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The Capital and Risk Adjustment Under Regulatory Pressure of Chinese Commercial Banks

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Abstract

This paper analyzes the adjustment of Chinese commercial banks' capital and risk after the implementation of Measures for the Management of Capital Adequacy Ratios of Commercial Banks, using 3SLS technique and a simultaneous equation model (Shrieves and Dahl, 1992) with data of 28 commercial banks. The results suggest that banks increase the capital level in order to meet the requirement of capital regulation; the regulation pressure increases the risk taking by banks with inadequate capital, and increases the capital level in banks with adequate capital.

Key words: Capital Adequacy Ratios; Regulation Pressure; Risk Taking

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INTRODUCTION

The foundation theory of Capital Adequacy Ratios (CAR) was introuduced by Merton in 1997. Basel Commitee put forward three pillars in 1999, and one is the lowest CAR requirement. In the end of 2006, the New Capital Agreement was implemented officially, and allowed the banks with high management level to use inter risk parameters calculating CAR in order to link banks' capital and risk closely. After the financial crisis of USA, in September, 2010, the new capital framework was determined and put forward the gradual transition arrangement.

The requirment of CAR is aimed to decrease risks, but the ralationship between the capital regulation and risk taking is not conclusive. Some researchers proved that there was a positive relationship between them (Kahane, 1997; Koehn and Santomero, 1980; Kim and Santomero, 1988), while some others found the relationship was negtive (Dothan and Willianms, 1980; Benston, 1996; Furlong and Keeley, 1989; Keeley and Furlon, 1990).

In China, the CAR regulation did not begin untill 1993, but for a long time it had no effect because of lack of attention. In 2004, Measures for the Management of Capital Adequacy Ratios of Commercial Banks was issued, and formulated that the lowest CAR was 8 percent, the lowest core CAR was 4 percent, and the compliance date was Jan 1, 2007. Till now Chinese bank industry has regarded the CAR as the heart of its development.

This article tries to evaluate what the relationshiop is between capital and risk behavior in the banks with regulation pressure after the implementation of Measures for the Management of Capital Adequacy Ratios of Commercial Banks. The article is organized as follows: section 1 is the literature review; section 2 is the research model; section 3 is the empirical results and section 4 is conclusions.

1. LITERATURE REVIEW

In order to resolve the debate between capital requirement and risk taking, a lot of researchers examined the relationship from the empirical perspective, and most of them used simultaneous equation model to ananlyze how banks change the asset portfolio when facing the constrains of capital requrirement. Shrieves and Dahl(1992)found that banks with CAR lower than 7 percent increased the CAR averagely higher 140 base point than other banks every year, using the data of 1800

banks insuranced in FDIC from 1983 to 1987. Jacques and Nigro(1997) found that the regulation pressure decreased banks' risk taking in 1990-1991 after the implementation of the risk-based capital requirement. Aggarwal and Jacques(1998) analyzed the influence of FDIC Improvement Action and Prompt Correction Action in 1991, and found that banks with inadequate capital increased the CAR more quickly than the banks with adequate capital, using the panel data of US banks. In 21 century, the empirical research focused more on the banks outside USA. Rime(2001) found that in Switzerland the regulation pressure increased CAR, but had no effect for risk taking.

In China, ZHU Jianwu (2006) found that the regulation pressure didn't influence the banks' risk taking significantly , but influenced the CAR negtively in medium and small banks. WU Dong and ZHOU Jianping (2006) found the CAR requirement decreased the risk taking, but had no significant effect for capital improvement.

On the basis of the exsisting research, this paper empirically analyzes the effect of the implementation of Measures, and try to found the relationship between capital regulation and risk.

2. MODEL SPECIFICATION

The theory model usually assumes that the banks will adjust capital and risk simultaneously when facing the capital requirement. I use the framwork of Shrieves and Dahl(1992) and their follwers to analyze the relationship between capital regulation and risk taking in Chinese commercial banks. Capital and risk taking are decomposed into two components: a discretionary adjustment and a change caused by exogenous factors to the bank:

$$\Delta CAR_{j,t} = \Delta^d CAR_{j,t} + \varepsilon_{j,t} \quad (1)$$

$$\Delta RISK_{j,t} = \Delta^d RISK_{j,t} + v_{j,t} \quad (2)$$

Where $\Delta CAR_{j,t}$ and $\Delta RISK_{j,t}$ are the observed changes in capital and risk for bank j in period t. $\Delta^d CAR_{j,t}$ and $\Delta^d RISK_{j,t}$ represent the discretionary adjustments, and $\varepsilon_{j,t}$ and $v_{j,t}$ are exogenously determined factors. In any period, banks may not be able to adjust their desired capital and risk levels instantaneously. Thus, Shrieves and Dahl(1992) and their followers model the discretionary changes in capital and risk using the partial adjustment framework such that:

