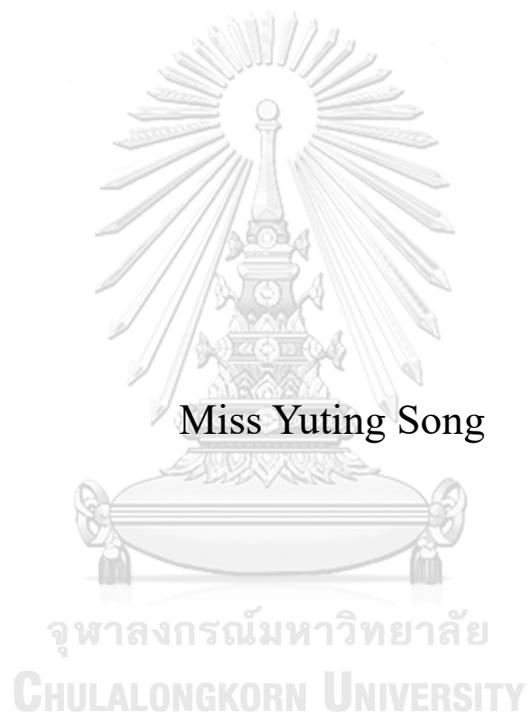


The Impact of Internet Finance on the Profitability of  
Commercial Banks in China



A Thesis Submitted in Partial Fulfillment of the Requirements  
for the Degree of Master of Arts in International Economics and Finance

Field of Study of International Economics

FACULTY OF ECONOMICS

Chulalongkorn University

Academic Year 2020

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วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรมหาบัณฑิต  
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ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย



จุฬาลงกรณ์มหาวิทยาลัย  
**CHULALONGKORN UNIVERSITY**



ผู้ถึง ช่ง : ผลกระทบของการเงินทางอินเทอร์เน็ตต่อความสามารถในการทำกำไรของธนาคารพาณิชย์ในประเทศจีน. ( The Impact of Internet Finance on the Profitability of Commercial Banks in China) อ.ที่ปรึกษาหลัก : รศ. ดร. ชันทาล แฮร์เบอไรท์

งานวิจัยหลายชิ้นวิเคราะห์ผลกระทบของการเงินทางอินเทอร์เน็ตต่อการทำกำไรของธนาคารพาณิชย์ในจีน เอกสารนี้ เพิ่มเนื้อหาในบทความโดยเน้นที่การเงินทางอินเทอร์เน็ต 2 ประเภท ได้แก่ การเงินทางอินเทอร์เน็ตภายใน (ธนาคารออนไลน์) และการเงินทางอินเทอร์เน็ตภายนอก (การชำระเงินโดยบุคคลที่สาม (TPP) ) และแพลตฟอร์ม Peer-to-peer Lending (P2P) และความสัมพันธ์กับผลการดำเนินงานของธนาคาร ชุดข้อมูล 2 ชุดที่ครอบคลุมปี 2554 ถึงปี 2561 ใช้สำหรับการวิเคราะห์การถดถอย ชุดข้อมูลแผงสมมูลของธนาคาร 10 แห่งเพื่อวิเคราะห์ผลกระทบของภายใน และการเงินทางอินเทอร์เน็ตภายนอกที่มีต่อประสิทธิภาพของธนาคารพาณิชย์ต่อไปผลการถดถอยชี้ให้เห็นว่าธนาคารออนไลน์ลดความสามารถในการทำกำไรของธนาคารซึ่งอาจอธิบาย โดยต้นทุนที่เพิ่มขึ้นในด้านการดำเนินงาน การตลาด และการบำรุงรักษาตลอดจนการอัพเกรดโครงสร้างพื้นฐาน การเติบโตของ TPP ยังส่งผลลบต่อกำไรของธนาคาร ซึ่งอาจบ่งชี้ว่า TPP เพิ่มการแข่งขัน ในทางกลับกัน การเติบโตอย่างรวดเร็วของ P2P ส่งผลดีต่อผลการดำเนินงานของธนาคาร อาจเป็นเพราะผลกระทบจากเทคโนโลยีสั่นคลอนจากบริษัทอินเทอร์เน็ต เพื่อเพิ่มผลกำไร นอกจากนี้การควบคุมต้นทุนแล้ว ธนาคารพาณิชย์ควร ปรับปรุงช่องทางออนไลน์และ win-win ร่วมมือกับองค์กร EIF เพื่อใช้ประโยชน์จากผลกระทบจากการแพร่กระจายของเทคโนโลยี



สาขาวิชา  
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2563

ลายมือชื่อนิสิต .....  
ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

## 6284145829 : MAJOR INTERNATIONAL ECONOMICS AND FINANCE

KEYWORD: bank profitability, internet finance, fintech, China

Yuting Song : The Impact of Internet Finance on the Profitability of Commercial Banks in China. Advisor: Assoc. Prof. CHANTAL HERBERHOLZ, Ph.D.

Several studies analyzed the impact of internet finance on the profitability of Chinese commercial banks. This paper adds to the literature by focusing on two types of internet finance, internal internet finance (online banking) and external internet finance (third-party-payment (TPP) and peer-to-peer lending (P2P) platforms), and their relationship with bank performance. Two datasets that cover the years 2011 to 2018 are used for the regression analyses, a balanced panel dataset of 10 banks to analyze the impact of internal and external internet finance on bank performance and an unbalanced panel dataset of a larger sample of 43 banks to further explore the impact of external internet finance on commercial bank performance. The regression results suggest that online banking reduced the profitability of banks, which might be explained by increased cost in terms of operation, marketing and maintenance as well as upgrading of infrastructure. TPP growth also negatively affected bank profitability, which might indicate that TPP increases competition. The rapid growth of P2P, on the other hand, had a positive effect on bank performance, probably because of technology spillover effects from internet companies. To increase profitability, besides controlling cost, commercial banks should improve online channels and win-win cooperate with EIF enterprises to take advantage of technology spillover effect.



