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Nexus of Risk-taking Behavior, Capitalization, and Profitability of Chinese Banks: Evidence from Panel Threshold Regression

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ABSTRACT

The study is based on the nexus of capitalization, risk-taking, and profitability of 187 commercial banks of the People's Republic of China (P.R.C) around the years 2011 to 2018. Research regulates a single threshold level for bank size and reviews the nonlinear correlation of capitalization, return on assets, and return on equity with the use of pmodels like panel ordinary least square (POLS), fixed effect (FE), and panel threshold regression (PTR). The value of threshold amounts to approximately 1,371,44 USD 1000 of total assets above this level market capitalization positively affect bank performance. The magnitude of capitalization declines from 3.14% to 0.65% for return on assets and from 21.9% to 1.56% for return on equity for banks is excessively larger after crossing the threshold level in the China banking sector.

Key Words: Bank risk-taking behavior; Profitability; China; and Panel Threshold Regression

Introduction

The global financial crisis (GFC) of 2007-2009 was due to unrestrained risk-taking by banks, which eroded capitalization. The size of the bank plays a part in the fiscal profit and risk absorbing capacity of banks. The Basel Accord proposed reforms in the shape of regulations of minimum capital requirements as a safety net for further losses. This led the regulators and policy-makers to formulate regulations to increase the capitalization of banks, which also increase bank branches to not only provides services to more people and businesses but also result in profit generation. The bank structure is divided into two aspects (a) total assets and (b) capitalization.

The capital of a bank enhances the social efficiency of banks operate during and after the GFC. The accumulation of more capital would destroy bank performance and decrease the lending ratio. There are many studies available on the issue and have suggested some adverse consequences for accumulating capital (Jime´nez et al., 2012), (Osborne, M., Fuertes, A.M., Milne, 2012) and (Diamond & Rajan, 2001). These conflicting views provide a solid ground for studying a joint effect

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of capitalization and size on banks. The bank profit is always the primary concern of a manager and regulators to make strategic decisions about bank performance.

The available research either directly checks the linear relationship between capitalization and performance or adds capitalization as a quadratic factor in the regression model to look for non-linearity among capitalization, return on assets, and return on equity. The addition of the quadratic term of capitalization in the regression model is a vastly used technique to know non-linear relations. The method has the shortcoming of turning point in non-linear relations correctly. In contrast, the PTR model is a good option. The issue of capitalization is vital for the evolution of banking theory, for obligations, and the rationality of assumptions of channels by which capital has an impact on bank performance.

Does an important question arise whether an increase in performance is caused by capitalization and bank size structure? Therefore, banks' financial performance by taking risk practices is a crucial concept to study to identify how financially proficient and profitable the Chinese banks are. By including bank-specific and macro-economic variables by risk-taking practices. In the situation of the high volatile industry, it is of great attraction to focus on the particular form of assets. Commercial banks have an essential role in China with a strong affiliation to many sectors in the country. The market competition propels a bank to opt for risk-taking behavior, to know the profit and competence of going solvent.

Institutes dealing with the financial sector of a country have gone through changes globally to improve efficiency and performance. Against the particular performance background, the size and capitalization in commercial banks have brought forward problems, of risk-taking according to resources and stability that cannot be ignored in the competitive market (Pool et al., 2015). The study aims to provide empirical evidence to these conflicting results in some scenarios. Furthermore, there is a scope of verifying the size of various impacts and the variation across the cross-section of banks in China. Provides a need for empirical studies.

Theories usually do not differentiate banks that have different total assets that are important to propose policy and research. The POLS regression is run on the performance of banks, and capital ratio concerning bank size as a coefficient in the nonlinear model is not possible to interpret as is done in linear models (Norton et al., 2004). Results prove that capital improves the profitability of a bank with small sizes, but as total assets of the bank increase and the magnitude of the impact keep decreasing. This study is significant for the bank sector in China, as there is a differentiation of size built on threshold regression.

The classification of the bank on size is an essential factor for commercial banks. High capitalization helps small banks to enhance performance and help small banks in a more vulnerable crisis. Banks with a high volume of total assets do have a benefit of capital accumulation but with diminishing value. The Chinese banking system has improved in buoyancy and performance after the implementation of first-generation banking reforms such as the introduction of bank supervision, familiarization of an institution with corporate governance, and strengthened profitability substantially.

The non-linear relationship is tested by a panel thresholds model, and the connection concerning capitalization, size, and profitability is measured. The nonlinear relationship is checked to see if the correlation between capitalization and profitability reverse from positive to negative and vice versa.

Literature Review

Capitalization is the number of bank funds as a ratio of equity to total assets. Equity is an expensive form of bank liability for expected returns (García-Herrero et al., 2009), (Alexiou & Sofoklis, 2009), (Angbazo, 1997), (Athanasoglou et al., 2008), (Berger, A. N., 1995), (Bourke, 1989), (Iannotta et al., 2013), (Lloyd-Williams et al., 1994), (Pasiouras & Kosmidou, 2007) and

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(Goddard et al., 2004). The high-value of capital results in a substantial return for banks. The capital ratio used in the trade-off theory proposed that the ideal level of capital improves performance as the trade-off benefit and costs (Berger, A. N., 1995) and (Osborne, M., Fuertes, A.M., Milne, 2012).

