

## Article

# Determinants Affecting Profitability of State-Owned Commercial Banks: Case Study of China

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**Abstract:** The study examines the relationship between internal determinants, external determinants and the profitability of state-owned commercial banks. We use pooled regression, fixed effect, and random effect models on the case of the top five Chinese state-owned commercial banks from 2007 to 2019. The results show that internal factors, measured by size, credit quality, and liquidity, significantly positively influence banks' profitability. State-owned banks that have larger sizes, higher credit quality, and higher liquidity have accordingly higher profitability than other banks. On the contrary, the external factor, measured by the natural logarithm of GDP, negatively influences banks' profitability. The decrease in GDP leads to higher profitability of state-owned commercial banks in China. Our results provide insight into the profitability of state-owned commercial banks, considering the latest changes in the Chinese banking industry.

**Keywords:** Chinese state-owned commercial banks; profitability; credit quality; liquidity



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## 1. Introduction

According to The Banker ranking Top 25 World Banks 2020, Chinese state-owned commercial banks are leading the global banking industry. The big four Chinese state-owned commercial banks (ICBC, CCB, ABC, and BOC) occupy the top four positions, with BoCom in 11th position. This means that Chinese banks play a significant role in the development of the global banking industry. Moreover, China's state-owned banks control the largest proportion of the world economy and represent the strongest financial capital. They have been actively responding to national policies, mainly focused on key areas of inclusive finance such as small and micro businesses, agriculture-related investment, poverty alleviation, increasing credit investment, and reducing financing costs. With policy support, China's largest state-owned banks have grown at a relatively high rate of loans for inclusive financial services in recent years. The above-mentioned makes Chinese state-owned commercial banks an interesting case for investigating the determinants affecting their profitability.

The main determinants can be classified into two groups: internal explanatory variables (or bank-specific) and external explanatory variables (macroeconomic). Most scholars who conducted research on commercial banks as a whole, such as (Qu 2007; Zhang 2009; Lu et al. 2013), studied from the perspectives of internal and external indicators and found that bank size, credit quality, liquidity and economic conditions of a country have significant impact on the profitability of banks. However, few scholars have conducted research on state-owned commercial banks, and only the "Big Four" (Bai 2010; Ye 2010) have been studied from the perspectives of internal and external indicators, with it being found that the liquidity and economic conditions of a country have significant impact on the profitability of banks.

In recent years, many changes have taken place in the Chinese banking industry, and these changes have had a profound impact on the development of Chinese banks. In the previous literature, almost all research was conducted on the "Big Four", and few

research has been conducted on the “Big Five”. However, the China Banking Regulatory Commission’s publishing of the “Notice of China Banking Regulatory Commission on Issuing the Guidance to Corporate Governance of State-owned Commercial Banks and the Relevant Supervision Thereof (2006 Revision)”<sup>1</sup> on 16 May 2006, which was issued to Bank of Communications in addition to the initial four largest state-owned banks, indicates that Bank of Communications has become the “fifth largest” state-owned commercial bank from the joint-stock bank. Since then, state-owned commercial banks have changed from the “Big Four” to “Big Five”; therefore, the research objects of this study are the five largest Chinese state-owned commercial banks. The five largest state-owned commercial banks are an important part of China’s banking system. They have a large number of employees, branches all over the country, large assets, and a large market share. They hold an absolute monopoly position in China’s banking industry, so the profitability of the five largest banks plays a pivotal role in the steady development of China’s economy. In addition, since China proposed to develop inclusive finance in 2013, the State Council of China has made a series of major arrangements to continuously promote the development of inclusive finance.

We examine the relationship between determinants and state-owned commercial banks’ profitability. Specifically, we use pooled regression, fixed effect, and random effect models on the case of the top five Chinese state-owned commercial banks from 2007 to 2019. The internal determinants are measured by bank size, credit quality and liquidity. The external determinants are characterized by economic conditions, measured by natural logarithm of GDP. We measure banks’ profitability by return on assets (ROA) and return on equity (ROE). The results show quite a significant positive influence of internal determinants and contrary negative influence of external determinants on state-owned commercial banks’ profitability.

Our paper contributes to the literature of profitability of state-owned commercial banks in China by being the first to investigate the relationship between determinants and banks’ profitability, focusing on the “Big Five” and considering the latest changes in the Chinese banking industry.

This study is organized into six sections as follows: Section 1 is the introduction. Section 2 displays previous studies and variable selection based on a literature review. Section 3 shows data and methodology. Section 4 describes the model results. Section 5 tests hypotheses based on model results and explains the relationship between variables. Section 6 is the conclusion, including the advantages and limitations of this research and future research directions.

## 2. Literature Review

### 2.1. International Empirical Research

The banking system accelerates the process of transferring funds from saving to investing units. This is why the efficient financial system should demonstrate improvements in profitability (Hoffmann 2011).

There is a lot of research (Staikouras and Wood 2004; Jumono and Mala 2019; Majid et al. 2014) that reveals the dependence of bank profitability not only on internal but also on external factors. Staikouras and Wood (2004) proved the influence of the macroeconomic environment on banks’ profitability, based on the dataset of European banks from 1994 to 1998. Jumono and Mala (2019) drew similar conclusions from the example of the Indonesian banking industry from 2001 to 2014. The researchers revealed that the profitability of banks can be affected by the behavior and performance of the bank, market structure, and the basic macroeconomic conditions. Similar to previous researchers, Alfadli and Rjoub (2020) found the connection between macroeconomic factors and the profitability of banks. According to the case of banks operating in Gulf Cooperation Council countries, the oil price remains one of the significant factors influencing banks’ profitability. Additionally, the influence of macroeconomic factors on banks’ profitability is proven for Islamic Banks (Esmaeil et al. 2020). The authors revealed the similarities in the influence of attitudinal factors on the profitability of conventional and Islamic banks.

Majid et al. (2014) and Rjoub et al. (2017) found the influence of not only internal but also external determinants on the bank's profitability. Bhatti and Hussain (2010), UI Mustafa et al. (2012) and Noman et al. (2015) came to the same conclusions; they analyzed and found the specific influencing factors on profitability of banks. Based on Pakistani commercial bank data from 1996 to 2004, Bhatti and Hussain (2010) used regression analysis to analyze the relationship between the Pakistani commercial bank market structure and performance through regression analysis, and found a positive relationship of concentration ratio with profitability. In addition, UI Mustafa et al. (2012) and Noman et al. (2015) both found that credit risk has a significant impact on the profitability of commercial banks. UI Mustafa et al. (2012) used annual panel data of fifteen banks during the period 2001 to 2009 to analyze the profitability of Pakistani banks. The survey revealed the association between the loan loss provision of the banks and their profitability. The well-managed bank aims to have lower loan loss provisions to translate it into higher profitability. Noman et al. (2015), based on observations from 18 private commercial banks in Bangladesh from 2003 to 2013, concluded that credit risk affects the profitability of the commercial banks negatively. Besides that, their analysis also found that the capital adequacy ratio has a negative and significant impact on bank profitability.

Acaravci and Calim (2013) highlighted that internal determinants have more influence on banks' profitability than external determinants in the case of Turkish banks during the period from 2003 to 2013. Contrary to other research, the ambiguous connection between different determinants and banks profitability was revealed by Gremi (2013). In the case of Albania, the researcher did not find a significant correlation between internal variables and bank profitability.