$$\Delta^d CAR_{j,t} = \alpha(CAR^*_{j,t} - CAR_{j,t-1}) + \varepsilon_{j,t} \quad (3)$$

$$\Delta^d RISK_{j,t} = \beta(RISK^*_{j,t} - RISK_{j,t-1}) + \nu_{j,t} \quad (4)$$

Where $CAR^*_{j,t}$ and $RISK^*_{j,t}$ are bank j's target capital and risk levels. In the partial adjustment framework, the discretionary changes in capital and risk are proportional to difference between the target level and the level in period t-1. Substituting equations (3) and (4) into equations (1) and (2):

$$\Delta CAR_{j,t} = \alpha(CAR^*_{j,t} - CAR_{j,t-1}) + \varepsilon_{j,t} \quad (5)$$

$$\Delta RISK_{j,t} = \beta(RISK^*_{j,t} - RISK_{j,t-1}) + v_{j,t} \quad (6)$$

In this research, I use the CAR formulated by Measures as the capital indicator, and use the difference of CAR as the capital change (ΔCAR). Following Shrieves and Dahl (1992), Jacques and Nigro (1997), Aggarwal and Jacques (1998) and Rime (2001), I choose the ratio of the risk-weighted asset to total asset to stand for the banks' risk taking. This indicator can reflect the banks' risk taking at a specific time. Also I use the difference of Risk as the risk change ($\Delta RISK$). Follows Jacques and Nigro (1997), we use CARLOW and CARHIGH to evaluate the influence of capital regulation to bank's behaviors. When CAR is lower than 8 percent, CARLOW=1\CAR-1\8%, otherwise CARLOW=0. When CAR is higher than 8 percent, CARHIGH=1\8%-1\CAR, otherwise CARHIGH=0. The banks will adjust the capital and risk level in period t according to the capital and risk level in period t-1. So I use $CAR_{j,t-1}$ and $RISK_{j,t-1}$ to reflect the lag of capital and risk.

We also control bank size (lnSIZE), earings (ROA), asset qulity ($\Delta NPL_{j,t}$ -the change of non perfect loan), market constrain (dummy variable, if the bank is listed, MP=1, otherwise MP=0).

Till now , I construct the model for my research:

$$\Delta CAR_{j,t}=a_0+a_1\Delta RISK_{j,t-1}+a_2 \ln SIZE_{j,t}+a_3 ROA_{j,t}+ a_4 CARLOW_{j,t}+ a_5 CARHIGH_{j,t}+a_6 CAR_{j,t-1}+a_7 MP_{j,t}+\varepsilon_{j,t}$$

$$\Delta RISK_{j,t}=\beta_0+\beta_1\Delta CAR_{j,t-1}+\beta_2 \ln SIZE_{j,t}+\beta_3\Delta NPL_{j,t}+\beta_4 CARLOW_{j,t}+ \beta_5 CARHIGH_{j,t}+\beta_6 RISK_{j,t-1}+\beta_7 MP_{j,t}+v_{j,t}$$

3. DATA AND EMPIRICAL ESTIMATION

I manually collect the data of 28 Chinese commercial banks, and get 136 observations from the annual report, including 4 state-owned commercial banks, 10 national joint-stock commercial banks and 14 city commercial banks. Because I need to analyze the differences, I choose the banks at least with 2 years data continuously.