The capitalization helps banks to supply the assets at favorable interest rates and increase expectations on profitability to counterbalance the fee of equity. A better-capitalized bank earns a better profit (Athanasoglou et al., 2008) and (Berger & Bouwman, 2013). The high rate of capitalization shows that the bank is less risky and has more access to an inexpensive basis of reserves and a better quality of assets (Terraza, 2015). According to (Goddard et al., 2004) a bank's profitability increases at first, due to size and economies of scale but a decline is seen when the size exceeds the threshold level with the exhaustion of competitive advantage over small banks by an economy of scale, access to resources, a broader market and bureaucratic style of managers and cause performance and efficiency.

Bank with assets is functional in times of crisis, too, as loans are repaid faster than small banks and decrease the cost of raising capital (Smirlock, 1985). A bank with vast networking and branches has a high amount of DEPOs, but the cost of operation had an indirect effect on financial gains as economies of scale are not adequately maintained (Smirlock, 1985). Better technology and managerial structure practice are important than scale efficiency to make the bank more profitable (Berger & Humphrey 1997). (Black, 2001) gave a negative effect between the return and size of the bank with the use of scale and type of product mix.

Size of the bank gives an image of big banks are better than banks with less proportion of total assets as economies of scale and gain high profits (Smirlock, 1985), (Molyneux & Thornton, 1992), (Goddard et al., 2004), (Bikker & Hu, 2002) and (Hashem, 2016). The operation of the bank is dependent on size to continue operations with regulated risk faced by the partners. Banks diversify business and decrease the risk percent that permits banks to work with low capital, and less steady money is required to strengthen market activity with high fixed costs. The result of these activities may be unstable funding and raise leverage as securities are kept as collateral.

Size proxy through the logarithm of total assets is a vital determinant of financial performance. (Berger & Bouwman, 2013) show capitalization ratio increases the profitability at the time of crises with dependence on bank size. (Smirlock, 1985) concludes the direct relation of size and profit as the cost of raising capital is reduced. Banks have more capital and effortlessly follow the regulatory requirement of capital values, and extra capital is given as loans (Berger, A. N., 1995). The high volume of capitalization proves that the need for external funding is low and high profits are earned, a well-capitalized bank faces a low cost of getting bankrupt, and also the cost of funds is decreased.

According to expectations, high capital reserves ratio suggests banks face losses and low risk or high capacity to absorb risk (Berger & Bouwman, 2013). (Acharya et al., 2016) proposed the theory of diversificaton that causes a bank to face the problems of a decrease in returns. The bank return decrease as loans of the industry is diversified. Banks prefer diversificaton to grab the opportunity of availability of the vast type of loans (Zheng et al., 2017). The revenue diversificaton index is calculated as net operating income into net interest revenue and non-interest income proposed by (Deng et al., 2013). The asset that forms bank safety is diversified may not give positive output for good profitability.

The decrease in non-interest business and risk-adjusted profits is witnessed and prove the aftermath of diversificaton. The adverse reaction of diversificaton has an impact on earned income (Stiroh & Rumble, 2006). Liquidity is explained as customer loans divided by customer DEPOs given by (Haq et al., 2014) and (Cornett et al., 2010). The situation of liquidity with profitability is the new supervision regulation adoption due to the financial crisis and also because of business strategies given by stockholders. As bank gains profit, the requirement of the liquidity is less severe suggesting that banks that give importance to loans over DEPOs are risk-averse. Banks that face losses increase liquidity as per the new guidelines.

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In the situation of a saturated market, banks face issues in the increase of revenue and therefore granted additional loans. As a result, a bank was unable to meet the needs of shareholders and form a negative relation between the indicators (Roman & Sargu, 2015). Bank managers are cautious with liquidity management; banks with higher liquidity ratios have fewer risks and low profits. The administration is, therefore, at a dilemma between liquidity and profitability (Uzhegova, 2015). (Bodla & Verma, 2006) state bank evaluation is determined by the liquidity or ability to meet collateral and cash responsibilities without experiencing huge loss.

Risk ratio is in inverse relationship to profitability for big size banks. The high value of ratio also results in high provisions and impaired loans and decreases assets and low coverage ability of credit losses (Terraza, 2015). The ratio of impaired loans proposed by (Zhu & Yang, 2016), (Haq et al., 2014) and (Cornett et al., 2010). (Sangmi & Nazir, 2010) prove that the status of the bank is determined by credit administration programs and the quality of loan portfolios. The loans with no performance are in default or are about to default and carry an element of doubt. The low value of impaired loans shows that the loan portfolio is good, and thus, banks try to keep loans at the lowest possible amount.

The ratio of loan loss provision is calculated based on the study of (Iannotta et al., 2013) and highlight the assets of the bank. return on assets has an inverse correlation with asset quality and suggests that a diversified bank with excellent performance restricts loan loss provision. Loan loss provision has an important and moderate effect on return on equity as interaction is harmful to the profitable running of business and safety net from solvency risk (Zheng, Changjun et al., 2019). As banks increase loans than profitability decrease as the lending ability of bank is poor and suggest an increase in loan loss provision (Louzis et al., 2012). The cyclical pattern of credit loss leads to dynamic provisioning, also called statistical or generic provisioning.

The method is that a bank builds up loan loss provision, and a lousy economy deteriorates the value of loan range. (Albertazzi & Gambacorta, 2009) also state that the pro-cyclical quality of incomes is generated from the impact of the financial cycle applied on loan loss provision through credit portfolio quality. The ratio is due to doubt on asset quality and doesn't incur revenue. Force a bank to issue an essential magnitude of total margin for provisioning to shield the forecasted credit failure, and profitability will decrease. The low amount of poor quality of assets in a bank over a long period is favorable for performance.