## 2.2. Empirical Studies from China

Although there is a lot of literature on the profitability of the Chinese banking industry, most is generally focused on commercial banks, ignoring state-owned banks. Most researchers analyze the Chinese banking industry generally, or separately focus on the major commercial banks. Zhang (2009), based on the data of 14 major commercial banks from 1999 to 2008, conducted an empirical analysis of Chinese state-owned commercial banks and joint-stock banks to analyze the impact of various factors on the profitability of commercial banks. The study found that the profitability of commercial banks is not only related to internal factors of the bank but also related to external factors. Similar results were obtained by Gu (2008) and Lu et al. (2013).

Qu (2007), Zhong (2013) and Fu (2020) found that only internal factors have a significant impact on bank profitability, while external factors have no significant impact. Qu (2007) found that capital adequacy ratio, liquidity and bank scale have a significant impact on bank profitability, while external factors have no significant impact. Zhong (2013) used the relevant data of 16 listed banks in China from 1999 to 2011 and came to the same conclusions. Fu (2020) selected the relevant data of 5 state-owned commercial banks and 13 joint-stock commercial banks in China from 2009 to 2018 and used regression analysis to analyze the profitability of banks. The analysis found that the non-performing loan rate will affect the profitability of commercial banks, and the GDP growth rate ratio is positively correlated with profitability but not significant. There are also some scholars who did not include external factors in the scope of the study. Gu (2020) used OLS regression to analyze the profitability of banks based on the data of 16 listed commercial banks in China in 2018. He found that internal factors such as asset risk level and capital adequacy ratio have an impact on bank profitability.

However, contrary to the above research, Qu (2007) and Chen (2016) proved that liquidity is not the decisive factor in attitudes to bank profitability. Qu (2007) found that the capital adequacy ratio, liquidity and inflation also have no significant impact on a bank's profitability. Chen (2016) also revealed that liquidity and revenue costs do not have a significant impact on bank profitability.

In a manner similar to the authors of this study, some researchers focus only on Chinese state-owned banks. Bai (2010), Bi (2014) and Li (2017) found that both internal and external factors have a significant impact on bank profitability. Bai (2010) selected data of four major state-owned commercial banks in China from 1999 to 2008 and used a multivariate regression model to analyze the profitability of the banks. They found that the internal factors that affect the profitability of banks are mainly three factors: risk, bank operations and business. In addition, external factors such as the condition of national economic development and market structure, as well as the size of banks, will all have an impact on profitability. Bi (2014) found that bank scale, bank asset quality and external environment all have a significant impact on bank profitability. Li (2017) selected relevant data of state-owned commercial banks in China from 2007 to 2016, using a panel data model to analyze the banks' profitability. The study found that most of the internal factors and external environment, except for the size of the bank, have a significant impact on the profitability of the bank.

Ye (2010) and Du (2015) researched and found that only internal factors have a significant impact on bank profitability, while external factors have no significant impact. Ye (2010) analyzed the banks' profitability based on the 2004–2008 data of Chinese state-owned commercial banks, using individual fixed effects analysis. The study found that most of the internal factors, except for the business condition, all have a significant impact on bank profitability, while the external environment has no significant impact on bank profitability. Du (2015) selected relevant data from five large state-owned commercial banks in China from 2005 to 2011, using a panel data model to analyze the banks' profitability. The study found that most of the internal factors except asset quality and liquidity all have a significant impact on bank profitability, while the external environment has no significant impact on bank profitability.

### 2.3. Selection of Variables and Hypotheses

The previous studies support that many different determinants may influence profitability of the banks. Based on a literature review, we extracted the variables which will be used to measure the profitability of Chinese large state-owned commercial banks and its explanatory variables. In this article we try to explain how banking profitability is influenced by internal factors (bank-specific variables) and external factors (macro-economic conditions).

- Dependent variables

Return on equity (ROE) and return on assets (ROA) are common tools for measuring the profitability of companies. ROA, the ratio of net income to total assets, reflects the efficiency of using companies' total assets. ROE, the ratio of net income to total equity, reflects the returns of company owners on their investments (Guru et al. 2002). ROA is more frequently used as the key ratio for evaluation of bank profitability in the literature than ROE. In research (Noman et al. 2015; Hou 2016) there are also other measures of the profitability. They are return on average assets (ROAA) or return on average equity (ROAE). In the framework of this research, ROE and ROA are chosen as the measurements of banks profitability.

ROE is a return indicator from a stockholder's perspective and is a proxy for the returns that the equity holders are receiving from bank operations. ROA is a return indicator from an enterprise perspective and is used more as an indicator of operational efficiency of a bank. The relationship between ROA and ROE can be expressed by  $ROE = ROA \times (\text{Asset/Equity})$ ; assets to equity ratio is a measurement of financial leverage. From this relationship it follows that the higher the financial leverage, the higher the ROE. However, the equity capital cannot be too low, because the level of bank capital funds is subjected to capital adequacy regulation of Basel III. According to the requirements of China's "Capital Management Regulation" in 2013, the requirements of capital adequacy ratio, tier 1 capital adequacy ratio and core capital adequacy ratio for banks are 11.5%, 9.5%, and 8.5%, respectively.<sup>2</sup>

- Internal explanatory variables

- (1) Bank size

The main business of commercial banks is to absorb deposits and issue loans, and obtain profits through the interest spread between deposits and loans; the greater the difference between the cost of deposits and income from loan, the higher its profitability. The previous studies use different variables for measuring the bank size, including: Loan to Asset Ratio, Net Loan to Total Asset Ratio, Deposit to Total Asset Ratio, and Natural logarithm of Asset.

Loan to Asset Ratio reflects the share of the total loans in total assets. Generally, high credit will generate high returns. However, the higher ratio indicates the more risky policy of a bank, as high loans may lead to more defaults. [Lu et al. \(2013\)](#), [Bi \(2014\)](#) and [Staikouras and Wood \(2004\)](#) found that Loan to Asset Ratio has a negative impact on banks' profitability. On the contrary, [Karimzadeh et al. \(2013\)](#), [Gremi \(2013\)](#), [Bhatti and Hussain \(2010\)](#) and [Jumono and Mala \(2019\)](#) found the positive association between Loan to Asset Ratio and banks' profitability. [Bai \(2010\)](#), [Zhong \(2013\)](#) and [Gu \(2008\)](#) proved that Loan to Asset Ratio is a non-significant determinant of banks' profitability.

Another variable is Net Loan to Total Asset Ratio. It is an indicator of bank size which reflects the share of net loans in total assets. [Qu \(2007\)](#) and [Gu \(2020\)](#) proved the positive association between Net Loan to Asset Ratio and banks' profitability. [Lu et al. \(2013\)](#) and [Zhang \(2009\)](#) found that Loan to Asset Ratio has a non-significant impact on banks' profitability.

Deposit to Total Asset Ratio reflects the share of the total assets funded by deposits, which also shows the trust of depositors in a specific bank. Deposits are one of banks' primary income sources. However, the higher ratio may create a liquidity problem for the banks if the depositors rush to withdraw their money on some occasions, such as in bad economic situations. [Qu \(2007\)](#), [Karimzadeh et al. \(2013\)](#), [Acaravci and Calim \(2013\)](#) and [Gremi \(2013\)](#) proved that Deposit to Asset Ratio has a positive impact on banks' profitability, while [Ul Mustafa et al. \(2012\)](#) found that Deposit to Asset Ratio has a negative impact on banks' profitability. [Lu et al. \(2013\)](#) revealed the non-significant impact of Deposit to Asset Ratio on banks' profitability.