Field of Study:	International Economics and Finance	Student's Signature .....
Academic Year:	2020	Advisor's Signature .....

## ACKNOWLEDGEMENTS

First of all, I would like to express my sincere thanks to my advisor, Assoc. Prof. Dr. Chantal Herberholz, for her detailed and constructive comments for this study. With the valuable contribution of time and suggestions from my advisor, I could improve my thesis effectively.

Secondly, thanks to the committee members, Assoc. Prof. Dr. Sothitorn Mallikamas and Assoc. Prof. Dr. Siwapong Dheera-aumpon, for their instructive comments on the econometric challenges in this study.

Thirdly, I would appreciate my family, for their wholehearted support and encouragement along my time of my study experience in Chulalongkorn University.

Last not least, I would like to thank my professors during my study of MAIEF program, for their patient answering for my questions all the time, which helped me a lot to have a good understanding for new knowledge. Besides, I heartily thank staff and my classmates in Faculty of economics of Chulalongkorn University, especially Khun Lawan Thanasawangku, for their company and help to go through two wonderful years.

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## LIST OF ABBREVIATIONS

(The abbreviations are listed alphabetically.)

<b>BIS</b>	Bank for International Settlements
<b>CAR</b>	capital adequacy ratio
<b>CBRC</b>	China Banking Regulatory Commission
<b>CMT</b>	contestable market theory
<b>e-finance</b>	electronic finance
<b>EIF</b>	external internet finance
<b>ETA</b>	equity assets ratio
<b>fintech</b>	financial technology
<b>GDP</b>	gross domestic product
<b>GGDP</b>	growth rate of GDP
<b>GLS-RE</b>	random-effect model with generalized least squares
<b>GMM</b>	generalized method of moments
<b>GP2P</b>	annual growth rate of P2P transaction volume
<b>GTPP</b>	annual growth rate of TPP transaction volume
<b>HHI</b>	Herfindahl–Hirschman Index
<b>IF</b>	Internet finance
<b>IIF</b>	internal internet finance
<b>ISC</b>	Internet Society of China
<b>IV</b>	two step instrumental variable
<b>JSCBs</b>	joint-stock commercial banks
<b>LAR</b>	loan assets ratio
<b>LM</b>	Lagrange Multiplier
<b>LPR</b>	loan provision ratio
<b>LR</b>	long-term interest rate
<b>MS</b>	market share on assets

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<b>NIEAR</b>	non-interest earning ratio
<b>NIM</b>	net interest margin
<b>OECD</b>	Organization for Economic Cooperation and Development
<b>OLS</b>	ordinary least squares
<b>OLS-FE</b>	fixed-effect model with ordinary least squares
<b>P2P</b>	peer-to-peer lending
<b>PBOC</b>	People's Bank of China
<b>PC</b>	personal computer
<b>RCBs</b>	rural commercial banks
<b>ROA</b>	return on assets
<b>ROAA</b>	return on average assets
<b>ROAE</b>	return on average equity
<b>ROE</b>	return on equity
<b>SCP</b>	Structure-Behavior-Performance
<b>SMEs</b>	small and medium-size enterprises
<b>SOCBs</b>	state-owned commercial banks
<b>SOEs</b>	state-owned enterprises
<b>TPP</b>	third-party payment
<b>UCBs</b>	urban commercial banks
<b>UNCTAD</b>	United Nations Conference on Trade and Development
<b>VIF</b>	variance inflation factor

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## CHAPTER I INTRODUCTION

### 1.1 Motivation

Since the birth of electronic finance (e-finance) in the United States, as the global internet financial market spread quickly, the internet finance has experienced innovation and unparalleled growth (Claessens, Glaessner, & Klingebiel, 2001). So far, for important economies such as the United States, the United Kingdom and the European Union, the penetration rate of internet finance has showed a high level. Besides, crowdfunding, peer-to-peer lending (P2P) and bill financing have become important sources for financing funds (Ye & Ma, 2017). As the rise of internet finance increases the competition among providers of financial service, banks are spurred to offer electronic banking services and it is also a leapfrog opportunity for developing countries (Claessens et al., 2001). Compared with European countries and American, although internet finance started later in China, it has become a powerful economic force of China after showing explosive growth since 2013. To date, internet finance in China mainly includes electronic banking, third-party payment, P2P and crowdfunding (Du & Lang, 2020; Guo, Kong, & Wang, 2016).

Two concepts, *e-finance* and *internet finance*, have been mentioned above. Electronic finance, as the prototype of internet finance, namely the provision of financial services and markets using electronic communication and computation (Allen, McAndrews, & Strahan, 2002; Banks, 2001). With upgrading of internet technology, *Internet finance*(IF), as a new-born term derived from e-finance, has been drawn attention since 2012(Guo et al., 2016; Xie, Zou, &

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Liu, 2016; Xu, 2017). Shen and Huang (2016) further claimed that internet finance is often referred to as *digital finance* and *fintech* outside China. After comparing the definitions proposed by the United Nations Conference on Trade and Development(UNCTAD), Organization for Economic Cooperation and Development(OECD) and Bank for International Settlements(BIS) about these four terminologies, it's found that *e-finance*, *internet finance*, *digital finance* and *fintech* can be cross-used in most cases (Christiansen, 2001; Goldfinger & Perrin, 2001; Manyika, Lund, Singer, White, & Berry, 2016; OECD, 2018; Sato & Hawkins, 2001; Schueffel, 2016). However, according to the stage of technological development in different countries and the scope of research, these terms should be selectively used in the corresponding context. Specifically, without time limitation, e-finance and digital finance covers financial services applying a broader technology; fintech and internet finance confines to financial services supported by new or/and emerging technology.