The logic behind the profitability is that the customers in doubt are unable to pay the debt, and thus, loan loss provision leads to high profits. The current economic issues decrease industry business volume and influence the loan settlement capacity of the borrower. Here, the central bank comes in as the last recourse provider that is fully aware of the default risk of any bank. The empirical results set up the association between return on assets and the gross domestic product is inverse (Safrali & Gumus, 2010) due to less amount of investment products in the economy. The research incorporated macro-economic variable gross domestic product that is the primary source of economic activity. To know whether the ownership structure influences the correlation between determinants of bank profitability (Ongore & Kusa, 2013).

Size, inflation, and gross domestic product significantly define the fiscal profits of the bank (Acaravci & Çalim, 2013), (Curak et al., 2012), and (Hassan & Bashir, 2003). The justification is during good economic situations, companies and investors have enough funds internally and borrow less from the banks. Eventually, banks are unable to exercise lending as favorable terms and circumstances. Inflation has a direct effect as the exposure to risk is high (Berglund & Mäkinen, 2019), (Alexiou & Sofoklis, 2009), (Athanasoglou et al., 2008), (García-Herrero et al., 2009), (Kasman et al., 2010), (Pasiouras & Kosmidou, 2007), (Aburime, 2008), (Vejzagic & Zarafat, 2014), (Claessens et al., 2001), (Molyneux & Thornton, 1992) and (Kosmidou, 2008).

Inflation impact on the behavior of the bank. Hence, when high inflation is forecasted, the bank has intentions to raise the price without facing the decline in demand for the output and result in an

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increase in saving and investment in the financial market (Benford & Driver, 2008). The relation was first studied by (Revell, 1979) and gave the problem statement for the outcome of the rise of price on the performance of bank employee salaries and operation costs to fulfill the anticipation. Bank management capable enough to forecast the inflation and adjust the interest rate for the increment of revenue more than cost has a direct effect on profits.

As inflation rate increase, the demand for money rises to overcome expenses which lead bank to raise the interest rate and revenue. Due to inflation, the number of depositors decreases as money rises to engage in high return activities bank has the power to increase rate and productivity (Tan & Floros, 2013).

Research Methodology

The heterogeneity is the main issue of panel data. That means each bank in the study is different, and the relation among the banks may wary (Wang, 2015). For banks, at the different development stages, different banking techniques, the correlation between capitalization and profitability will be different due to changes in quality. Therefore, to examine the relationship, full consideration is paid to the problem of heterogeneity of different banks instead of reaching the standardized results. A lot of studies instruct to use models that have space to change with the possible regime (Pesaran & Timmermann, 1995). The study calculated the effectiveness of a bank with the return on assets and return on equity within a PTR model.

We focus on commercial banks' reasons previously explained (i) with different methodologies (ii) the dataset is after the recent financial crises (iii) extensive collection of predictor variables.

The study is based on statistical measurement techniques POLS. FE, and PTR as an empirical methodology.

Panel Ordinary Least Square

POLS also are known as linear regression. is used as the baseline model for all three studies. The formula of POLS is:

$$\mathbf{y_n} = \sum_{\mathbf{i=0}}^{\mathbf{k}} \boldsymbol{\beta}_\mathbf{i}\, \mathbf{x_{ni}} + \boldsymbol{\varepsilon}_\mathbf{n} \qquad (0.1)$$

Here the ‘x’ is an explanatory variable and ‘y’ is a dependent variable. The POLS model writes that for ‘y’ value for sample ‘n’ is the sum of its values on ‘x’ multiplied by the radical coefficients and error term. The way the coefficient is found by minimizing errors. For simple regression, the errors of prediction are the difference between real value and predicted value. For multiple linear regression, the explanatory variables are more than one. Then the regression plane has minimum error or prediction. POLS has some limitations. First, the redundant information in the explanatory variables can cause misinterpretation of the model and the coefficients. Thus, it is important to have more observations than explanatory variables. Second, there is a possibility of collinearity between the explanatory variables. Therefor for the robustness of the study, more test techniques are used (Stone & Brooks, 1990).

Fixed Effect

In panel data, each observation is indexed by unit ‘i’ that represents an individual in period’t’. the dependent variable ‘y’ is dependent on a variety of independent variables and error terms. FE model removes time-variant individuals and replace them with ‘αi’ that shows the unique value in an individual unit in the panel and is called FE or individual effect. The effect of the unit that is not carried over time. FE includes the effect of time-variant characteristics that is difficult or impossible to measure. The panel data also adds the term ‘δt’ is a time-specific intercept. To capture differences independent variable when varied across periods but not across individual units.

$$Y_{it} = \beta_1 + \beta_2 X_{2it} + \cdots + \alpha_i + \delta_t + \mu_{it} \qquad (3.2)$$

There are three methods of FE models. First, within-group FEs. Here, the dependent and independent value is demeaned within each unit before the model estimation. Second, dummy variable regression is a collection of dummy variables for each unit or individual and one category is

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excluded. Here *'αi'* means each individual or unit in the sample has different intercepts by adding a dummy variable to the model. Third, the final method is the first difference. The difference is calculated as subtracting from each variable the value one period earlier during the estimation model (Moon & Weidner, 2017).

(3.3)

Panel Threshold Regression

The study uses a panel regime-switching model like panel thresholds regression (Hansen, 1999). The panel dataset is efficient to gain from econometric estimation as the sample is significant and provides a better policy to understand profitability at aggregate.

