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Effectiveness Analysis of Capital Adequacy Regulation in China

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Effectiveness Analysis of Capital Adequacy Regulation in China

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Abstract

This paper is to estimate the effectiveness of capital adequacy regulation (CAR) in improving capital ratios and restraining risk-taking behavior of Chinese banks in a simultaneous equation framework with an unbalanced panel data of 37 China's commercial banks (1999-2003). As shown in the data, most domestic banks in China have not yet met the 8 percent capital requirement. The empirical analysis does not find a statistically significant relationship between changes in capital, risk levels and the regulatory pressure, implying that the imposition of capital adequacy regulation may not effectively increase capital level and discourage risk-taking behavior of banks in China. To improve capital adequacy of Chinese banks, therefore, recapitalization for state-owned banks should be implemented. Furthermore, the regulatory authority should be handed over the independence, which may help it fairly exercise its regulatory and supervisory authority. More importantly, ownership reform should be launched so that the government can focus on its role as a regulatory and supervisory agency instead of a bank owner, which is necessary for promoting an equal footing for all banks in the financial regulatory framework. Moreover, this also helps cultivate proper internal control mechanisms in banks.

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1. Introduction

The 1990s and the early 2000s witnessed comprehensive bank reforms in China, among which bank restructuring, financial liberalization and strengthened regulation and supervision are three main pillars (Garcia-Herrero et al, 2005). Indeed, the prudential regulation and supervision for the banking sector in China has been improved remarkably. Current regulatory framework employed for “safety and soundness” reasons comprises capital adequacy regulation (CAR), risk concentration restriction, connected transactions restriction, functional separation (or “Glass-Steagall Act”), entry and branching requirement, depositor protection, among others. Furthermore, a basic legal system for banking regulation and supervision with the *People’s Bank of China Law*, the *Commercial Banks Law* and the *Banking Regulation and Supervision Law* at its core has been established, which serves as a legal guarantee for current regulatory framework (Liu, 2005).

Despite all these efforts, the banking sector in China is still characterized with poor asset quality and low capitalization, and is often viewed as one of the weakest and most risky sectors that may jeopardize the whole transition. A safe and sound banking system is far from being achieved. Such disappointing result casts doubts over the effectiveness of the prudential regulations in the banking sector when other important reforms—particularly the incentive structure—are missing.¹ Motivated by this doubt, the study examines the effectiveness of prudential bank regulations in China, where government political objectives still permeate the banking system.

In what follows, Section 2 presents the related literature on CAR, and Section 3 briefly describes the banking sector in China. The empirical model and methodology are illustrated in section 4, and the result is presented in Section 5. The last section summarizes the study and provides some policy implications for further bank reform in China.

¹ Actually, the authorities also realized the shortcomings of the measures undertaken before, and the recent effort is to tackle the incentives problem by allowing foreign strategic investors to acquire certain shares in the commercial banks. For instance, Bank of America will get a seat on the board of China Construction Bank (one of big four state-owned banks) through acquisition of 9% stake for USD 2.5 billions (Garcia-Herrero et al, 2005).

2. Related literature

In theory, the role played by bank capital is to provide a buffer against possible losses, thereby allowing individual institutions to continue operation during periods of declining asset values (Bhattacharya et al, 1998). In this case, CAR may prevent bank runs and therefore bring down the systemic risk, which has been the main justification for CAR in the early literature, such as, among others, Kahane (1977) and Sharpe (1978). Under asymmetric information and deposit insurance scenario, CAR may also help solve or alleviate moral hazard and adverse selection problems arising from unfairly priced deposit insurance schemes. Deposit insurance, especially when not fairly priced, creates incentives for banks to increase their risks, which they can achieve by increasing the risk of their assets or their leverages (Hall, 2001). Employing CAR, therefore, may counter the adverse effect and moral hazard by constraining their risk level (Buser et al, 1981; Benston and Kaufman, 1996). In short, CAR is often proposed by the literature as an *ex ante* mechanism to insure banks against liquidity shocks.