Considering that this study focuses on internet finance, it is important to distinguish internet finance and fintech. Basically, two distinct differences can be identified: (1) Different scope. Fintech applies digital technology, while IF just uses the internet and mobile communication technology included in digital technology. (2) Different focus: Fintech tends to focus on traditional financial institutions to expand their business through the availability of internet, while IF emphasizes the financial services provided by internet-based enterprises that are non-financial institutions (Guo et al., 2016). In short, the current stage of fintech in China is named as internet finance.

With a further step, orienting at “*internet finance*”, which is the current stage of fintech in China, we referred to the official definition from People's Bank of China(PBOC): Internet finance is an emerging financial mode which realizes functions including financing, payment and information intermediary through the internet and mobile communication technology (PBOC, 2014). In addition, from a forthcoming perspective of internet finance in China, we selected the term “*fintech*” as well, and further referred to the definition from OECD proposed in 2018: Fintech involves not only the application of new digital technologies to financial services but also the development of business modes and products which rely on these technologies and more generally on digital platforms and processes (OECD, 2018). Moreover, PBOC (2014) further divides internet finance into broad and narrow concepts according to its content: The broad sense of internet finance includes financial services operated by financial and non-financial institutions, while the narrow sense of internet finance only refers to financial services provided by non-financial institutions. Most scholars have also adopted this classification in their research (Li & Dong, 2013; Wu, 2015; Xu, 2017).

Starting from internet finance in a broad sense, China's internet finance can be divided into three major business modes according to the existing penetration:

*Mode 1:* Banks expand payment business with the help of internet technology (e.g., online banking)

*Mode 2:* Third-party payment (TPP, e.g., Alipay and WeChat pay)

*Mode 3:* Peer-to-peer lending (P2P) and crowdfunding (Guo et al., 2016; PBOC, 2014; Xie et al., 2016).

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In particular, for the purpose of this study, mode 1 is called *internal internet finance* (IIF) in this paper as it is provided by banks. Mode 2 and mode 3 are operated by non-bank institutions, so they are called *external internet finance* (EIF).

It can be seen that internet finance not only upgrades the business of traditional banks, but also gives new roles more opportunities to get involved in the financial industry. New entrants break down the monopoly position of traditional commercial banks in terms of the deposit, loan and intermediary business, thereby resulting in less concentration in banking sector (Du & Lang, 2020). Turning to bank profitability, which could be determined by (1) bank-specific factors, (2) macro factors and (3) industry-level factors (Athanasoglou, Brissimis, & Delis, 2008; Bourke, 1989; Demirgüç-Kunt & Huizinga, 1999; Dietrich & Wanzenried, 2011, 2014; Kohlscheen, Murcia Pabón, & Contreras, 2018; Sufian & Habibullah, 2009), has been decreasing over recent years when measured by return on assets (ROA) and return on equity (ROE) (CBRC, 2018b). Linking to Structure-Behavior-Performance (SCP) hypothesis, concentration could be a measure of competition, to be an industry-level determinant of bank profitability: Using Herfindahl–Hirschman Index (HHI) as the indicator of bank concentration, Bikker and Bos (2008) shows that in a more concentrated market, banks are less competitive because they are more likely to collude. This allows oligopolistic rents to increase profitability. The SCP hypothesis suggests that market structure affects competitive behavior, which in turn influences bank performance. The SCP hypothesis was supported by the empirical studies of Samad (2008) on 44 commercial banks in Bangladesh, Dietrich and Wanzenried (2011) on 372 commercial banks in Switzerland, Dietrich and Wanzenried (2014) on commercial banks in middle-income

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countries and Tan (2016) on 41 commercial banks in China. Another method to measure competition is based on the efficiency hypothesis, believing that the competition which can be reflected by concentration, can be captured by market share as well: As a bank-specific determinant, larger market share (higher concentration, less competition) and stronger performance result from higher efficiency (Bikker & Bos, 2008). The macro determinants are more complex than the other two categories: The change of macro environment can directly affect the revenue and cost of bank business, and then affect its profitability (Athanasoglou et al., 2008; Demirgüç-Kunt & Huizinga, 1999; Sufian & Habibullah, 2009); In addition, macro factors may also change the competition in the banking industry, further affecting the profitability of banks (Claessens & Laeven, 2003; Tan & Floros, 2012).

With emergence of internet finance, we wonder if it deserves attention when we study bank performance. According to statistics from China Banking Regulatory Commission (CBRC), by the end of 2018, the total assets of commercial banks accounted for 78% of banking financial system in China (CBRC, 2018a). From average bank size for each type of banks, these commercial banks can be divided into state-owned commercial banks (SOCBs), joint-stock commercial banks (JSCBs), urban commercial banks (UCBs) and rural commercial banks (RCBs), with market shares of 37%, 17%, 13% and 11% respectively. As the main body of traditional financial institutions, commercial banks are facing more competition from EIF. With the support of SCP hypothesis, EIF might serve as one of the industry-level determinants, to increase competition thus negatively impact bank profitability. At the same time, studies from Hernando and Nieto (2007), Delgado, Hernando, and Nieto (2007) and DeYoung (2005)

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supported that depending on IIF, commercial banks might improve efficiency. Based on efficiency hypothesis, IIF is probably one of the bank-specific determinants, having positively influenced bank profitability. According to inferences above, it motivated us to consider IIF and EIF when we study the determinants of banks profitability in China.

