ownership structure when they try to approach the minimum capital level, and (3) the reason Chinese banks adjust their risk level is primarily due to the effects of regulation, as well as their own idiosyncrasies rather than corporate governance influences.

From a theoretical perspective, this thesis helps to address the gaps in the existing literature and extends our understanding of the Chinese banking industry. Specifically, it contributes to the body of knowledge on the adjustments in banks' capital and risk by studying the

[23] BUF includes all assets eligible for Tier 1 and Tier 2 capital and, as of 1998, also Tier 3 capital elements for market price risks.

effects of banking policy. From a practical perspective, it provides some valid empirical evidence and suggestions with respect to banks' activities and sheds lights on the influence of the CBRC regulation. Since banks' operations play a vital role in Chinese finance and the economy, further research and analysis are clearly important and would be highly valued by practitioners.

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