A large body of literature has been working on the effectiveness of CAR, with two focuses—effects on capital level and risk-taking behavior of banks (Jackson, 1999). The first evaluation is usually undertaken in a time series dimension by examining bank capital ratio dynamics before and after the imposition of CAR, e.g., Peltzman (1970), Mingo (1975), Shrieves and Dahl (1992), Jacques and Nigro (1997), among others. Most of these studies do provide evidence for the effectiveness of capital adequacy regulation; namely, CAR helps increase capital ratios of those banks that have not fulfilled the requirement. The effectiveness of CAR in terms of risk control, however, is not obviously and reliably supported by empirical evidence (Shrieves and Dahl, 1992; Jacques and Nigro, 1997; Ito and Sasaki, 1998).²

The above literature assesses CAR mostly in advanced economies, and therefore, may provide only limited guidance for those countries in the transition. This paper tries to fill this

² These studies are also restricted by the fact that there is no direct measure of the risk profile of lending within the broad Basle risk buckets.

gap by empirically assessing the effectiveness of CAR (in terms of capital ratio and risk-taking behavior of banks) with Chinese banking data.

3. Banking sector in China

This section briefly reviews three main features characterizing China's banking sector.³ Specifically, China's banking sector is dominated by state-ownership; the overall performance of Chinese commercial banks is very poor; and the regulation and supervision framework is quite weak. First, state ownership is pervasive in China's banking sector. In terms of bank numbers, the majority of Chinese banks are wholly or partially owned by the government. Even most of the newly established joint-stock commercial banks (JSCBs) are also partially owned by the government.⁴ As for bank capital, state-ownership amounts to 90 percent of total capital (Liu, 2002). As far as market size is concerned, the largest four state-owned banks (big four) alone have been occupying over 75 percent of the market (asset, loan, and deposit), as shown in Figure 1.⁵ As the result of massive existence of state-ownership, the corporate governance is very weak (Garcia-Herrero et al, 2005). The external boards of supervision do not have any role in the governance, and management is a de facto bureau, which is subject to the control of the party.

Second, the overall performance of China's commercial banks is quite poor. Figure 2 shows that the profitability of China's commercial banks is very low. In 2003, average return on asset (ROA) and return on equity (ROE) for major banks in China were 0.1% and 3%, respectively. These ratios are even lower for big four, on average 0.06% and 1.5%, respectively. Even though ratios for JSCBs are higher, 0.3% and 8% on average, they are still relative lower compared to those in EU-15, 0.4% and 10% on average (Garcia-Herrero et al, 2005). The low profitability of China's commercial banks may be explained by the low quality of their assets. Since around 60% of total assets are loans (Figure 3), return on loans determines the profitability of China's banking sector. Non-performing loans (NPL) ratios,

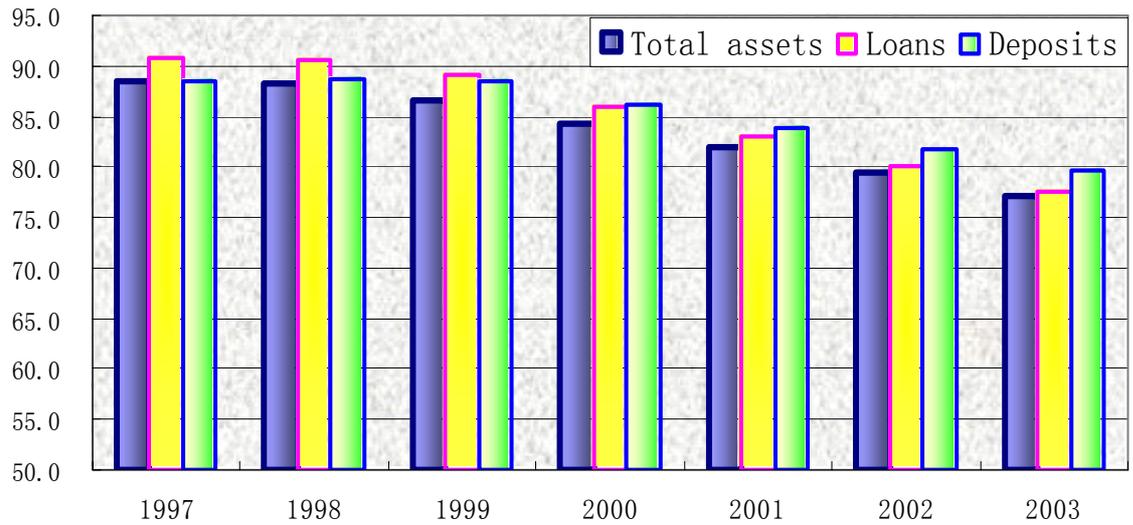
³ Excellent surveys of China's banking system can be found in Garcia-Herrero et al (2005) and Liu (2002).