The threshold model presented by (Hansen, 1999) gave the bounding basic breaks and character bound in a link among the variables. (Hansen, 1999) proposed the estimation technique of least square for threshold regression. (Wang, 2015) later complemented panel threshold repression. The structural equation for single thresholds is:

$$y_{it}=\mu+X_{it}I_{(q_{it}<\gamma)}\beta_1+X_{it}I_{(q_{it}\geq\gamma)}\beta_2+ u+\varepsilon_{it} \quad (3.1)$$

Here y_{it} is a dependent variable and q_{it} is size defined as the threshold variable, and I (.) is the indication function. Another equation is

$$y_{it}=\begin{cases} \mu + X_{it}I\beta_1 + u_i + e_{it}, q_{it} < y, \\ \mu + X_{it}I\beta_2 + u_i + e_{it}, q_{it} \geq y. \end{cases} \quad (3.2)$$

The observation is separated into two regimes, with β_1 and β_2 constants with the dependence on the threshold variable that is q_{it}. A notation for size is small or big as compared to the threshold value of γ. Given γ, the estimator of POLS of β is:

$$\beta=\{X^*(\gamma)'X^*(\gamma)\}^{-1}\{X^*(\gamma)'y^*\} \quad (3.3)$$

Here y^* and X^* are within-group deviation. RSS defined as the residual sum of the square is equivalent to $e*'e*$. γ's estimation is used to minimize RSS, as:

$$\gamma = \text{argmin}_\gamma S_1(\gamma) \quad (3.4)$$

Equation (3.4) defines the estimated scheme search for any single threshold.

Two tests are conducted to know the stability of the threshold. First, to know the $\gamma=\gamma_0$. (Hansen, 1999) proved the favorable approach for the formation of confidence interval with the use of "no-rejection region" method with (LR) likelihood statistics, as below:

$$LR_1(\gamma)=\frac{\{LR_1(\gamma)-(\bar{y})\}}{\sigma^2} \quad (3.5)$$

The second test is conducted to evaluate the similarity of each regime coefficient. The construction of F statistics is as follow:

$$F_1=\frac{(S_0-S_1)}{\sigma^2} \quad (3.6)$$

Here, S_0 is the linear model RSS, and S_1 is the PTR model RSS. (Hansen, 1999) proposed the normal test technique and bootstrap method to know the threshold effect of size on profitability.

$$\text{Profitability}=\beta_0 + \beta_1(\text{internal factors})_{it}+\beta_2(\text{external factors})_{it}+\varepsilon_{it} \quad (3.7)$$

The suitable approach of analytical regression for ROA with regime-switching arrangements is tested for the null hypothesis of linearity is framed as H0: 1 = 2 beside the other that they are diverse. The econometric model is structured as:

$$\text{Return on asset}_{it}=\alpha_0+\alpha_1(\text{Capitalization}_{it})(\text{thr} < \lambda_1)+\alpha_2(\text{Capitalization}_{it})(\lambda_1\leqslant\text{thr}<\lambda_2)+\alpha_3(\text{Capitalization}_{it})(\text{thr}\geqslant \lambda_2)+\alpha_4(\text{Impaired loans}_{it})+\alpha_5(\text{Management efficiency}_{it})+\alpha_6(\text{Diversificaton}_{it})+\alpha_7(\text{Loan loss provision}_{it})+\alpha_8(\text{Liquidity}_{it})+\alpha_9(\text{Gross domestic product}_{it})+\alpha_{10}(\text{Inflation}_{it})+\mu_{it}+\varepsilon_{it} \quad (3.8)$$

$$\text{Return on equity}_{it}=\alpha_0+\alpha_1(\text{Capitalization}_{it})(\text{thr} < \lambda_1)+\alpha_2(\text{Capitalization}_{it})(\lambda_1\leqslant\text{thr}<\lambda_2)+\alpha_3(\text{Capitalization}_{it})(\text{thr}\geqslant \lambda_2)+\alpha_4(\text{Impaired}$$

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$loans_{it})+\alpha_5(Management\ efficiency_{it})+\alpha_6(Diversificaton_{it})+\alpha_7(Loan\ loss\ provision_{it})+\alpha_8(Liquidity_{it})+\alpha_9(Gross\ domestic\ product_{it})+\alpha_{10}(Inflation_{it})+\mu_{it}+\varepsilon_{it}$ (3.9)

Here the Return on asset is the dependent variable for equation (3.2) and return on equity for equation (3.3). The control variables are impaired loans, management efficiency, diversificaton, loan loss provision, liquidity, gross domestic product, and inflation. The study about the role of size and capitalization structure in profitability with bank-specific and macro-economic variables. The banks panel dataset from the year January 2011 to December 2018 annually of 187 commercial banks in China. The time-frame is after the GFC set from July 2007 to March 2009 (Dungey & Gajurel, 2015). The Bureau Van Dijk's (BVD) BankFocus portal (*Bureau Van Dijk's*, 2019), which is a large portal for the data collection on banks and an appropriate representation of the banking sector for consideration of study on China.

Further, gross domestic product and inflation data from the WDI database (*World Bank Open Data*, 2019).