Natural logarithm of Asset has been commonly used in previous research as a measure of a bank's size. Different research has revealed contrary results when analyzing the association between banks' size and their profitability. [Lu et al. \(2013\)](#), [Li \(2017\)](#), [Ye \(2010\)](#), [Gremi \(2013\)](#), [Ul Mustafa et al. \(2012\)](#) and [Staikouras and Wood \(2004\)](#) found the positive impact of the Natural logarithm of Asset on banks' profitability. However, [Qu \(2007\)](#), [Bi \(2014\)](#) and [Chen \(2016\)](#) found that the Natural logarithm of Asset has a negative impact on banks' profitability. [Bai \(2010\)](#), [Fu \(2020\)](#), [Gu \(2008, 2020\)](#), [Du \(2015\)](#) and [Zhang \(2009\)](#) found that the Natural logarithm of Asset has a non-significant impact on banks' profitability.

Net Loan to Asset Ratio and Deposit to Asset Ratio are used in this article to measure the bank size. According to the literature review, we suppose the following hypothesis:

**Hypothesis 1 (H1).** *Bank size has a positive impact on banks' profitability.*

- (2) Credit quality

Credit quality is another factor which can affect bank profitability. The high share of non-performing loans leads to bank bankruptcy. The International Monetary Fund considers non-performing loans as loans that are less than 90 days past and have high uncertainty surrounding future payments. Banks are required to account for potential loan defaults, which is known as loan loss provision, to ensure their overall financial health. The loan loss provisioning is an indicator of the bank's protection against future losses. Previous studies used different variables for measuring the loan quality of a bank, including: Non-Performing Loan to Total Asset Ratio, Loan Loss Provision to Total Asset

Ratio, Non-Performing Loan to Gross Loan Ratio and Loan Loss Provision to Gross Loan Ratio.

Non-Performing Loan to Total Asset Ratio is a measure to assess the credit quality of a bank. The possibility of non-performing loans becoming bad debts is relatively high, and this occurs when the debtor cannot pay the interest and principal of the loan that reduces the income and profit of a bank. [Lu et al. \(2013\)](#) and [Gremi \(2013\)](#) found that the Non-Performing Loan to Total Asset Ratio has a negative impact on banks' profitability.

Another variable is Non-Performing Loan to Gross Loan Ratio (NPL), which reflects the bank's effectiveness in receiving repayments on its loans. A high ratio means that the bank is at a greater risk of loss. [Fu \(2020\)](#), [Zhong \(2013\)](#), [Noman et al. \(2015\)](#) and [Jumono and Mala \(2019\)](#) revealed that Non-Performing Loan to Gross Loan Ratio has a negative impact on banks' profitability. [Qu \(2007\)](#) and [Chen \(2016\)](#) found that Non-Performing Loan to Gross Loan Ratio has a non-significant impact on banks' profitability.

Loan Loss Provision to Total Asset Ratio measures the credit quality of a bank since the provision is a cushion for non-performing loans, which meet the losses when repayment default occurs. Hence, the ratio is expected to have a negative association with profitability. However, researchers believe that loan loss provisions will cover non-performing loans, thereby ensuring banks' profitability. [Ye \(2010\)](#) found that Loan Loss Provision to Total Asset Ratio has a positive impact on banks' profitability, while [Ul Mustafa et al. \(2012\)](#) found that Loan Loss Provision to Total Asset Ratio has a negative impact on banks' profitability. [Qu \(2007\)](#), [Gu \(2020\)](#), [Du \(2015\)](#) and [Zhang \(2009\)](#) found that Loan Loss Provision to Total Asset Ratio has a non-significant impact on banks' profitability.

Loan Loss Provision to Gross Loan Ratio measures the credit quality of a bank using a different denominator compared to Loan Loss Provision to Total Asset Ratio. [Lu et al. \(2013\)](#) found that Loan Loss Provision to Gross Loan Ratio has a positive impact on banks' profitability, while [Noman et al. \(2015\)](#) and [Staikouras and Wood \(2004\)](#) found that Loan Loss Provision to Gross Loan Ratio has a negative impact on banks' profitability. [Bai \(2010\)](#) and [Gu \(2008\)](#) found that Loan Loss Provision to Gross Loan Ratio has a non-significant impact on banks' profitability.

Non-Performing Loan to Total Asset Ratio and Loan Loss Provision to Total Asset Ratio are used in this article to measure the credit quality of the bank. According to the literature review, we suppose the following hypothesis:

**Hypothesis 2 (H2).** *Credit quality has a positive impact on banks' profitability.*

### (3) Liquidity

Liquidity refers to the ability of the bank to immediately meet its maturing obligations and new loan demands. [Maness and Zietlow \(2005\)](#) highlight three components of liquidity—amount, time and cost. Amount reflects the quantity of resources that a company has to fulfil its obligations. Time reflects the period of time that a company needs to transfer its assets into cash. Cost reflects the additional costs which appear in the process of a company transferring its assets into cash. Liquidity plays a crucial role in the operational stability of a bank; banks with less liquid assets face difficulties when facing short-term liabilities. Previous studies used the Cash and Cash Equivalents to Total Asset Ratio and the Loan to Deposit Ratio for measuring liquidity of the banks.

Cash and Cash Equivalents to Total Asset Ratio reflects the efficiency of banks in using assets which can be easily transformed into cash to meet matured obligations without influencing credit business operations. It is understood that banks with higher cash and cash equivalent ratio have more liquidity. Appropriate liquidity is a guarantee for the stability of bank operations and the main measure to prevent bank runs, which occur when a large number of customers of a bank withdraw their deposits simultaneously over concerns regarding the bank's solvency. [Ye \(2010\)](#) and [Qu \(2007\)](#) found that Cash and Cash Equivalents to Total Asset Ratio has a positive impact on banks' profitability. [Qu \(2007\)](#) and [Acaravci and Calim \(2013\)](#) found that Cash and Cash Equivalents to Total Asset Ratio has a negative impact on banks' profitability. [Bai \(2010\)](#), [Zhong \(2013\)](#), [Du \(2015\)](#), [Zhang](#)

(2009), Gu (2008) and Chen (2016) found that Cash and Cash Equivalents to Total Asset Ratio has a non-significant impact on banks' profitability.

Loan to Deposit Ratio measures liquidity by comparing a bank's total loans to its total deposits. From the perspective of bank profitability, loans earn interest income, while deposits require interest costs. A low Loan to Deposit Ratio indicates high costs and low income—banks have poor profitability. However, a high ratio indicates a potential risk of loan default; in such a case the banks are liable to repay the deposit money to their customers. Moreover, the high ratio means that the bank may not have enough liquidity to cover its unforeseen fund requirements. Jumono and Mala (2019), Fu (2020) and Bhatti and Hussain (2010) found that Loan to Deposit Ratio has a negative impact on banks' profitability, estimated by ROA, and non-significant impact on ROE. Ye (2010) found that Loan to Deposit Ratio has a non-significant impact on banks' profitability.

Cash and Cash Equivalents to Total Asset Ratio is used in this article to measure the liquidity of the bank. According to the literature review, we suppose the following hypothesis:

**Hypothesis 3 (H3).** *Liquidity has a positive impact on banks' profitability.*

- External explanatory variables

(4) Economic conditions of a country

Economic conditions are the external factors that determine the performance of economic activity. The development of each industry is closely related to the level of a country's total economy, including the banking system; banks' profitability is highly related to economic development. A bank's profit mainly comes from the interest spread between loans and deposits. The economic situation of a country can directly affect the output of enterprises and loan demands, which corresponds to the growth rate and quality of bank loans. During an economic boom, the external economic environment becomes better, and the profitability of banks will increase accordingly. Conversely, when the national economy is in depression, all the deposits, loans and intermediate operations of banks will be affected and reduced, resulting in a decline in profitability.