However, in the specific context of internet finance, most studies that evaluates the profitability of commercial banks within Chinese-language literature published in core journals focus on qualitative analysis. In literature of quantitative analysis noted by this paper, only Gu and Yan (2019) used transaction volume of P2P and TPP to measure EIF in China, whereas IIF was not considered. Furthermore, the English-language literature is particularly limited: Firstly, most of the research has focused on online banking. However, in the literature review, it is shown that the previous studies basically used dummy variable to indirectly measure the development of IIF as data unavailability (DeYoung, Lang, & Nolle, 2007). Secondly, as regards mode 2 and mode 3, only three papers published in 2020 by Chen, Li, and He (2020) on Chinese banking sector, Du and Lang (2020) on Chinese banking sector and Tobing and Wijaya (2020) on Indonesian banking sector has noticed the impact of P2P and TPP on the performance of commercial banks. Thirdly, narrowed down to Chinese banking system, only Yang, Li, Ma, and Chen (2018) focused on online banking but without P2P and TPP, while Chen et al. (2020) and Du and Lang (2020) noticed the impact of P2P and TPP but ignored online banking on bank profitability. Consequently, neither for Chinese nor English-language literature, we found there is not a study to simultaneously explore the impact of both IIF and EIF on bank profitability. Moreover, without an IIF proxy, by dividing 2003-2013 into developing and developed stages of

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electronic banking in China, Yang et al. (2018)'s research is limited to descriptive analysis on 5 SOCBs' financial ratios only. Besides, it is noted that because of multicollinearity problem, Chen et al. (2020) denoted TPP and P2P variables were not able to add into one equation in their study, even dropped out macro variables which are collinear with TPP and P2P variables. The same shortcoming also exists in Du and Lang (2020)'s paper. In response, we try to overcome these weaknesses in this study. To sum up, the contributions of this paper are mainly concentrated on the following points:

- (1) The main contribution is that considering both IIF and EIF as determinants simultaneously, an empirical study of regression analysis was made on the impact of internet finance on bank profitability in China.
- (2) In this study, we improved the method to measure IIF. Instead of dummy variables in previous literature, we employed data of online-banking transaction volume to calculate IIF variable. Noted in the literature from DeYoung et al. (2007), data on internet transaction volume would be a better measure of IIF, since it can capture how intensively a bank's customers used the internet channel versus brick-and-mortar channel. In other words, online-banking transaction volume data could more comprehensively reflect the development of IIF than dummy variable, because it includes information about customers' willing to use IIF.

Coherently, this study seeks to answer the following research questions:

- (1) As to top 10 commercial banks in terms of online-banking transaction volume, what is the relationship of IIF(i.e., online banking) and EIF(i.e., TPP and P2P) with their profitability ?
- (2) As to Chinese commercial banking sector represented by 43 commercial banks in this study, what is the relationship between EIF(i.e., TPP and P2P) and bank profitability ?

Two datasets are used, because it is difficult to collect data on online-banking transaction volume for the total of 43 commercial banks, we just select 10 of them to investigate question (1).

## 1.2 Research objectives

The main objective is to examine the relationship between internet finance and bank profitability.

The two specific objectives are:

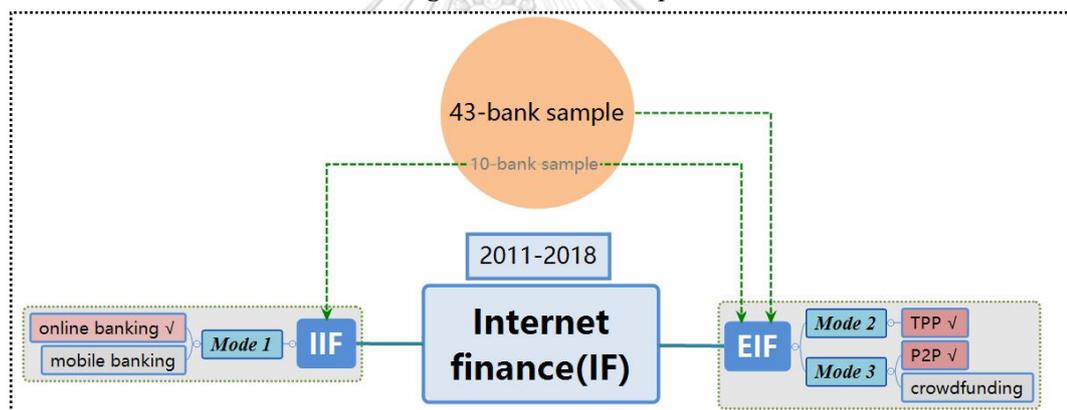
1. to examine the effect of IIF (i.e., online banking) and EIF (i.e., TPP and P2P) on bank profitability in China , using data from top 10 commercial banks(5 SOCBs and 5 JSCBs) in terms of online-banking transaction volume.
2. to further explore the impact of EIF (i.e., TPP and P2P) on bank profitability in China, using a larger sample that does not only comprises the 10 commercial banks, but also 7 JSCBs, 18 UCBs and 8 RCBs (i.e., a total of 43 banks that accounts for 83% total assets of commercial banks in China).