Table 1 Variable Description

Variables	Description
Dependent Variables	
Profitability/ Return on asset)	Data gathered from BVD BankFocus, a broad portal for return on assets ratio for banks.
Profitability/Return on equity)	Data gathered from BVD BankFocus, a broad portal for return on equity ratio for banks.
Threshold variable	
Size	Data gathered from BVD BankFocus, a broad portal for the logarithm of total assets of a bank and authors' calculation.
Regime variable	
Capitalization	Data gathered from BVD BankFocus, a broad portal for equity to total assets ratio of a bank and authors' calculation.
Control/ Other variables	
Impaired loans	Data gathered from BVD BankFocus, a broad portal for impaired loans to gross loans ratio of a bank and authors' calculation.
Management efficiency	Data gathered from BVD BankFocus, a broad portal for earning assets to total assets ratio and authors' calculation.
Diversification	Data gathered from BVD BankFocus, a broad portal for 1- (net interest income-other income/ total income) ratio, and authors' calculation.
Loan loss provision	Data gathered from BVD BankFocus, a broad portal for loan loss provision to total assets ratio and authors' calculation.
Liquidity	Data gathered from BVD BankFocus, a broad portal for customer loan /customer deposit ratio and authors' calculation.
Macro-economic variable	
Gross domestic product	Data gathered from WB's WDI, a broad portal growth in GDP as a quantity of the yearly development of gross domestic products in real value.
Inflation	Data gathered from WB's WDI, a broad portal for a yearly proportion of a user value index, alteration in rate concerning regular customers that obtain things or facilities at fixed or

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	varying prices with time
Note: All the variables are in USD 100 annual or individual banks, except gross domestic product and inflation, which is reported in annual data for China.	

Results

The description of 187 commercial banks over a time of 8 years (1496 observations) are presented below for a better understanding of the sample. After the financial crises and demanding financial; conditions, there has been a change in regime in capitalization and requires an appropriate model by regime-switching approach.

Table 1 Descriptive Statistics (n=1496)

Variable	Mean	Std. Dev.	Min	Max
Return on asset	2.218	1.509	0.734	10.875
Return on equity	15.341	7.154	5.406	52.969
Impaired loans	1.195	0.827	0.000	4.245
Management efficiency	0.842	0.046	0.706	0.968
Diversificaton	-1.046	2.934	-22.258	8.373
Loan loss provision	4.852	0.854	0.000	7.111
Liquidity	64.050	14.019	26.530	127.850
Capitalization	124.673	53.083	4.492	395.571
Size	7.299	0.701	5.455	9.476
Gross doestic product	6.963	0.873	6.120	9.010
Inflation	2.476	1.228	1.440	5.550

Figure 1 and Figure 2 show a two-way scatter-plot graph which represents the trend of capitalization in 187 commercial banks of China from 2011 to 2018. According to Figure 1, the capitalization rate is at the peak value of 395.5704, when the size of the bank is between 6 and 7. These figures are enough to prove the accumulation of capitalization in years after the financial crisis has been surprisingly increasing the profits of the bank measured as return on asset. Similarly, the size of a commercial bank has improved to 1,371,44 USD of total assets. The downward moving line fit proves that as the total assets of the bank increased from a threshold value of 6.2165, the magnitude of capitalization advantage enjoyed by a bank has decreased.

Graph of trends demonstrated below:

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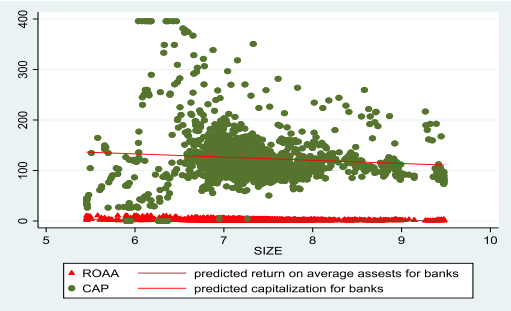

Fig 1 The capitalization, size, and return on asset ratio of 187 banks.

Figure 5.2 represents the robustness of performance measures as return on asset. Here, the bank is profitable, but the impact of bank capitalization has decreased in magnitude as the total assets of a bank increase more than 1,371,44 USD 1000. Graph of Trends demonstrated below:

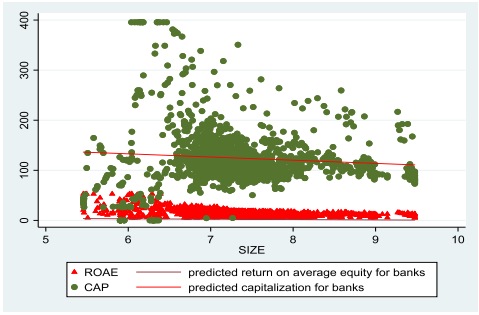

Fig 2 The capitalization, size, and return on equity ratio of 187 banks.

To define the regime-switching model, the null bootstrap test for PTR (an F1 test) is performed to lower the nuisance limitation problem (Hansen, 1999). The null hypothesis is not rejected for the PTR model of two regimes at any level of significance.