GDP is the total monetary or market value of all the finished goods and services produced within a country's borders in a specific time, which measures the level of national economic development and comprehensively represents all external factors as macroeconomic conditions. Including it in the analysis can more accurately analyze the level of bank profitability. Bai (2010), Zhong (2013), Gu (2008) and Zhang (2009) found that GDP has a non-significant impact on banks' profitability.

Another frequently used variable is natural logarithm of GDP. Li (2017), Bi (2014), Du (2015) and Acaravci and Calim (2013) and Fadzlan (2009) found that natural log of GDP has a positive impact on banks' profitability. Ye (2010) found that natural log of GDP has a non-significant impact on banks' profitability.

GDP growth rate can also measure the economic conditions of a country. Lu et al. (2013) and Fu (2020) found that GDP growth rate has a positive impact on banks' profitability. Staikouras and Wood (2004) found that GDP growth rate has a negative impact on banks' profitability. Qu (2007) found that GDP growth rate has no significant impact on banks' profitability.

Since the GDP data are quite large while other data used in this article are ratios, which are relatively small, the natural logarithm of GDP is used to optimize the model. According to the literature review, we suppose the following hypothesis

**Hypothesis 4 (H4).** *Economic conditions of a country have a positive impact on banks' profitability.*

For a list of related references and variables, see Appendix A.

### 3. Data and Methodology

This study is based on panel dataset covering China's top five largest state-owned commercial banks, which are listed in Table 1. The variables used in the model are calculated by using the original data, which were collected from annual financial reports of five Chinese state-owned commercial banks in the time period 2007–2019. We have chosen state-owned commercial banks, since there is a lack of research that explores determinants of profitability of Chinese state-owned commercial banks. GDP comes from the official data set of the National Bureau of Statistics of China.

**Table 1.** Basic information of “Big Five” Chinese State-owned commercial banks.

Banks	Total Asset (2020, Million Yuan)	Total Equity (2020, Million Yuan)	Net Income (2020, Million Yuan)	The Banker Ranking 2020
Industrial and Commercial Bank of China (ICBC)	31,621,939	2,780,808	304,492	1st
China Construction Bank (CCB)	27,294,127	2,318,515	268,174	2nd
Agricultural Bank of China (ABC)	27,000,802	2,186,780	216,400	3rd
Bank of China (BOC)	21,363,483	1,838,794	177,200	4th
Bank of Communications (BoCom)	10,130,645	828,750	79,570	11th

The use of panel data is the most suitable tool when the sample is compounded by cross-sectional and time-series data. A multiple regression model has been built to analyze the panel data set and to identify the major determinants that affect profitability of the large Chinese state-owned banks. The contents of the model are as outlined in the following equations:

$$ROE_{it} = \beta_0 + \beta_1 \times NLTAR_{it} + \beta_2 \times NPLTAR_{it} + \beta_3 \times LLPTAR_{it} + \beta_4 \times CCETAR_{it} + \beta_5 \times DTAR_{it} + \beta_6 \times GDP_t + \mu_{it} \quad (1)$$

$$ROA_{it} = \alpha_0 + \alpha_1 \times NLTAR_{it} + \alpha_2 \times NPLTAR_{it} + \alpha_3 \times LLPTAR_{it} + \alpha_4 \times CCETAR_{it} + \alpha_5 \times DTAR_{it} + \alpha_6 \times GDP_t + \varepsilon_{it} \quad (2)$$

where:

*i* refers to an individual bank, and *t* refers to time.

$\alpha_0$  and  $\beta_0$  are constants,  $\alpha_1 - \alpha_6$  and  $\beta_1 - \beta_6$  are coefficients.  $\varepsilon_{it}$  and  $\mu_{it}$  are the error terms.

NLTAR<sub>it</sub> refers to Net Loan to Total Asset Ratio.

NPLTAR<sub>it</sub> refers to Non-Performing Loan to Total Asset Ratio.

LLPTAR<sub>it</sub> refers to Loan Loss Provision to Total Asset Ratio

CCETAR<sub>it</sub> refers to Cash and Cash Equivalents to Total Asset Ratio.

DTAR<sub>it</sub> refers to Deposit to Total Asset Ratio.

GDP<sub>t</sub> refers to Natural logarithm of GDP.

Three types of panel analytic models were used to estimate the coefficients: (1) pooled regression model, (2) fixed effect (FE) model, and (3) random effect (RE) model. The pooled regression model is based on an assumption that cross-sectional variation (between banks) in any of the independent variables has the same implications for profitability as variation over time in that variable for an individual bank. The fixed effect model considers the differences across cross-sectional units that can be captured in differences in the constant term and the intercept term of the regression model as they vary across the cross-sectional units; the intercept term represents the fixed bank effect in this paper. On the other hand, in the random effect model, the individual effects are randomly distributed across the



cross-sectional units and in order to capture the individual effects, the regression model is specified with an intercept term representing an overall constant term. The Hausman test can be used to test fixed or random affects, testing whether the unique errors are correlated with the regressors.

#### 4. Results

This section presents the descriptive statistics of the variables and the regression results to measure the impact of explanatory variables on profitability of Chinese “Big Five” state-owned commercial banks.

##### 4.1. Descriptive Statistics

Table 2 presents the summary statistics for the variables used in the model and displays the mean, standard deviation, minimum and maximum value of the variables. There are 5 banks and 65 observations. The results show that banks in the sample have an average return on assets of 1.06% and return on equity of 16.12% over the period 2007–2019. The standard deviation and the other statistics point out that there are quite small differences among banks in the sample. The variable with the largest standard deviation (2.7985) is the Non-Performing Loan to Total Asset Ratio, which is also captured by regression diagnostics as an unusual and influential piece of data with a maximum value equaling 23.57%, coming from the China Construction Bank in 2007. These unusual data have been excluded in empirical model to avoid incorrect regression results.

**Table 2.** Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
roe	65	0.16	0.03	0.09	0.22
roa	65	0.01	0.00	0.01	0.01
nltar	65	0.51	0.04	0.43	0.57
npltar	65	0.02	2.80	0.01	0.24
llptar	65	0.01	0.00	0.01	0.02
ccetar	65	0.05	0.02	0.02	0.12
dtar	65	0.76	0.07	0.56	1.00
gdp	65	17.83	0.40	17.11	18.41

The Materials and Methods should be described with sufficient detail to allow others to replicate and build on the published results. Please note that the publication of your manuscript implies that you must make all materials, data, computer code, and protocols associated with the publication available to readers. Please disclose at the submission stage any restrictions on the availability of materials or information. New methods and protocols should be described in detail while well-established methods can be briefly described and appropriately cited.