### 1.3 Scope

From the perspective of the broad sense of internet finance, this paper explored the impact of IIF and EIF on the profitability of Chinese commercial banks, respectively. IIF is mode1, including online banking and mobile banking, which rely on personal computers(PC) and smartphones to complete transaction, respectively. This study focused on the largest component, namely online banking. EIF includes mode 2 and mode 3: mode 2 is third-party payment (TPP); mode 3 covers P2P and crowdfunding. However, the scale of crowdfunding is still small relative to P2P because of immature financial market in China (ISC, 2014). With data unavailability of crowdfunding, we would not consider it in this study. Hence, this study focused on TPP and the largest component for mode 3, namely P2P (*Figure 1*). In conclusion, this paper aimed at online banking for mode1, TPP for mode2 and P2P for mode3.

According to the transaction share of China's online banking in 2018, top 10 commercial banks (5 SOCBs and 5 JSCBs) in terms of online-banking transaction volume were selected as the first sample (*Figure 3*), to be able to examine relationship of both IIF and EIF with bank profitability at the same time. Besides, after adding more 33 commercial banks (7 JSCBs, 18 UCBs and 8 RCBs), we selected a total of 43 commercial banks as the second sample (*Table A-20 in appendix*), to be able to represent Chinese commercial banking sector (with 83% market share on total assets of commercial banking sector in 2018). Specifically, we wonder if the consistent relationship could be generalized into commercial banking sector in China. Yet, since data on IIF is unavailable for the additional 33 banks, we could only further explore the relationship between EIF and bank profitability.

Referring to the China Financial Stability Report (PBOC, 2014), internet finance has not developed rapidly until 2013. However, considering TPP is a representative proxy of EIF for this study, so 2011 (PBOC began to issue TPP licenses, marking the development of TPP institutions pave a standardized way) is taken as the beginning of time period. Based on the timeliness and availability of data related to internet finance, 2018 is determined as the end of time period. Finally, in terms of the 10-bank sample and 43-bank sample, 80 and 344 observations were obtained, respectively.



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#### 1.4 Expected benefits

At present, China banking industry is undergoing a period of transformation and reform, China is now home to the largest internet finance markets in the world (Xu, Tang et al. 2019), and its important position in Chinese financial field has become increasingly prominent. In the context of rapid growth for internet finance development in China, this paper not only focused on EIF, but also studied IIF, and connected its impact with the profitability of commercial banks, so as to have a more comprehensive understanding of the determinants of bank profitability. It is

expected that the empirical study and data support of internet finance based on this paper could provide suggestions for Chinese banking industry, to improve its profit modes and enhance its profitability in the era of internet finance. It is hoped that the analysis of EIF could provide inspiration for the innovation and upgrading of traditional financial services, in order to help internet financial enterprises and commercial banks form a benign competition ecosystem and build a healthy development of Chinese financial system.

The reminder of this paper proceeds as follows. Section 2 introduces overall performance of Chinese banking system and landscape of Chinese internet finance. Section 3 next reviews related literature on bank profitability with respect to traditional determinants and internet finance. Section 4 is conceptual framework. Section 5 discusses the data, variables, methodology, model specification and hypotheses. Section 6 presents the empirical results. Section 7 concludes.

## CHAPTER II BACKGROUND OF STUDY

### 2.1 Overall performance of commercial banking sector in China

According to an assessment of International Monetary Fund (Fund, 2017), in absolute terms, China's banking market has become the largest in the world. Total banking assets have reached 300% of GDP. According to data released by PBOC (2019), the total assets of Chinese banking institutions have reached \$41.4 trillion by the end of 2019, which rose 8.1% from a year earlier, tripled compared to 2010. Additionally, the total assets of commercial banks in China were \$34.2 trillion, with the fastest growth rate of 14.1% among 5 major economies in 2019. With 83% total assets, commercial banking sector became the most important component of Chinese banking system. Referring to further category by CBRC (2019), commercial banks comprise state-owned commercial banks (SOCBs), joint-stock commercial banks (JSCBs), urban commercial banks (RCBs), rural commercial banks (RCBs) and foreign commercial banks in China. They have differences with regard to market share, scope of branch networks, ownership, lending groups and operational level, which are shown in *Table 1* in detail.

In 2019, Chinese commercial banking sector posted net profits of \$297.5 billion, up 8.9% from a year earlier, but ROA was only 0.87%, down 3 basis points compared before (*Table 2*). Although the profitability measured by ROA of China's commercial banking sector is not poor among the five major economies, it remains to be improved compared with the United States (ROA: 1.29%), which possesses a more mature financial system (including more perfect market structure, market competition and policy system). In general, since global financial crisis

**Table 1** 4 types of commercial banks in China

Bank type	Market share on assets in 2019 (%)	Shareholders	Characteristics
<b>SOCBs</b>	49	state	to finance mainly large SOEs; oligopolistic, massive government intervention; larger size measured by assets and nationwide branch networks; to be allowed operate at national level
<b>JSCBs</b>	22	local government; private enterprises and SOEs.	to finance small state-owned enterprises(SOEs) & small and medium-size enterprises(SMEs); smaller branch network than SOCBs which typically confined to their locality or the fast-growing coastal area; to be allowed to operate at national level
<b>UCBs</b>	16	local government; urban enterprises and residents	strong relationship with local business fraternities and retail customers thus finance SMEs, collective and local residents in their municipalities; rely heavily on traditional lending activities with interest income; to be not allowed to operate at national level
<b>RCBs</b>	12	enterprises and residents	to finance SMEs or peasants; to typically attract deposits from rural areas or small towns; deposits expand continually but lending is limited as they are subject to lending policies from the local public authorities; to be not allowed to operate at national level
<b>Differences among 4-type commercial banks in China</b>	(1) market share: SOCBs > JSCBs > UCBs > RCBs (2) scope of branch networks: SOCBs > JSCBs > UCBs > RCBs (3) different ownership (4) different lending groups (5) different operational level		