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Table 2 Results of return on asset Model

	POLS(1) return on asset	**FE(2)** return on asset	**PTR(3)** return on asset
Impaired loans	0.0918**	0.429***	0.158***
	(3.16)	(6.53)	(4.50)
Management efficiency	1.054	-3.046***	-4.853***
	(1.90)	(-3.58)	(-6.01)
Diversificaton	-0.00819	-0.0167*	-0.0339***
	(-1.05)	(-1.97)	(-3.94)
Loan loss provision	-0.192***	-0.106	-0.275**
	(-3.35)	(-1.13)	(-3.29)
Liquidity	-0.000929	-0.00937***	-0.00816**
	(-0.55)	(-3.51)	(-3.05)
Gross doestic product	-4.263***	-4.429***	-4.474***
	(-41.85)	(-44.72)	(-46.97)
Inflation	2.496***	2.569***	2.593***
	(35.11)	(39.04)	(40.28)
Size	-0.636***	-32.38***	
	(-9.23)	(-5.21)	
Capitalization	0.00161***	-0.959***	
	(3.64)	(-3.92)	
0. Capitalization			0.0314***
			(8.16)
1. Capitalization			0.00655***
			(7.39)
Con	30.15***	37.18***	31.68***
	(35.21)	(19.96)	(29.07)
N	1460	1480	1496
F statistics	331.36	336.26	354.23
R-squared	0.67	0.702	0.710
LR test			(6.1795, 6.266)***

Dependent Variable: return on asset, *p < 0.05, ** p < 0.01, *** p < 0.001

PTR determines a single threshold level of total assets for the conclusion of capitalization on return on asset of Chinese commercial banks, as depicted in Table 3. The value of the threshold amounts to approximately 1,371,44 thousand USD. Below this level, market capitalization has an evidential positive outcome on banks' profits. However, the magnitude of the positive result of

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capitalization declines from 0.0314 to 0.0065 for banks who are excessively larger after crossing the threshold level. These findings indicate that larger banks' profitability is comparatively not much affected by variations in capitalization in China.

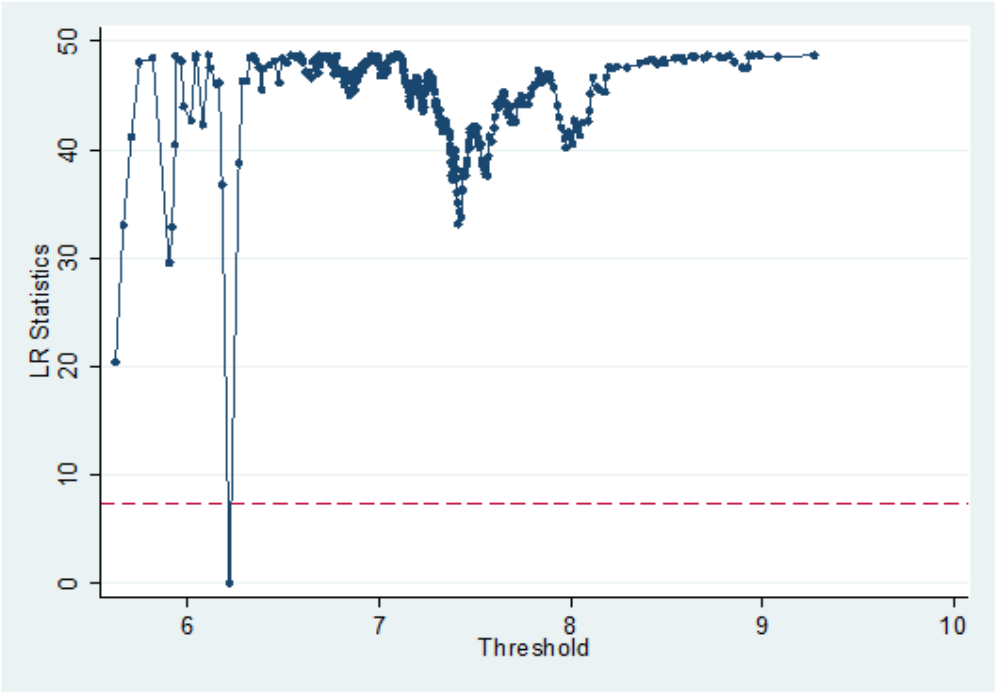

Fig 3 Estimation threshold LR test results for commercial banks.

Notes: The threshold variable is the logarithm of total assets as a standard to compare different banks. Figure 3 also exhibits the presence of a single threshold as the LR statistic is significant for the computed value of the threshold.

Table 3 Results of return on equity Model

	POLS(1) return on equity	**FE(2)** return on equity	**PTR(3)** return on equity
Impaired loans	1.545***	3.718***	2.776***
	(8.06)	(8.59)	(11.90)
Management efficiency	5.499	-20.30***	-22.06***
	(1.50)	(-3.62)	(-4.12)
Diversificaton	-0.121*	-0.229***	-0.310***
	(-2.36)	(-4.09)	(-5.43)
Loan loss provision	-2.324***	-3.583***	-3.222***
	(-6.16)	(-5.81)	(-5.81)
Liquidity	-0.0300**	-0.0893***	-0.0848***
	(-2.66)	(-5.08)	(-4.79)
Gross doestic product	-4.574***	-5.107***	-5.774***
	(-6.80)	(-7.83)	(-9.14)
Inflation	4.520***	4.739***	5.100***
	(9.62)	(10.94)	(11.95)
Size	-2.091***	1.575	
	(-4.59)	(0.98)	
Capitalization	0.00498	-91.32*	
	(1.70)	(-2.23)	

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0. Capitalization			0.219*** (8.57)
1. Capitalization			0.0156** (2.65)
Cons	57.24*** (10.12)	64.05*** (5.22)	75.58*** (10.46)
N	1496	1480	1496
F statistics	90.43	68.66	76.02
R-squared	0.3539	0.325	0.345
LR test			(6.180, 6.266)***

Dependent Variable: return on equity, *p < 0.05, ** p < 0.01, *** p < 0.001

PTR determines a single threshold level of total assets for a consequence of capitalization on profits of Chinese commercial banks. The threshold value amounts to approximately 1,371,44 thousand USD. Below this level, market capitalization has a significant positive outcome on bank profitability. Though, the magnitude of the positive result of capitalization declines from 0.219 to 0.0156 for banks who are excessively larger after crossing the threshold level. These findings indicate that larger bank profitability is comparatively not much effected by variations in capitalization in China. Figure 5.4 also exhibits the presence of a single threshold as the LR statistic is significant for the computed value of the threshold.