Table 3 presents the correlation between the independent variables and the explanatory variables. The matrix of correlation coefficients shows that Non-Performing Loan to Total Asset Ratio, Loan Loss Provision to Total Asset Ratio and GDP are negatively correlated with both ROE and ROA. Deposit to Total Asset Ratio is positively correlated with both ROE and ROA. Net Loan to Total Asset Ratio is positively correlated with ROA, Cash and Cash Equivalent to Total Asset Ratio are negatively correlated with ROA. However, the two explanatory variables have opposite correlations with ROE. Some high degree of correlation observed between ROE and Deposit to Total Asset Ratio equals 0.55, and ROE with GDP equals  $-0.60$ . There is a low correlation among explanatory variables, and the absolute value of correlation between explanatory variables are distributed in the area 0.01–0.47. Therefore, there is no strong correlation between

**Table 3.** Correlation matrix.

	roe	roa	nltar	npltar	llptar	ccetar	dtar	gdp
roe	1							
roa	-	1						
nltar	-0.37	0.1	1					
npltar	-0.07	-0.28	-0.1	1				
llptar	-0.16	-0.05	-0.14	-0.16	1			
ccetar	0.187	-0.02	-0.36	0.12	0.01	1		
dtar	0.55	0.27	-0.34	0.47	0.19	0.13	1	
gdp	-0.6	-0.01	0.47	-0.31	0.33	-0.25	-0.47	1

#### 4.2. Regression Results

In this study, we analyze panel data on five state-owned commercial banks over a 13-year period. Three types of econometrics models are used to estimate the coefficients: (1) pooled regression model, (2) fixed effect (FE) model, and (3) random effect (RE) model. We conducted analysis on influential observations and found that one observation for one year had excessive value of the NPLTAR, which caused severe bias of the estimates. We excluded this observation from the regression analysis. Next, the Hausman test was performed to determine which model is the most appropriate for making conclusions about relations between variables. The fixed effect (FE) model is preferred according to the Hausman test for models presented in Tables 4 and 5, which is consistent with econometrics theory. In addition, the profitability model might suffer from omitted variable bias due to unobservable factors such as quality of management; therefore, the FE model can be considered as more appropriate. The pooled regression model and the random effect model will also be presented for the purpose of comparison.

**Table 4.** Regression results for ROE.

	POOL		RE		FE	
	b (se)	Sig. Level	b (se)	Sig. Level	b (se)	Sig. Level
nltar	-0.21 (0.06)	***	-0.21 (0.06)	***	-0.10 (0.09)	
npltar	-0.03 (0.00)	****	-0.03 (0.00)	****	-3.27 (0.00)	****
llptar	-1.19 (0.73)		-1.19 (0.73)		-3.50 (0.98)	****
ccetar	0.06 (0.11)		0.06 (0.11)		0.32 (0.13)	**
dtar	0.25 (0.04)	****	0.25 (0.04)	****	0.13 (0.06)	*
gdp	-0.04 (0.01)	****	-0.04 (0.01)	****	-0.05 (0.01)	****
_cons	0.84 (0.13)	****	0.84 (0.13)	****	1.08 (0.18)	****
r2_a	0.8				0.81	
r2_w			0.81		0.84	
r2_o			0.82		0.63	
r2_b			0.9		0.02	
N	64		64		64	
N_g			5		5	

\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ ; \*\*\*\*  $p < 0.001$ .

**Table 5.** Regression results for ROA.

	POOL		RE		FE	
	b (se)	Sig. Level	b (se)	Sig. Level	b (se)	Sig. Level
nltar	0.00 (0.01)		0.00 (0.01)		0.00 (0.01)	
npltar	−0.00 (0.00)	****	−0.00 (0.00)	****	−0.17 (0.00)	****
llptar	−0.09 (0.06)		−0.09 (0.06)		−0.02 (0.07)	
ccetar	0.00 (0.01)		0.00 (0.01)		0.03 (0.01)	***
dtar	0.02 (0.00)	****	0.02 (0.00)	****	0.00 (0.00)	
gdp	−0.00 (0.00)		−0.00 (0.00)		−0.00 (0.00)	*
_cons	0.00 (0.01)		0.00 (0.01)		0.03 (0.01)	**
r2_a	0.52				0.51	
r2_w			0.46		0.58	
r2_o			0.56		0.33	
r2_b			0.96		0.07	
N	64		64		64	
N_g			5		5	

\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ ; \*\*\*\*  $p < 0.001$ .

The regression diagnoses are conducted to test consistency of the FE models with assumptions of regression modelling.

Results of the FE model, presented in Table 4, are generally consistent with these assumptions. Results of the modified Wald test for groupwise heteroskedasticity in fixed effect regression model show that residuals are homoscedastic. Pesaran’s test of cross-sectional independence shows that there is no cross-sectional autocorrelation in residuals. The Wooldridge test for autocorrelation in panel data shows that we cannot reject null hypothesis on first order autocorrelation in residuals at 0.01 significance level. The Shapiro–Wilk test for normal data shows that we cannot reject the null that residuals are normally distributed.

Table 4 presents the three types of regression results for ROE. The sample is comprised of 64 observations for 5 banks. The fixed effect (FE) model is preferred for ROE according to Hausman test result. The explanatory power of the fixed effect model, the R-squared, is at the satisfactory level of 0.63. The standard error of the regression is 0.32. Not all the coefficients are significant at the 5% level in the regression for ROE. Coefficients of Non-Performing Loan to Total Asset Ratio, Loan Loss Provision to Total Asset Ratio, Cash and Cash Equivalent to Total Asset Ratio and GDP are significant at the 5% level, which reflects the direction of change in profitability for a given change in those explanatory variables for any individual bank from year to year. Coefficient of Deposit to Total Asset Ratio is significant at the 10% level, and coefficient of Net Loan to Total Asset Ratio is not significant. The highest absolute value of coefficient comes from Loan Loss Provision to Total Asset Ratio (3.50); Non-Performing Loan to Total Asset Ratio has a significant negative coefficient (3.27); Cash and Cash Equivalent to Total Asset Ratio and Deposit to Total Asset Ratio have relatively high positive coefficients of 0.32 and 0.13, respectively; GDP has a significant negative coefficient (0.05).

Results of the FE model, presented in Table 5, are generally consistent with these assumptions. Results of the modified Wald test for groupwise heteroskedasticity in fixed effect regression model show that residuals are homoscedastic. Pesaran’s test of cross-sectional independence shows that there is no cross-sectional autocorrelation in residuals. The Wooldridge test for autocorrelation in panel data shows that we can reject the null

hypothesis on first order autocorrelation in residuals at 0.01 significance level. The Shapiro–Wilk test for normal data shows that we can reject the null that residuals are normally distributed. These results are consistent with the analysis presented below, since it is clear that most predictors are not significant, and they do not explain changes in ROA.

Table 5 presents the three types of regression results for ROA. The sample is comprised of 64 observations for 5 banks. The Hausman test result suggests the fixed effect (FE) model is preferred for ROA regression. The explanatory power of the model, the R-squared, is at the level of 0.3344. The standard error of the regression is 0.05. Not all the coefficients are significant at the 5% level in the regression for ROA. Coefficients of Non-Performing Loan to Total Asset Ratio and Cash and Cash Equivalent to Total Asset Ratio are significant at the 1% level, equaling 0.17 and 0.03, respectively. Coefficient of GDP is significant at the 10% level (0.00). Coefficients of Net loan to Total Asset Ratio, Loan Loss Provision to Total Asset Ratio and Deposit to Total Asset Ratio are not significant at the 10% level. The significant coefficients are quite low compared with coefficients from the regression for ROE.

To compare the size of the effects on dependent variables we transformed variables to the z-scores and built two regression models with fixed effects for ROE and ROA, respectively. Results are presented in Table 6. Results from this table show that one standard deviation change of Non-Performing Loan to Total Asset Ratio results in  $-0.64$  standard deviation change of ROE and  $-0.63$  standard deviation change of ROA. Change of Non-Performing Loan to Total Asset Ratio in terms of standard deviations shows the highest effect on dependent variables among all regressors, used in the models. Next, z-score of natural logarithm of GDP shows the second strongest impact on z-score of ROE. One standard deviation change in Loan Loss Provision to Total Asset Ratio leads to  $-0.35$  standard deviation change in ROE, which is the third biggest estimate by modulo. Deposit to Total Asset Ratio and Cash and Cash Equivalents to Total Asset Ratio demonstrate the fourth and fifth biggest impacts by modulo on ROE in terms of standard deviations, respectively.