*Citation:* CBRC (2019); García-Herrero, Gavilá, and Santabárbara (2006); Sufian and Habibullah (2009); Tan and Floros (2012)

*Note:* Foreign banks would not be shown here, as their market share is really small and play a very limited role in Chinese banking system. Consequently, they are not included in the scope of this study.

happened in 2008, though China's commercial banking sector has performed relatively well, it has also seen slower revenue growth and lower ROA as well as ROE in recent years (*Figure 2*). Besides, the capital adequacy ratio(CAR) of Chinese commercial banks is 14.54%, lower than the European average of about 18.0% (Data source: CEIE). It can be seen that although China has a

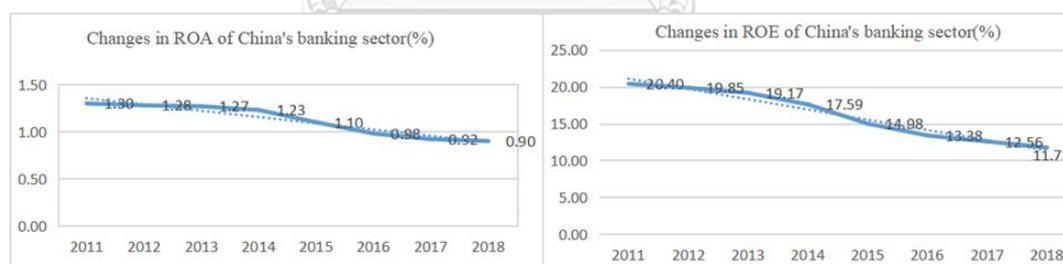
huge financial system, there might be a gap remained in terms of CAR compared with developed countries. As of 2017, although the bank concentration in China has decreased in recent years, it was still higher relative to the United States (*Table 3*). Moreover, the whole system is still dominated by the banking industry that is monopolized by four large state-owned commercial banks (Hou, Gao et al. 2016).

**Table 2** Performance of commercial banking sectors in 5 major economies, 2019

Country	Total Asset (\$ trillion)	Growth Rates (%)	Net Profit (\$100 billion)	Growth Rates (%)	ROA (%)	Growth Rates (%)
China	34.2	14.1	3.0	8.9	0.87	-0.03
Euro Zone	35.5	6.0	1.6	-5.5	0.45	-0.07
America	18.6	3.9	2.4	-1.0	1.29	-0.05
England	7.0	2.2	0.3	-9.3	0.42	0
Japan	6.7	2.1	0.2	-16.7	0.29	-0.05

Data source: Central Banks and Regulators, Annual Report of banks, Bank of China's Research Institution

**Figure 2** Changes in ROA and ROE of China's banking sector, 2011-2018



Data source: China Banking Regulatory Commission

**Table 3** 5-bank concentration

Country	2013	2014	2015	2016	2017
China	77.5229	55.3802	54.5358	52.916	52.4763
America	47.577	48.3788	46.3981	46.5793	46.2162
England	73.3877	73.4064	71.0253	70.3001	67.1318
Japan	56.8207	59.2723	60.7453	60.3506	64.4399

Data source: World Bank

## 2.2 The development of internet finance in China

Under the background of relatively steady, healthy and sustainable development in Chinese economics, thanks to the spread application of internet and mobile communication technology, Chinese traditional financial institutions began to use the internet to innovate themselves (Ye & Ma, 2017). Then, internet companies have found the advantages that they will boom rapidly through cloud computing and big data with the ability of computers processing for high-speed information. These internet enterprises started to enter financial sector, to spawn a new financial mode namely "*Internet finance*" (ISC, 2014).

In 2012, as the term internet finance firstly emerged in China, Xie et al. (2016) argued that internet finance is a new finance mode that ranges from traditional financial system to the emerging scenarios developed by internet technologies. The concept is so similar to the concepts of e-finance, fintech and digital finance that Shen and Huang (2016) believe these terms can be used interchangeably, with names changing in different countries. This is in line with opinions of BIS and OECD (*Table 4*). Besides, Gong (2013) and Chen (2014) claimed that internet finance only refers to financial activities based on modern information technology, and the internet just plays an auxiliary role. The functions of internet finance include financing, payment and transaction intermediary. Finally, as noted in the introduction, PBOC gave an official definition of internet finance in 2013, further dividing it into broad sense (i.e., including IIF operated by banks as well as EIF operated by non-financial institutions) and narrow sense (i.e., including EIF only). This paper regards it as one of the crucial reference definitions.

**Table 4** Definitions of e-finance, fintech and digital finance

	<b>Paper</b>	<b>Definition</b>	<b>Use of terminology</b>
<b>BIS</b>	Sato and Hawkins (2001)	<i>E-finance</i> : The provision of financial services over the internet or other public electronic media. This includes money, banking, payments, trading, broking, insurance etc. Also known as " <i>digital finance</i> ". Subset of e-commerce.	Sometimes the terms " <i>online finance</i> ", " <i>Internet finance</i> ", " <i>virtual finance</i> " and " <i>cyber finance</i> " are also used interchangeably.
<b>OECD</b>	Christiansen (2001)	<i>E-finance</i> : An electronic finance transaction is a financial transaction that depends on the Internet or a similar network to which households or non-financial enterprises have access.	The words <i>e-finance</i> , <i>online finance</i> and <i>Internet finance</i> are in practice used interchangeably
	OECD (2018)	<i>Fintech</i> : Fintech involves not only the application of new digital technologies to financial services but also the development of business models and products which rely on these technologies and more generally on digital platforms and processes.	
<b>UNCTAD</b>	Goldfinger and Perrin (2001)	<i>E-finance</i> : E-finance is financial services delivered through Internet(i.e., online). It includes online brokerage, banking, insurance and other financial services.	-
<b>Individual</b>	Schueffel (2016)	<i>Fintech</i> : Fintech is a new financial industry that applies technology to improve financial activities.	
<b>McKinsey Global Institute</b>	Manyika et al. (2016)	<i>Digital finance</i> : Digital finance is financial services delivered via mobile phones, the internet or cards.	