Table 1
Statistical Description

Variables	2003	2004	2005	2006	2007	2008	2009
	Mean	Mean	Mean	Mean	Mean	Mean	Mean
$\Delta CAR_{j,t}$	-1.29	-0.44	0.81	1.53	2.63	-0.53	-0.78
	(1.82)	(2.81)	(1.15)	(2.27)	(4.4)	(2.36	(3.1)
$\Delta RISK_{j,t}$	0.054	0.068	0.541	-0.415	-0.023	0.01	0.008
	(0.0930)	(0.034)	(1.835)	(1.640)	(0.135)	(0.047)	(0.066)
$CAR_{j,t-1}$	9.278	8.504	7.616	8.556	9.566	12.604	12.423
	(2.43)	(1.342)	(2.939)	(2.410)	(2.980)	(5.309)	(3.717)
$RISK_{j,t-1}$	0.528	0.548	0.606	0.575	0.588	0.588	0 .568
	(0.0520	(0.076)	(0.083)	(0.082)	(0.162)	(0.078)	(0.081)
$CARLOW_{j,t}$	0.670	5.355	5.315	0.723	0.310	0	0
	(1.182)	(10.701)	(14.041)	(3.232)	(1.024)	(0)	(0)
$CARHIGH_{j,t-1}$	1.136	1.052	1.021	2.357	3.750	3.905	3.720
	(1.0180	(1.356)	(1.589)	(1.802)	(2.644)	(1.985)	(1.299)
$\Delta NPL_{j,t}$	-2.828	-0.324	-1.056	-0.768	-0.925	-0.379	-0.567
	(2.332)	(2.424)	(1.411)	(0.503)	(2.685)	(1.203)	(0.541)
$ROA_{j,t}$	0.456	0.530	0.738	0.696	0.916	1.039	0.873
	(0.142)	(0.305)	(0.689)	(0.272)	(0.343)	(0.461)	(0.292)
In$SIZE_{j,t}$	12.984	12.136	12.197	12.026	12.407	12.822	13.205
	(0.978)	(1.863)	(2.235)	(2.305)	(2.138)	(2.109)	(2.242)

Standard deviation in parentheses

From the statistical description, I find that, after the implementation of Measures, the signal of $\Delta CAR_{j,t}$ is changed to positive, which means that the capital level increases annually. From 2006 to 2007, the signal of $\Delta RISK_{j,t}$ is changed to negtive, but changed to positive again in 2008, which shows that the implementation of Measures decreased the risk, but after the compliance date, the risk increased again. The low regulation pressure is decreasing untill zero, and the high regulation pressure is increasing.

In order to examine the exact adjustment of capital and risk, I estimate the model with 3SLS procedure, which recognizes the endogeneity of both bank capital ratios and risk levels in a simultaneous equation framework, and the 3SLS technique provides consistent estimates of the parameters.The results of estimating is presented in table 2.

Table 2
The Estimation Results

	$\Delta CAR_{j,t}$	$\Delta RISK_{j,t}$
C	8.6925***	1.6136***
	(1.3682)	(0.5631)
$\Delta CAR_{j,t}$		-.0047
		(0.0183)
$\Delta RISK_{j,t}$	0.7987	
	(1.4562)	
$CAR_{j,t-1}$	-0.976***	
	(0.0607)	
$RISK_{j,t-1}$		-0.7978
		(0.5082)
$CARLOW_{j,t}$	-0.2***	0.0284*
	(0.0496)	(0.0145)
$CARHIGH_{j,t-1}$	1.5477***	-0.0235
	(0.1765)	(0.0268)
$\Delta NPL_{j,t}$		-0.1309***
		(0.0404)
$ROA_{j,t}$	0.0377	
	(1.4069)	
In$SIZE_{j,t}$	-0.2559**	-0.0907***
	(0.1236)	(0.0352)
$MP_{j,t}$	1.1688**	0.0728
	(0.4926)	(0.1487)
R^2	0.5283	0.2285
Wald chi2	419.86	29.91
P	0.0000	0.0001
observations	101	101

t statistics in parentheses,* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

According to table 2 , there is no significant relationship between the change of capital and the change of risk. The coefficient of $CAR_{j,t-1}$ is -0.2 and is significant, which shows that if the CAR in period t-1 decreases, the CAR in period t will increase. In capital equation, the coefficients of CARLOW and CARHIGH are both significant, but in risk equation, only CARHIGH is significant. It shows that when a bank's capital is inadequate, the regulation pressure decreases the capital level and increases the risk level, because the bank wants to get more return by taking more risk; and when a bank's capital is adequate, the regulation pressure still increases the capital level, because the bank wants to prove its safety. The increase of bank's size can decrease the risk level of the bank, and listing can increase the capital level.

4. CONCLUSIONS

This paper analyzes the behavior of commercial banks' capital and risk adjustment after the implementation of Measures for the Management of Capital Adequacy

Ratios of Commercial Banks, using 3SLS technique and a simultaneous equation model (Shrieves and Dahl, 1992) with the data of 28 commercial banks. The results suggest that banks increase the capital in order to meet the requirement of capital regulation; the regulation pressure increases the risk taking in banks with inadequate capital, and increases the capital level in banks with adequate capital.

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