**Table 6.** Regression results for fixed effects models for ROE and ROA with standardized variables.

	zROE		zROA	
	FE		FE	
	b (se)	Sig. Level	b (se)	Sig. Level
zNLTAR	−0.11 (0.11)		0.02 (0.13)	
zNPLTAR	−0.64 (0.07)	****	−0.63 (0.08)	****
zLLPTAR	−0.35 (0.10)	****	−0.01 (0.12)	
zCCETAR	0.17 (0.07)	**	0.25 (0.09)	***
zDTAR	0.25 (0.13)	*	0.05 (0.16)	
zGDP	−0.61 (0.11)	****	−0.24 (0.14)	
_cons	−0.00 (0.05)		0.00 (0.06)	
r2_a		0.809		0.499
r2_w		0.839		0.578
r2_o		0.630		0.335
r2_b		0.016		0.077
N		64		64

\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ ; \*\*\*\*  $p < 0.001$ .

## 5. Discussion

The regression results focusing on the relationship between bank profitability and explanatory variables are presented in Tables 5 and 6 in the previous section. In this part, we will discuss the regression results and analyze the impact of each variable on the profitability of Chinese state-owned commercial banks.

(1) Bank size has a positive impact on the profitability of Chinese state-owned commercial banks

Bank size is one of the main factors which can impact the profitability; banks of a large size are expected to produce a higher profitability based on the view that a larger size should allow the bank to obtain economies of scale, which reduces risk and cost. However, there is a suggestion that medium-sized banks are slightly more scale efficient than either large or small banks. Only small banks appear to have the potential for scale efficiency gains (Berger and Humphrey 1994). Firm size impacts negatively on profitability of large banks but positively for small ones (Vong and Chan 2009). The impact of size on profitability could be nonlinear, because small banks can achieve economies of scale while growing their asset size up to a certain level, and then further increase in assets leads to lower profitability due to ineffectiveness and some other reasons (Eichengreen and Gibson 2001; Athanasoglou et al. 2008).

Bank size is measured by its two main business, absorbing deposits and issuing loans. Hypothesis 1 is accepted, which means that bank size has a positive impact on the profitability of the banks according to empirical results.

Net Loan to Total Asset Ratio (NATAR) measures the loan size and lending activity of a bank. The main principal activities of commercial banks are to grant loans to borrowers. Loans are the highest yielding assets a bank can add to its balance sheet, and they provide the largest portion of operating revenue. The regression result shows that there is a non-significant correlation between net loans and the profitability of Chinese state-owned commercial banks. The top five Chinese state-owned commercial banks have a 50.77% Net Loan to Total Asset Ratio (NATAR) on average during the research period, which indicates their good credit performance; however, this high ratio has a negative effect on liquidity. Moreover, existing funds of these state-owned banks are widely used for long-term credit allocation and less so for short-term liabilities.

Deposit to Total Asset Ratio (DTAR) is a variable measuring the volume of deposits held by a bank. Deposits are banks' primary sources of funds that they can invest to generate income. According to the regression result, Deposit to Total Asset Ratio (DTAR) has a positive impact on profitability of Chinese state-owned banks. Regression for ROE has a significant coefficient equaling 0.1319 at 10% level, and regression for ROA has a non-significant coefficient equaling 0.0013. State-owned banks attract more deposits than other types of banks because they represent the country's (government's) trust, then they can issue more loans; however, the profitability mainly depends on the spread between loans and deposits. As state-owned banks support special areas such as the rural economy by lending to farmers and small businesses with relatively low-interest, their profitability will be affected to a certain extent.

(2) Credit quality has a positive impact on the profitability of Chinese state-owned commercial banks

Credit quality is an important parameter with which to measure the financial status of a bank. Non-performing loans decrease bank profitability, since banks are unable to recover their interest and principal, non-performing loans require loan loss provisions for expected losses. Loan loss provision provides a buffer for unrecoverable losses of defaulted loans, but it will reduce the bank's profitability. According to analysis, we expect there is a positive correlation between credit quality and banks' profitability.

Non-Performing Loan to Total Asset Ratio and Loan Loss Provision to Total Asset Ratio are used in this article to measure the credit quality of the bank. Hypothesis 2 is accepted, which means that credit quality has a positive impact on the profitability of the banks according to empirical results.

Non-Performing Loan to Total Asset Ratio (NPLTAR) measures credit quality and the effectiveness of a bank in receiving repayments on its loans. The banks obtain their income from the loans that are disbursed, and if these loans are not repaid it is not possible for them to receive profits. A high ratio means that the bank will be at a high level of credit risk if loan loss provision does not recover the non-performing loan amounts. The regression result shows that Non-Performing Loan to Total Asset Ratio (NPLTAR) has a significant negative impact on both ROE and ROA at 0.1% level. Regression for ROE has a coefficient equaling  $-3.27$ , and regression for ROA has a coefficient equaling  $-0.17$ . A non-performing loan is a loan in which the borrower is in default and has not paid the principal and interest repayments for a specified period. As soon as a loan is classified as a non-performing loan, it means that the likelihood of receiving repayments is significantly lower.

Loan Loss Provision to Total Asset Ratio (LLPTAR) measures the ability of a bank to prevent against credit risks. The regression result shows that Loan Loss Provision to Total Asset Ratio (LLPTAR) has a significant negative impact on ROE equaling  $-3.5048$  at 0.1% level and has a non-significant impact on ROA. Credit risk is one of the biggest risks faced by banks and arises from the possibility that loans held by banks will not be paid back either in part or in full. Although loan loss provisions give protection to a bank from loan losses and customer defaults, it reduces the earning asset size and profitability. Moreover, an increase in the loan loss provisions depends upon the non-performing loan indicating poor credit quality, which leads to decreasing profitability.

(3) Liquidity has a positive impact on the profitability of Chinese state-owned commercial banks

Liquidity measures a bank's ability to meet its financial obligations by raising funds at short notice and evaluates a bank's ability to convert assets into cash without losing its value. Banks generally hold liquid assets in the form of cash and money market instruments to act as a liquidity buffer. Cash and Cash Equivalents to Total Asset Ratio is used in this article to measure the liquidity of the bank. According to analysis, we expect there is a positive correlation between liquidity and banks' profitability. From the empirical results, the profitability of Chinese state-owned commercial banks is positively correlated with their liquidity, which is consistent with Hypothesis 3 of this paper.

The regression result shows that Cash and Cash Equivalents to Total Asset Ratio (CC-ETAR) has significant positive impacts on both ROA and ROE. The correlation coefficient of ROA is equal to  $0.0252$  at 1% level, and the correlation coefficient of ROE is equal to  $0.3188$  at 5% level. Chinese state-owned commercial banks have efficient liquidity, which enhances the stability of banking operations and reduces extra costs caused by lack of liquidity, thus exerting a positive impact on their profitability. It is worth mentioning that cash and cash equivalents are the most liquid but least profitable asset of banks. Cash and cash equivalents have lower transaction costs when facing a matured payment. However, banks' profitability will be affected by the opportunity cost of holding cash and cash equivalents. [Graham and Bordeleau \(2010\)](#) hold the idea that liquid assets may have a nonlinear relationship with bank profitability; there is a trade-off between short-term profitability of lower liquidity and long-term performance of insurance against liquidity shocks. Moreover, cash and cash equivalents are a valuable buffer when it comes to unexpected situations, e.g., financial crisis or economic shock. The 2008 global financial crisis proved the risk of lack of liquidity. Basel III took liquidity regulation into consideration and put forward global rules for liquidity regulation, which aim to improve banks' ability against financial crisis and other unexpected economic shocks.