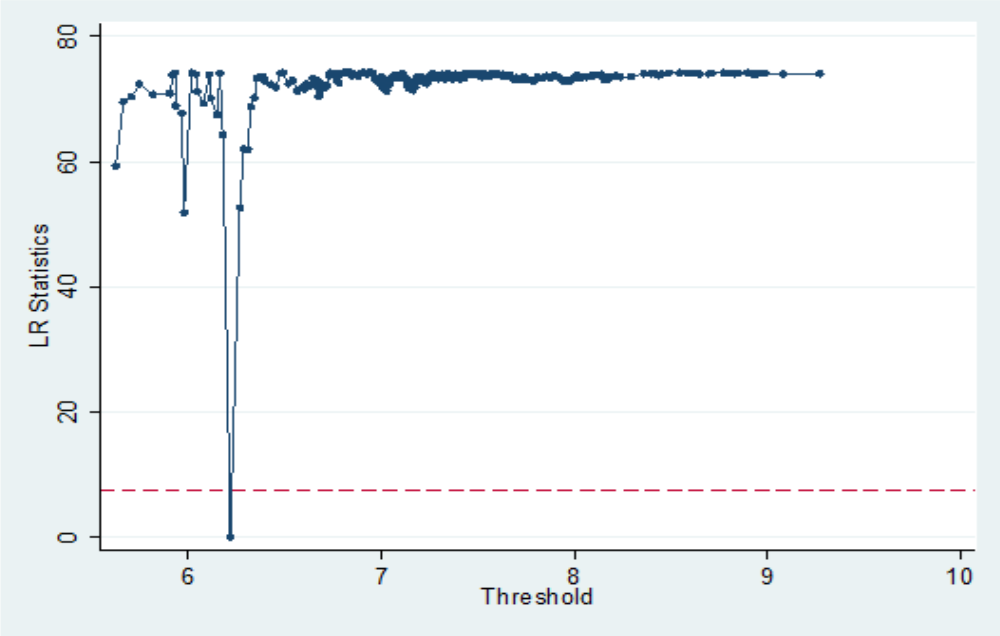

Fig 4 Estimation threshold LR test results for commercial banks.

Discussion and Policy Implications

The above reasoning proves that return on assets and return on equity contains an extensive profitability element from variables that differed for individual banks. However, there was a threshold effect with capitalization, and the lower and upper threshold is 6.1795 to 6.2662, respectively. As size was smaller than 6.1795, the influence of capitalization on profitability was high, when the size exceeded 6.1795 and was lower than 6.2662, the effect of capitalization on return on assets and return on equity increased. As the size increased more than 6.2165, the influence of capitalization decreased. Thus, more attention should be paid to the relation between capitalization

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and return on assets and return on equity if the size is between lower values of threshold estimator that is 6.1795 to the upper value of the threshold estimator that is about 6.266.

R-square value favor PTR for Tables 3 and 4. A large number of observations explain the large level of R-square value due to panel data and the relevance of predictive regressors. The level of capitalization increases bank profitability; however, large banks are less capitalized and vice versa. The result shows that the increase in total assets equal to and higher than the threshold level banks doesn't necessarily lead to a higher magnitude of profitability concerning capitalization. In impaired loans yields positively significant coefficients for the POLS regression model (1), FE in the model (2), the regime of PTR in the model (3).

So far, the variable impaired loans has a positive influence on return on assets and return on equity for the possible explanations entered on the fact of the high number of impaired loans shows the low quality of assets. With the group of bank-specific variables, management efficiency exhibits a positive coefficient in the model (1) and the expected negative coefficient with a significant change in the model (2) and (3) or table 3 and 4. The high bank profitability causes an increase in employees and less management efficiency, thus less profitability (García-Herrero et al., 2009). Diversificaton is inversely correlated to return on assets and return on equity (Stiroh & Rumble, 2006).

Bank activities with no interest cause harm to diversified banks, as of volatile nature and fewer profits from lending. Loan loss provision and liquidity are inversely proportional to return on assets and return on equity (Zheng, Changjun et al., 2019). According to (Dang, 2011), banks maintain statutory liquidity requirement as customer DEPO is cheap methods to fund as the margin is high between DEPO and rate of lending which a bank use to create income. The total asset of a bank is the threshold variable in model 3 thus doesn't appear in the respective column, as for the model (1) and (2), the negative correlation is reported as the size of the bank increase phenomenon of dis-economies of scales is witnessed and becomes difficult for management to carry out surveillance.

A high level of bureaucracy results in an inverse influence on the productivity of the commercial bank. Total assets of a commercial bank are inversely correlated to return on assets and return on equity; the operating cost impact negatively on financial profitability as economies of scale are not appropriately monitored (Smirlock, 1985). Gross doestic product has a negative impact on a model (1) to (3) on return on assets and return on equity. As gross doestic product grows demand for credit decreases and has an inverse influence on the steadiness of the bank (Flamini et al., 2009) and (Safrali & Gumus, 2010). Inflation is positively linked to return on assets and return on equity (Berglund & Mäkinen, 2019) in all three models of Tables 3 and 4. The positive impact of the macro-economic variable is explained that investors need a high future return during the tightening of monetary policy.