Since 1995, internet finance has sprouted and developed rapidly in China, which can be roughly divided into the following three periods:

- (1) The first stage was the period before 2005. The combination of internet and finance was mainly embodied in the technical support for financial institutions, which helped financial institutions make the transformation from traditional business. For example, in 1997, China

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Merchants Bank was the first player to establish Chinese first online banking called "All In One Net" (Yang & Yang, 2000). In this period, there was not real form of internet finance, which was often referred to "Network finance", which means banks expand new business depending on internet technology (PBOC, 2014).

(2) The second phase is 2006-2012. This period was mainly marked by the germination of third-party payment and online lending. The combination of internet and finance began to deepen from the technical field to the financial business field. P2P lending platforms in China have been emerging and developing fast since 2006 (ISC, 2014). By the end of 2013, there were more than 350 active P2P lending platforms nationwide, with a total turnover of over 60 billion yuan. Besides, this kind of innovative development mode also got the country's encouragement and support. The outstanding evidence is that in 2011, People's Bank of China began to issue third-party payment licenses (i.e., PBOC approves non-financial institutions to engage in payment business), marking the development of third-party payment institutions has been paved a standardized way (PBOC, 2014).

(3) The third phase began in 2013. With the emergence of Alibaba, internet finance has developed rapidly from the gestation state in the previous stage (Shen & Huang, 2016). Since then, P2P lending platforms have developed promptly and the number of internet finance companies has grown exponentially (PBOC, 2014). As of June 2014, the turnover in the half year was close to 100 billion yuan, close to the turnover in the whole year of 2013 (ISC 2014). The start of crowdfunding platforms implies that the development of internet finance has entered into a new stage (ISC, 2014).

## 2.3 The status of three major internet finance modes

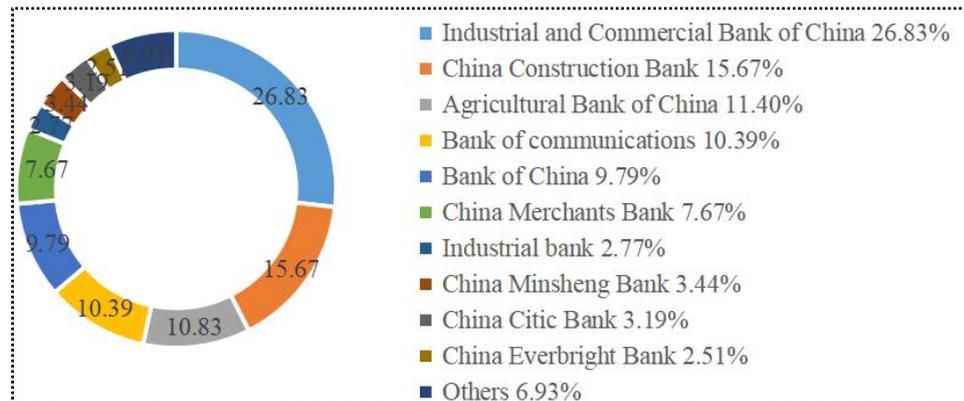
As introduced, Chinese internet finance is divided into three main business modes, and this section will introduce the status of these three modes.

### 2.3.1 Internal internet finance (IIF)

Model 1 is internal internet finance (IIF). With the official establishment of China Bank Card Association in 2002, commercial banks in China opened the era of online banking. By 2005, online banking which depends on PC to complete transactions, had entered a mature stage (ISC 2014). In 2005, the number of personal online banking users in China was 34.6 million, an increase of 103.5% over 2004. In 2006, this scale increased to 70 million households, with an annual growth rate of 102% (iResearch, 2006). United States, the birthplace of online banking, had 72.8 million online banking users in 2006 with a growth rate of only 9.7% (iResearch, 2008). Then, with the rise of internet payment, commercial banks developed the emerging business mode of mobile banking (ISC, 2014), which depends on smartphones to complete transactions. According to data from Analysys (Analysys, 2018), in the fourth quarter of 2018, the transaction volume of online banking was 501.7 trillion yuan, up 2.8% from the previous quarter. The transaction volume of personal online banking decreases, while that of enterprise online banking keeps growing. The transaction volume of mobile banking were 77.1 trillion yuan, up 8.8% from before. In general, personal online banking tends to be replaced by mobile banking and third-party payment. In addition, online banking tends to be appreciated by large state-owned commercial banks and joint-stock commercial banks, and users are concentrated in a few large banks. According to the *Figure 3*, as of 2018, the market share for top 10 banks in

terms of online-banking transaction volume has exceeded 90%.

**Figure 3** China's Online Banking transaction share, 2018



Data source: Annual reports of banks and [www.analysis.cn](http://www.analysis.cn)

### 2.3.2 External internet finance(EIF)

#### 2.3.2.1 Third-party payment (TPP)

Mode2 is third-party payment (TPP). TPP is the payment service provided by non-financial institutions (PBOC, 2010). Under this payment mode, customers could open an account in a payment institution and transfer deposits from their bank account to this payment account. After the customer and seller reach a deal, the TPP platform will inform the signing bank to transfer money to the payment account, but the TPP platform will not pay the money to the seller until the customer receives the goods. Therefore, the third-party payment business is actually a currency transfer business.