(4) Economic conditions of a country has a negative impact on the profitability of Chinese state-owned commercial banks

From the empirical results of this paper, the profitability of Chinese state-owned banks is negatively correlated with the economic conditions of the country, which is inconsistent with Hypothesis 4 of this paper. Moreover, the result is contrary to the general consensus in the literature. [Li \(2017\)](#), [Bi \(2014\)](#), [Du \(2015\)](#) and [Karimzadeh et al. \(2013\)](#), all show that

the natural logarithm of GDP and the profitability of banks are positively correlated. The reason may be that Chinese state-owned commercial banks are gradually moving towards marketization, but they are still largely affected by the country's macroeconomic policies, especially some national strategic deployments, and are relatively less affected by market fluctuations.

The regression result shows that the natural logarithm of GDP has a negative impact on both ROA and ROE. The correlation coefficient of ROA is equal to  $-0.049$  at 10% level, and the correlation coefficient of ROE is equal to  $-0.0011$  at 1% level. However, the correlation coefficients are very small, only a slight negative correlation. The reason for the slightly negative correlation is existence of some national strategic deployments, especially inclusive finance policies. The concept of inclusive finance was proposed by the United Nations in 2005, and it refers to the provision of appropriate and effective financial services at affordable costs for all social classes and groups in need of financial services, such as small and micro enterprises, farmers, urban low-income groups, etc. Vulnerable groups are its key service targets, and state-owned commercial banks issue low-interest loans to those groups, which will affect their profitability.

Since China first proposed the development of inclusive finance in 2013, the State Council of China has made a series of major arrangements to continuously promote the development of inclusive finance. As the backbone of China's banking system, state-owned commercial banks have always been a leader in actively promoting the implementation of inclusive financial policies. In the 2017 "Government Work Report", Premier Li Keqiang proposed that large and medium-sized commercial banks are encouraged to set up Inclusive Financial Divisions, and large state-owned banks must be the leader.<sup>3</sup> As of mid-2017, state-owned commercial banks have established an Inclusive Financial Divisions at the headquarters and at the level of branch banks, all 185 provincial branches have been established and more than 60,000 municipal branches and below are engaged in urban and rural community financial services.

According to the annual report, state-owned commercial banks have played a leading role in the growth of small and micro loans with the support of policies, and the Industrial and Commercial Bank of China (ICBC) and Agricultural Bank of China (ABC) have performed outstandingly. The ICBC annual report shows that as of the end of 2019, the balance of inclusive small and micro enterprise loans was 471.521 billion yuan, and the number of customers was 423,000. The average interest rate of accumulated loans that year was 4.52%. As of the end of 2019, the ABC's inclusive loan balance for small and micro enterprises was 592.3 billion yuan, the number of loan customers was 1.1092 million, and the average interest rate of loans was 4.66% throughout the year.<sup>4</sup> The 2020 "Government Work Report" requires state-owned large commercial banks to increase the loan growth rate for small and micro enterprises to 40% from the national level, and requires the comprehensive loan interest rate to drop. State-owned commercial banks have been a leader in actively responding to inclusive financial policies by issuing loans at relatively low interest rates to support the economy.<sup>5</sup> Therefore, the profitability of Chinese state-owned commercial banks is inconsistent with the development trend of China's economy.

## 6. Conclusions

Our paper provides insight into the association between internal and external determinants and Chinese state-owned commercial banks' profitability. The regression result shows that bank internal factors and external economic conditions can explain the profitability of banks to a large extent. We show that in line with Hypothesis 1, the size of banks only makes a slightly positive contribution to the profitability of Chinese state-owned commercial banks. State-owned banks are already large in scale, and scale effects are usually only reflected in small banks. The study also verified Hypothesis 2. The loan quality has a significant positive impact on the state-owned banks' profitability. In addition, according to Hypothesis 3 liquidity also has a significant positive impact on the profitability of Chinese state-owned commercial banks. Although the state-owned commercial banks

have been guaranteed by the government, and so there is no need to worry about the risk of run and bankruptcy, the improvement of liquidity will still improve the profitability of China's state-owned commercial banks to a certain extent. Finally, we do not accept Hypothesis 4, and find that GDP and the profitability of Chinese state-owned commercial banks have a relatively significant negative effect. This is different from most previous research results, which can be explained by the fact that the national strategic deployment of inclusive finance has been implemented since 2013 in China. As the backbone of the Chinese banking industry, Chinese state-owned commercial banks have been a leader in actively implementing inclusive finance policies. They issue loans at relatively low interest rates to support the economy and contribute to improving China's national economic situation. Therefore, the profitability of Chinese state-owned commercial banks is inconsistent with the development trend of China's economy.

Our paper contributes to the literature of profitability of state-owned commercial banks in China by being the first to investigate the relationship between determinants and banks' profitability, focusing on the "Big Five" and considering the latest changes in the Chinese banking industry.

This study only collected data on the five largest state-owned banks in China from 2007 to 2019, and the data time span is very small. According to the latest classification, there are six large state-owned banks in China now. As the sixth bank has only been listed as a "Chinese state-owned large commercial bank" since 2018, it has not been included in this study. Our dataset was based only on Chinese data. Therefore, our results cannot be generalized to other countries. Still, future similar studies in other countries could conduct comparative analysis and make the model results more comprehensive. Despite the above-mentioned limitations, our results are beneficial to government officers, bankers, investors, and researchers for their decision-making by estimating future trends in the profitability of state-owned commercial banks.

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## Appendix A

Table A1. List of variables and references.

Author	Sample	Y	NLTAR	DTAR	NPLTAR	LLPTAR	CCETAR	GDP
Qu (2007)	14 major commercial banks in China from 1999 to 2005	R O A	+	+	/	N	–	+
Bai (2010)	4 state-owned commercial banks in China from 1999 to 2008		/	/	/	/	N	N
Ye (2010)	5 state-owned commercial banks in China from 2004 to 2008		/	/	/	+	+	N
Majid et al. (2014)	8 commercial banks in India from 2003 to 2011		/	+	/	/	/	+
Gu (2020)	16 listed commercial banks in China in 2018		+	/	/	N	/	/
Du (2015)	5 largest state-owned banks in China from 2005 to 2011		/	/	/	N	N	+
Zhang (2009)	14 major commercial banks in China from 1999 to 2008		N	/	/	N	N	/
Gremi (2013)	12 big commercial banks in Albania from 2005 to 2012		/	+	–	/	/	/
Ul Mustafa et al. (2012)	15 schedule banks in Pakistan from 2001 to 2009		/	-	/	–	/	/
Acaravci and Calim (2013)	3 commercial banks in Turkey from 1998 to 2011		/	+	/	/	–	/
Lu et al. (2013)	144 commercial banks in China from 1997 to 2010	ROA and ROE	N	N	– (ROA) N (ROE)	/	/	/

Notes: “+” means positive; “–” means negative; “N” means non-significant.

## Notes

- <sup>1</sup> Available online: [http://www.gov.cn/jrzq/2006-05/17/content\\_283447.htm](http://www.gov.cn/jrzq/2006-05/17/content_283447.htm) (accessed on 7 December 2020).
- <sup>2</sup> The Chinese banking regulator—China Banking Regulatory Commission (CBRC)—released the Chinese version of Basel III rules in April 2011. For the full version of Chinese Basel III, see CBRC. Available online: <http://www.cbrc.gov.cn/chinese/home/jsp/docView.jsp?docID=20110503615014F8D9DBF4F4FFE45843249ABE00> (accessed on 17 July 2021).
- <sup>3</sup> 2017 “Government Work Report”. Available online: [http://www.gov.cn/guowuyuan/2017-03/16/content\\_5177940.htm](http://www.gov.cn/guowuyuan/2017-03/16/content_5177940.htm) (accessed on 17 July 2021).
- <sup>4</sup> The semi-annual report of major state-owned banks is released and the trend is improving, serving the real economy accurately and powerfully. Available online: [http://finance.ce.cn/bank12/scroll/201909/10/t20190910\\_33124454.shtml](http://finance.ce.cn/bank12/scroll/201909/10/t20190910_33124454.shtml) (accessed on 17 July 2021).
- <sup>5</sup> 2020 “Government Work Report”. Available online: <http://www.gov.cn/zhuanti/2020lhzfgzbg/index.htm> (accessed on 17 July 2021).