⁴ Among 10 JSCBs, only China Minsheng Bank is a pure private bank.

⁵ Big four are Agriculture Bank of China (ABC), Bank of China (BOC), China Construction Bank (CCB), and Industrial and Commercial Bank of China (ICBC).

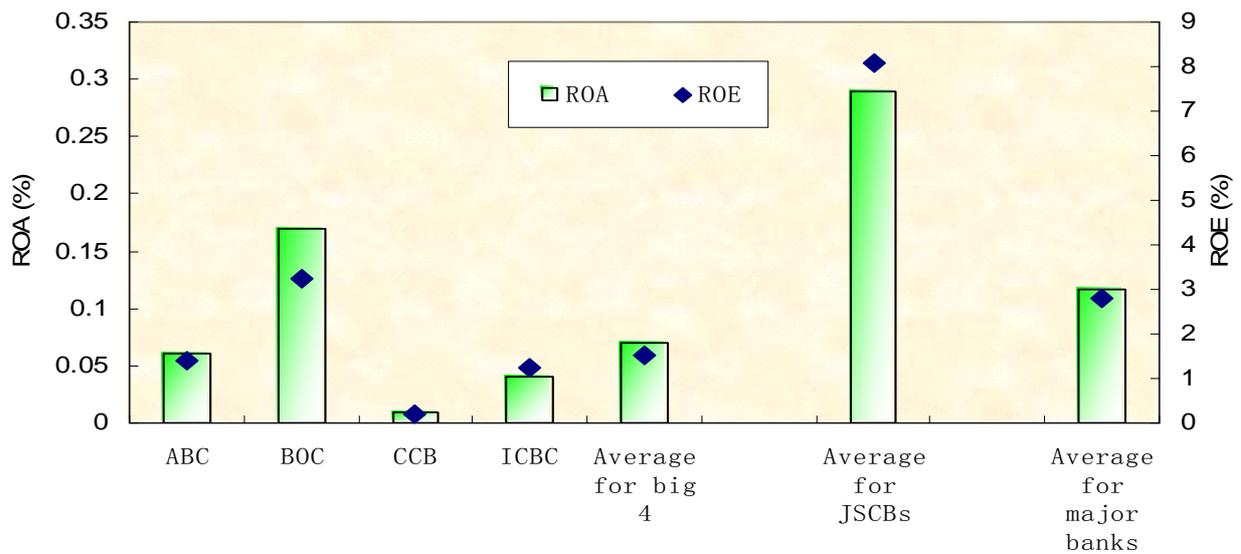
however, are very high. As shown Figure 4, average NPL ratio was around 20% for big four in 2003.⁶ Even JSCBs on average also had 7% NPL, which was quite high compared to the average level of 3% for top 1000 banks in the world. In short, China's banking sector is quite fragile.