Conclusion and Recommendations

The study researches the effect of many bank methods in consideration of capital, bank risk-taking behavior, and performance. Bank governance is important to help to know the important weaknesses of the banking system. Precious decisions made by the bank management to control credit risk resulted in liquidity constrains. This situation place dent in profitability and on the stability of the banking sector globally. The prospect theory suggests that biases, in the form of misjudgment and miscalculation of loss and profit, possibly increased the risk-taking behavior in commercial banks for country understudy.

With slow progress but with novel methods to risk administration and competence objectives will create an improved and comprehensive commercial banking sector globally. The contribution of the study is to provide information on the organized effect of bank sector profitability on credit risk. The study can give bank management an idea of banking development in the proper utilization of returns of commercial banks.

An increase in bank size to achieve economies of scale is a seeming problem that has

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captured the attention of managers and policy-maker. Moreover, capitalization of the bank is maintained in a percentage if the bank is big or small The effect concluded that the association amid capitalization and profitability was positively related to size. Nevertheless, the relationship is different in commercial banks of different sizes. An alternative proxy of profitability as an return on equity confirmed the study. The outcomes are robust to the bias improvement due to the perseverance of the predictors and to independent variables.

The threshold effect is seen with capitalization, with a total asset value amount of 1,371,44 thousand USD. At this level, capitalization has an impact on return on assets, but as the total asset of a bank grows from 1,371,44 USD 1000, the impact of capitalization starts to decrease. Similarly, in a robust situation, the capitalization impact on return on equity decreased with the same quantity size of a bank. The process of capitalization will be profitable for a bank but with a decreasing magnitude. The results recommend that policy-makers give extra consideration to other control variables in banks concerning size since profitability due to capitalization is not just size-dependent.

To sum up, there are some policy recommendations for the manager. In course of increasing the size by the development of more branches, or spread of business in different regions with diversification and acquisitions, a bank should concentrate on profitability initiated by capitalization as equity to total assets ratio will ultimately cause better performance and higher profits. Diversification strategy by China is in parallel to portfolio theory that states that the risk of a firm is decreased by the diversified portfolio that provides a less volatile income, economies of scale, and scope of banks bring performance efficiency of the bank.

Liquidity is not an issue for the country and promotes bank performance. The Chinese bank performs better with better gross domestic product, but at an optimal point later, the relation becomes inversely related to dis-economies of scale. If gross domestic product decreases, the credit taking is less in demand and hurts banks whose basic earning is with interest rates on credits. To conclude, banks make meaningful and strengthen board members, improvement of timing, accuracy, and scope of reporting in the bank and pay attention to the interests of minor shareholders. Balanced judicial schemes and efficient regulations in all make sure the foundation of excellent bank governance and risk management, which leads to better financial performance.

Very interesting area of future research can be at the supervisory side with an observation of present funding structures of commercial banks in the country or set of countries and devise guidelines pointing limitations of international business. The study is an effort to further develop the literature on bank risk-taking behavior and profitability by the addition of emerging, underdeveloped, and an economic bloc country in empirical research.

For a developing country China, the capitalization held in a bank is beneficial as a certain level of total assets. As the assets increase more than 1,371,44 USD 1000 than there are other bank-specific variables like impaired loans that need consideration following capitalization.

The overall conclusion of the study is that despite heavy bank regulations after GFC banks are still concerned to earn profits in the framework of risk-taking behaviors for economic and global financial situations. Commercial banks need improved bank supervision, government performance, and bank risk-taking decision to earn profits. Someway, the commercial banks need to improve profitability to lower down the credit risk and maintain bank risk-taking behavior.

The banks depend on the relationship of higher the risk higher the profit. the study gives important implications to bank governance and gives bases for future analysis. The performance of the bank sector according to governance feature of bank risk-taking and profitability.

Practically, Basel is based on a one-size-fits-all approach. Bank governance plays a part in kinds of risk, based on the factor of profitability. The banks in developed and developing economies should formulate different risk characteristics based on performance, capitalization, and size while the implementation of regulations.

For innovation, the study provides innovative aspects: the non-linear relationship is tested by

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a panel thresholds model, and the connection concerning capitalization, size, bank risk-taking behavior, and profitability is measured. The nonlinear relationship is checked to see if the correlation between capitalization and profitability reverse from positive to negative and vice versa with Panel Threshold Regression estimation for regime utilization.

Most of the previous literature in the field of bank risk-taking and profitability neglected uncertainty during the studies on the wellbeing of a commercial bank. The data is collected for commercial banks operating in developing, emerging, and developed economies. Therefore, the current study utilizes an accurate framework that is used to make empirical measurements and conclusions based on the tested dataset. With the importance of profitability and bank risk-taking, the concern is about future studies during adverse situations like pandemics, wars, etc. for academic investigation. Particularly for developing regions, a need is felt for a well-defined and broad banking model to enhance and retain the sustainability of a bank.

Hence, the study is an attempt to formulate well-defined strategies with a combination of profitability and bank risk-taking behavior. The present study is an initial attempt to address bank governance with the aspect of profitability and bank risk-taking interchangeably. This study has some limitations, like, as the study is based on the financial crises of 2007. Thus, the number of years is limited. China still, to some extent, believes in closed-door policy, so it is difficult to analyses the dynamic impact of capitalization and profitability in commercial banks.

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