## References

- Acaravci, Songül Kakilli, and Ahmet Ertuğrul Calim. 2013. Turkish banking sector’s profitability factors. *International Journal of Economics and Financial Issues* 3: 27–41.
- Alfadli, Abdualah, and Husam Rjoub. 2020. The impacts of bank-specific, industry-specific and macroeconomic variables on commercial bank financial performance: Evidence from the Gulf cooperation council countries. *Applied Economics Letters* 27: 1284–88. [\[CrossRef\]](#)
- Athanasoglou, Panayiotis P., Sophocles N. Brissimis, and Matthaïos D. Delis. 2008. Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money* 18: 121–36. [\[CrossRef\]](#)
- Bai, Jiyang. 2010. An Empirical Analysis of the Factors Influencing the Profitability of China’s State-owned Commercial Banks. *Financial Development Research* 6: 51–55.
- Berger, Allen N., and David B. Humphrey. 1994. *Bank Scale Economies, Mergers, Concentration, and Efficiency: The US Experience*. Center for Financial Institutions Working Papers. Philadelphia: Wharton School Center for Financial Institutions, University of Pennsylvania, pp. 351–70.
- Bhatti, Ghulam Ali, and Haroon Hussain. 2010. Evidence on structure conduct performance hypothesis in Pakistani commercial banks. *International Journal of Business and Management* 5: 174–87. [\[CrossRef\]](#)
- Bi, Chongyuan. 2014. The Analysis of the Factors of Profitability and Its Influence of State-Owned Commercial Banks in China. Master’s thesis, Shandong University, Jinan, China.
- Chen, Xin. 2016. Research on Profitability and Influencing Factors of Listed Commercial Banks. Master’s thesis, Tianjin University of Commerce, Tianjin, China.
- Du, Dandan. 2015. The Research on Chinese Large Commercial Banks’ the Profitability and Influencing Factors. Master’s Thesis, Jilin University, Changchun, China.
- Eichengreen, Barry, and Heather D. Gibson. 2001. Greek Banking at the Dawn of the New Millennium. Available online: <https://ssrn.com/abstract=269391> (accessed on 10 August 2021).
- Esmail, Jabir, Husam Rjoub, and Wing-Keung Wong. 2020. Do Oil Price Shocks and Other Factors Create Bigger Impacts on Islamic Banks than Conventional Banks? *Energies* 13: 3106. [\[CrossRef\]](#)
- Fadzlan, Sufian. 2009. Determinants of Bank Profitability in a Developing Economy: Empirical Evidence from the China Banking Sector. *Journal of Asia-Pacific Business* 4: 281–307.
- Fu, Jing. 2020. Analysis of the Influencing Factors of Commercial Banks’ Profitability: Based on the Comparison between State-owned Commercial Banks and Joint-stock Commercial Banks. *Times Finance* 21: 39–45.
- Graham, Christopher, and Étienne Bordeleau. 2010. *The Impact of Liquidity on Bank Profitability*. Working Paper. Ottawa: Bank of Canada.
- Gremi, Eliona. 2013. Internal factors affecting Albanian banking profitability. *Academic Journal of Interdisciplinary Studies* 2: 19–25. [\[CrossRef\]](#)
- Gu, Zhengyang. 2008. An Empirical Study on the Factors Affecting the Profitability of Commercial Banks. Master’s thesis, Zhejiang University, Hangzhou, China.
- Gu, Wei. 2020. Analysis of profitability and influencing factors of commercial banks. *Modern Business* 2: 72–73.
- Guru, Balachandher K., Staunton John, and Balashanmugam Bala. 2002. Determinants of commercial bank profitability in Malaysia. *Journal of Money, Credit, and Banking* 17: 69–82.
- Hoffmann, Paolo Saona. 2011. Determinants of the Profitability of the US Banking Industry. *International Journal of Business and Social Science* 22: 255–69.
- Hou, Yanke. 2016. Theoretical and Empirical Research on the Influencing Factors of the Profitability of Chinese Commercial Banks. Master’s thesis, Zhejiang University, Hangzhou, China.
- Jumono, Sapto, and Chajar Matari Fath Mala. 2019. Determinants of profitability in banking industry: A case study of Indonesia. *Asian Economic and Financial Review* 9: 91–108. [\[CrossRef\]](#)

- Karimzadeh, Majid, S. Jawed Akhtar, and Behzad Karimzadeh. 2013. Determinants of profitability of banking sector in India. *Transition Studies Review* 20: 211–19. [[CrossRef](#)]
- Li, Ming. 2017. Analysis of the factors affecting the profitability of state-owned banks. *Journal of Shandong University of Technology: Social Science Edition* 33: 10–17.
- Lu, Jing, Alatengsuda, and Yin Yuming. 2013. Determinants of Bank Profitability: Panel Data GMM Analysis from China Banking Sector During 1997 to 2010. *Finance Forum* 1: 3–14.
- Majid, MShabri Abd, Said Musnadi, and Indra Yadi Putra. 2014. A comparative analysis of the quality of Islamic and conventional banks' asset management in Indonesia. *Gadjah Mada International Journal of Business* 16: 185–200. [[CrossRef](#)]
- Maness, Terry S., and John T. Zietlow. 2005. *Short-Term Financial Management*. 3. Paines. Mason: South-Western.
- Noman, Abu Hanifa Md., Sajeda Pervin, Mustafa Manir Chowdhury, and Hasanul Banna. 2015. The effect of credit risk on the banking profitability: A case on Bangladesh. *Global Journal of Management and Business Research* 15: 41–48.
- Qu, Xin. 2007. Analysis on the Factors of Profit-Making Ability Model of Commercial Banks in China. Master's thesis, Southwestern University of Finance and Economics, Chengdu, China.
- Rjoub, Husam, Irfan Civcir, and Nil Günsel Resatoglu. 2017. Micro and macroeconomic determinants of stock prices: The case of Turkish banking sector. *Romanian Journal of Economic Forecasting* 20: 150–66.
- Staikouras, Christos K., and Geoffrey E. Wood. 2004. The determinants of European bank profitability. *International Business & Economics Research Journal* 3: 57–68.
- Ul Mustafa, Ahmed Raza, Riaz Hussain Ansari, and Muhammad Umair Younis. 2012. Does the loan loss provision affect the banking profitability in case of Pakistan? *Asian Economic and Financial Review* 2: 772–83.
- Vong, Anna Pou Iu, and Hoi S. Chan. 2009. Determinants of bank profitability in Macao. *Macau Monetary Research Bulletin* 12: 93–113.
- Ye, Linghong. 2010. Research on the Profitability of State-Owned Commercial Banks and Its Influencing Factors. Master's thesis, Fujian Agriculture and Forestry University, Fuzhou, China.
- Zhang, Jianxiao. 2009. Study on the Factors of Profit-Making Ability of Commercial Banks in China. Master's thesis, Chongqing University, Chongqing, China.
- Zhong, Jing. 2013. Empirical Analysis of the Profitability of Listed Commercial Banks in China. Master's thesis, Southwestern University of Finance and Economics, Chengdu, China.