Figure 1 Concentration ratio (n=4) for total assets, loans and deposits



Source: Bankscope

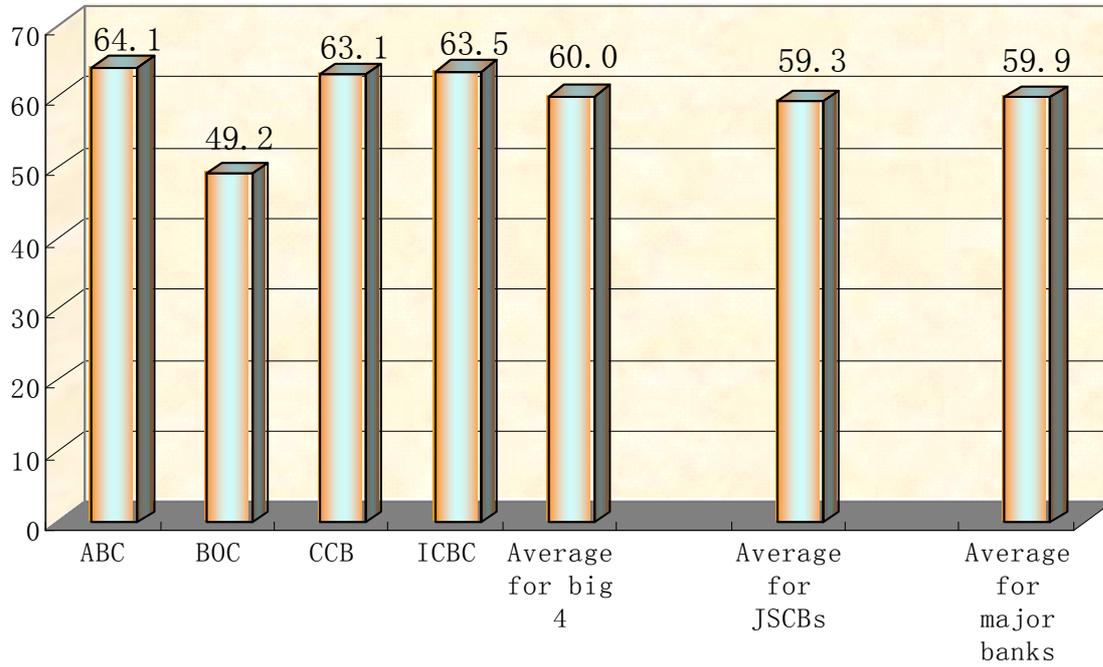
Figure 2 Profitability in 2003 (ROA, ROE)



⁶ This number is a conservative estimation. The real situation might be much more serious, as shown by many studies.

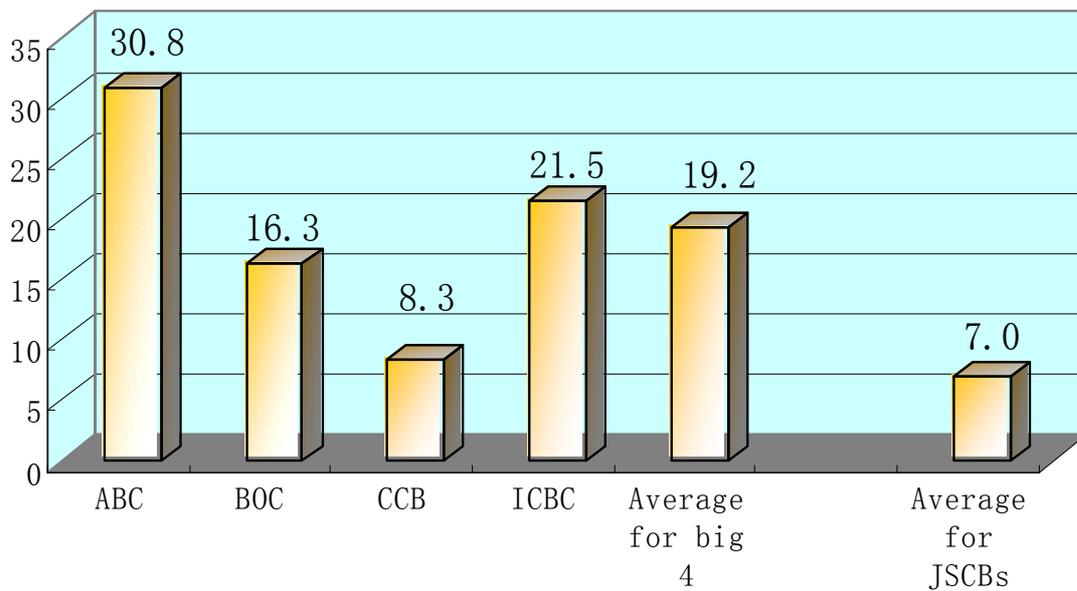
Source: Bankscope

Figure 3 Loan-asset ratio (LAR) in 2003



Source: Bankscope

Figure 4 Non-performing loans (NPL) ratio in 2003



Source: Bankscope

Finally, the regulation and supervision framework is quite weak, although the improvement in this aspect is impressive. Table 1 shows that China has set up a prudential regulation framework, which mainly consists of CAR, liquidity requirement, functional separation, among others. In addition, the authorities have also instructed all commercial banks to form internal risk audit departments to monitor risk and improve internal controls. China Banking Regulatory Commission (CBRC) also conducts off-site monitoring of financial institutions' asset liability ratios on a regular basis. The Chinese supervisory authorities, however, do not have much power to take action against troubled banks, as shown in Figure 5.⁷ For example, the Commercial Banks Law has stipulated 8% requirement for the total capital fund, which is not followed by many banks. As shown in Figure 6, the average solvency ratio for big four was still only 5.5% in 2003, which was well below 8%.⁸ Even JSCBs did not exceed 8%, either.

Table 1 Current Prudential Regulatory Framework in China's Banking System

Prudential Regulations	China-Applied
<i>Regulations employed for "Safety and Soundness" reasons:</i>	
Capital Adequacy Requirement	Minimum 8%
Liquidity Requirement	Minimum 25%
Loan Deposit Ratio	Maximum 75%
Entry Requirement	Varying with different cases
Functional Separation	Yes
Branching Restriction	Yes
Merger Restriction	Examined and approved by PBC
Lending Restriction	One single borrower: below 10% of Capital
Deposit Insurance*	No explicit scheme
Bank Ownership Control	Over 10%, needed to be approved
<i>Regulations employed for other prudential reasons:</i>	
Depositor Protection	Yes
Interest Rate Ceiling and Floor	Set by PBC
Bank Closure	Allowed in case of being unable to pay its maturity debt

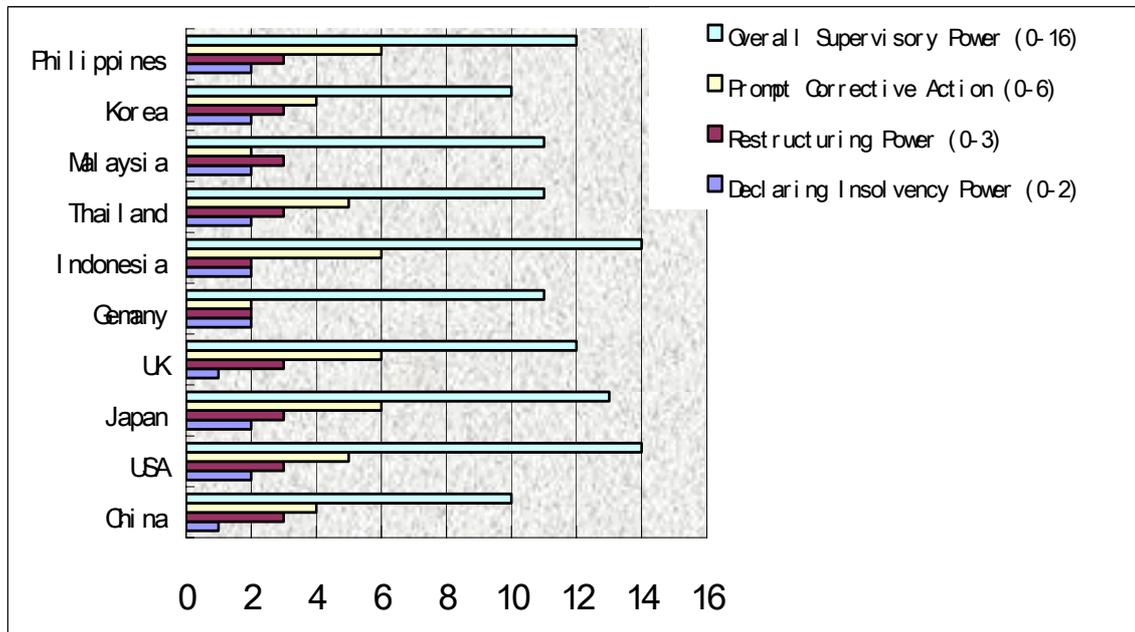
Note: * However, there are strong implicit government guarantees on deposits given the fact that the banking sector is dominated by state-owned banks (Liu, 2002).

This table is mainly withdrawn from The Commercial Bank Law of 1995 (www.pbc.org.cn).

⁷ Official supervisory power index shows how much power the supervisory body has for authorities to take specific actions to prevent and correct problems (Liu, 2002).

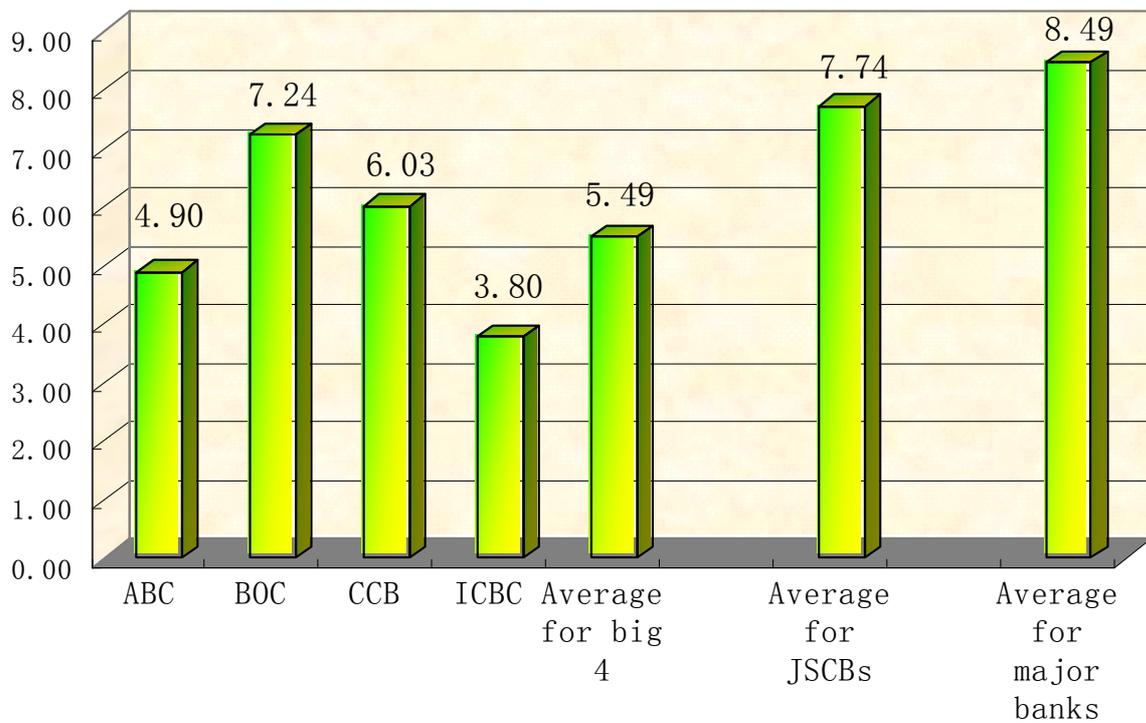
⁸ Solvency ratio = total capital fund * 100 / risky asset (%).

Figure 5 Overall Official Supervisory Power



Source: Liu (2002)

Figure 6 Solvency Ratios in 2003



Source: Bankscope

4. Model Specification and Methodology

To evaluate the effects of CAR on capital and risk ratios, the model used by Shrieves & Dahl (1992) and Jacques & Nigro (1997) is adopted here. In their studies, the relationship between changes in risk and capital levels is presumed to be simultaneously determined and interrelated. Changes in risk and capital levels are stochastic functions of the difference between the target values of this period and the actual values of last period, as shown in equations (1) and (2).

$$\left\{ \begin{array}{l} \Delta CAP_{it} = \alpha (CAP^*_{it} - CAP_{it-1}) + u_{it} \\ \Delta RISK_{it} = \beta (RISK^*_{it} - RISK_{it-1}) + v_{it} \end{array} \right. \quad (1) \quad (2)$$

where $CAP^*_{j,t}$ and $RISK^*_{j,t}$ are the target capital ratio and risk ratio, respectively.

The target value of capital is assumed to be related to a set of variables, including changes in risk ratio (*drisk*), regulatory pressure (*reg*), ownership structure (*state*, *jventure*), net interest margin (*nim*), the scale of deposit (the natural logarithm of deposit, *ln deposit*), and taxes (*taxes*). The target value of risk is assumed to be related to a set of variables, which include changes in capital ratio (*dcap*), regulatory pressure (*reg*), ownership structure (*state*, *jventure*), liquidity ratio (*liquidity*), loan asset ratio (*lar*), and size (natural logarithm of total asset, *size*). Replacing target values with the above variables, equations (1) and (2) are converted to equations (1') and (2'), respectively.

$$\left\{ \begin{array}{l} dcap_{it} = \alpha_0 + \alpha_1 drisk_{it} + \alpha_2 cap_{it-1} + \alpha_3 reg_{it} + \alpha_4 state_{it} + \alpha_5 jventure_{it} \\ \quad + \alpha_6 nim_{it} + \alpha_7 \ln deposit_{it} + \alpha_8 taxes_{it} + u_{it} \\ drisk_{it} = \beta_0 + \beta_1 dcap_{it} + \beta_2 risk_{it-1} + \beta_3 reg_{it} + \beta_4 state_{it} + \beta_5 jventure_{it} \\ \quad + \beta_6 liquidity_{it} + \beta_7 lar_{it} + \beta_8 size_{it} + v_{it} \end{array} \right. \quad (1') \quad (2')$$

Table 2 shows definitions of the above variables. Among these variables, the regulatory pressure (*reg*) is the prime interest in this paper. The binary variable *reg* (1 if the capital ratio is below 8 percent; 0 otherwise) reflects the regulatory pressure. If CAR is effective, then the positive relationship between *reg* and *dcap* as well as the negative relationship between *reg*

and *drisk* are expected; in other words, undercapitalized banks are required to increase capital and reduce risks. Ownership differences among JSCBs (nationwide and city joint-stock commercial banks), joint-venture commercial banks (mostly foreign controlled banks) and SOCBs may affect results due to the nature of the regulation, differences in bankruptcy costs and different treatments of regulatory forbearance. To capture the ownership effect, two binary variables (*state* and *jventure*) are included in the simultaneous equations. Other variables that may affect the target capital and risk are basically banks' characteristics, such as liquidity, profitability, risk management, and size. The number of variables in each equation satisfies the order condition for identifying another equation.

Table 2 Definition of Variables

No. of Variable	Variable	Description of Variable
<i>Dependent Variables:</i>		
1	<i>dcap</i>	Change in CAP
2	<i>drisk</i>	Change in RISK
<i>Independent Variables:</i>		
1	<i>state</i>	1, if state share is larger than 50%; 0, otherwise
2	<i>jventure</i>	1, if foreign share is larger than 50%; 0, otherwise
3	<i>reg</i>	1, if capital ratio<0.08; 0, otherwise
4	<i>cap</i>	Equity / risk-weighted assets
5	<i>risk</i>	Risky assets / total assets
6	<i>nim</i>	Net interest margin
7	<i>lndeposit</i>	Natural logarithm of total deposits
8	<i>size</i>	Natural logarithm of total assets
9	<i>liquidity</i>	Liquid assets / total assets
10	<i>lar</i>	Loan asset ratio
11	<i>taxes</i>	Bank income taxes

The simultaneous equations model is estimated using two-stage least squares approach which recognizes the endogeneity of capital ratios and risk levels in a simultaneous equations framework. Endogeneity causes inconsistency of the usual OLS estimates and requires instrumental variable methods to obtain consistent parameter estimates. For panel data, four different estimators may be applied to the model: the first-differenced estimator (FD2SLS), within estimator (W2SLS), between estimator (B2SLS), and error components two stage-least squares (EC2SLS). It is suggested by Baltagi (2001) that there are efficiency gains

in terms of mean squared error in performing EC2SLS over the standard simultaneous equation counterpart 2SLS. In fact, the estimator of EC2SLS is a matrix-weighted average of estimators of W2SLS and B2SLS with the weights depending on their respective variance-covariance matrices (Wooldrige, 2002).

5. Empirical Results and Analyses

The data for this study is collected from Bankscope (China sector, 1999-2003), including 37 banks. The EC2SLS estimators for the entire sample and for non-SOCBs are listed in Table 3 and Table 4, respectively. Both estimates satisfy the rank condition for identifying simultaneous equations system.

As shown in Table 3, *reg* is not significant in capital adjustment function, and is significantly but positively related to change in risk. This suggests that CAR may not be effective in increasing capital ratio and reducing risks. Instead, the result shows that undercapitalized banks tend to increase risk compared to those who have met the capital requirement. The result is similar when SOCBs are excluded from the entire sample, as shown in Table 4.

Both equations confirm the negative relationship between change in risk and change in capital. Namely, when the bank increases risk, it is decreasing capital ratio, vice versa. This is also true for non-SOCBs. For both samples, ownership seems not matter in the capital adjustment function, but matter in the risk adjustment function. Holding other factors constant, joint-venture banks tend to decrease risks more than other banks. Banks with higher capital in the previous period tend to continually increase capital while banks with higher risk in the last year tend to decrease risk ratios, other factors held constant. Taxes tend to reduce the capital ratio while deposit scale tends to increase capital ratio. Results also suggest that banks with higher liquidity ratio have prudential risk management policy, while banks with higher loan asset ratios tend expand their risky assets, holding other factors unchanged.

Table 3 Regression Results (the Entire Sample)

	(1) Dependent variable=dcap	(2) Dependent variable=drisk
	Coefficient (se)	Coefficient (se)
<i>drisk</i>	-6.780*** (1.812)	
<i>cap(t-1)</i>	2.471*** (0.072)	
<i>reg</i>	-4.124 (35.235)	2.515** (1.177)
<i>state</i>	8.450 (51.507)	-0.479 (1.726)
<i>jventure</i>	-86.65 (54.411)	-5.251** (2.099)
<i>nim</i>	-46.772*** (16.059)	
<i>lndeposit</i>	36.813*** (11.262)	
<i>taxes</i>	-0.020** (0.010)	
<i>dcap</i>		-0.005*** (0.001)
<i>risk(t-1)</i>		-0.727*** (0.046)
<i>liquidity</i>		-38.153*** (5.036)
<i>lar</i>		0.424*** (0.063)
<i>size</i>		-0.162 (0.379)
<i>Constant</i>	-288.316** (131.350)	39.018*** (5.520)
<i>Observations</i>	174	174
<i>Number of banks</i>	37	37
<i>R²</i>	0.92	0.56

Note: * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4 Regression Results (non-SOCBs)

	(1) Dependent variable=dcap	(2) Dependent variable=drisk
	Coefficient (se)	Coefficient (se)
<i>drisk</i>	-7.835*** (2.000)	
<i>cap(t-1)</i>	2.575*** (0.088)	
<i>reg</i>	-4.084 (43.869)	2.288* (1.366)
<i>jventure</i>	-29.373 (64.758)	-4.934* (2.603)
<i>nim</i>	-44.146** (18.081)	
<i>lndeposit</i>	64.309*** (16.470)	
<i>taxes</i>	-0.113** (0.050)	
<i>dcap</i>		-0.004*** (0.001)
<i>risk(t-1)</i>		-0.755*** (0.050)
<i>liquidity</i>		-35.873*** (5.572)
<i>lar</i>		0.494*** (0.073)
<i>size</i>		0.184 (0.564)
<i>Constant</i>	-553.016*** (180.606)	33.364*** (7.010)
<i>Observations</i>	140	140
<i>Number of code</i>	31	31

R^2

0.92

0.58

Note: * significant at 10%; ** significant at 5%; *** significant at 1%

6. Conclusions and Policy Implications

This paper utilizes several periods of cross-section data on China's commercial banks in a simultaneous equation framework to study the effectiveness of CAR in China. The study finds that most domestic banks (SOCBs and JSCBs) have not met the capital requirement of 8 percent. Furthermore, the relationship between changes in capital, risk levels and the regulation pressure are not as strong as expected by the regulator, either. In short, there is lack of empirical evidence that the imposition of capital adequacy regulation increases capital and discourages risk-taking behavior of China's banking sector.

Reasons for ineffectiveness of CAR are not identified in this study. The best attempting explanations, however, can be multifold. First, the regulatory and supervision authorities are not independent from the government, and therefore, cannot force SOCBs to follow the regulation immediately and strictly. Second, SOCBs dominate the whole banking sector, which suggests that the weak enforcement of CAR in the banking sector is not avoidable since SOCBs are not captured by the regulation. Last, the regulation does not impose constraints on SOCBs. With the unfair regulatory environment against non-state-owned banks, such as different closure policies and different requirements for the regulation, the charter value and the profit margin of non-state-owned banks will decrease. This situation will cause two effects on the risk-taking behavior of non-state-owned banks: income effect (reducing risk) and substitution effect (increasing risk). Generally speaking, substitution effect dominates income effect, and therefore, the imposition of capital adequacy regulation does not achieve its goal to decrease risks.

Therefore, further recapitalization should be implemented so that SOCBs meet the CAR. In addition, the regulatory authority should be handed over the independent regulatory, supervision and enforcement authority. This is important to create a fair and benign competition environment for all types of banks. Last but not least, the ownership reform should be started, the sooner the better, so that the incentive issue can be solved and the fair

regulatory environment can be cultivated.

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