According to the business operation mode of TPP provided by iResearch (2018), the following part will summarize the overlapping between the current TPP and the traditional banking business in China and identify possible impacts on bank profitability:

(1) *Competition in deposit business:* On the one hand, the interest rate of money fund of TPP is

higher than that of demand deposits in commercial banks, thus attracting bank customers to transfer their deposits to the TPP platforms. This phenomenon diverts demand deposits from banks and reduces their credit creation ability. On the other hand, depending on their own credit, TPP platforms provide guarantee for credit of sellers. When customers encounter fraud from sellers, platforms would be responsible for the full compensation. Credit guarantee function of TPP platforms attracted customers to transfer their demand deposits from banks to platforms, which diverts demand deposits of commercial banks directly.

- (2) *Competition in loan business:* TPP has begun to enter the credit market through cooperation with online lending platforms. It perhaps has indirectly substitute the lending from commercial banks that targets medium and small enterprises.
- (3) *Competition in intermediary business:* Relying on online channels, TPP can significantly reduce operating costs compared with traditional commercial banks, which rely on the offline channels, thus providing relatively lower commission charges. Therefore, it attracts the transfer of old customers of commercial banks and other new customers, which deprives commercial banks of non-interest income.

By the end of 2018, the TPP transaction volume in China had exceeded 300 trillion yuan, which is 164 % of deposit in banking financial institutions (PBOC, 2018), showing explosive growth compared with 16 trillion yuan in 2013. In 2013, TPP institutions were officially supervised by Central Bank (Analysys, 2012). In 2018, the regulatory system was further improved: The regulatory authorities required payment institutions to set up reserve accounts in central bank instead of commercial banks. In addition, the proportion of reserves in

the centralized deposit has been gradually increasing, and the plan is to reach 100% in 2019 (iResearch, 2018). At present, with the stricter regulation and orderly development of the market, the growth rate of TPP transaction volume has initially stabilized (iResearch, 2018).

### ***2.3.2.2 Peer-to-peer lending(P2P) and crowdfunding***

Mode3 includes peer-to-peer lending(P2P) and crowdfunding. P2P refers to the direct lending between individuals through the internet platforms (PBOC, 2014). Since 2013, with the industry consolidation and more shareholders from state-owned institutions in P2P firms, Chinese P2P industry has become increasingly powerful and then the world's largest one (ISC, 2014). However, the supervision of P2P platforms in China has big flaws: (1) The industry association can act as the main regulatory body; (2) There is not a minimum requirement for registered capital. These regulatory problems may tempt raising illegal funds involved in, which will increase the risks of P2P platforms and reduce the trust from investors (Huang, 2018; Wang, Shen, & Huang, 2016). In addition, in traditional lending markets, banks usually prudently use collateral as security, to increase creditworthiness of borrowers; but the lack of such a mechanism in online transactions means that lenders do not know the creditworthiness of borrowers as well as borrowers do. Therefore, a borrower's online credit has become a key indicator to assess the default risks (Huang, 2018; Wang et al., 2016). By 2018, the number of P2P platforms had dropped to 1,021 due to strengthened industry supervision and concentrated outbreak of borrower default risk, and the transaction volume was on a downward trend of 179.481 billion yuan (WDZJ, 2018).

Crowdfunding refers to the financing mode which raises small amount of funds for a business or activity through the internet platforms (PBOC, 2014). Crowdfunding started in 2011 as the first platform named Demohour emerged in China. With a late beginning and the immaturity of Chinese financial market, although the demand of Chinese crowdfunding is not small, the development speed of this mode is still slow and the scale is small (ISC, 2014).



## CHAPTER III LITERATURE REVIEW

Firstly, this section will highlight some of the most widely studied determinants on the profitability of commercial banks to date, in order to identify research advances in traditional determinants. Secondly, this section would focus on the topic of the impact of internet finance on bank profitability around the world. Corresponding to the research scope of this paper, we further target the research country to China, to identify the research status of the above topic in the context of China. As one of determinants for bank profitability, IF is the core explanatory variable in this study, so that the research methods used to link internet finance with the bank profitability is another point of the literature review. Based on the literature review of the above three aspects, the last part will summarize the current research status and identify the research areas that have not yet been involved, so as to illustrate the contribution of this paper.

### 3.1 The determinants of bank profitability

The most commonly used indicator to measure the profitability of commercial banks is return on asset (ROA) (Athanasoglou et al., 2008; Bikker & Hu, 2002; Demirgüç-Kunt & Huizinga, 2000), which is the ratio of net profit to total assets. It reflects the conversion ability between assets and net profit in commercial banks, so it is widely used in various literature as the core ratio to capture bank profitability (Athanasoglou et al., 2008; Claessens & Laeven, 2003; Demirgüç-Kunt & Huizinga, 1999; Dietrich & Wanzenried, 2011, 2014; Kohlscheen et al., 2018; Molyneux & Thornton, 1992; Sufian & Habibullah, 2009). In addition, as a robustness check, return on equity (ROE) and net interest margin (NIM) are often considered as supplementary

evidence to measure profitability (Athanasoglou et al., 2008; Demirgüç-Kunt & Huizinga, 1999; Dietrich & Wanzenried, 2011, 2014; Kohlscheen et al., 2018; Molyneux & Thornton, 1992). However, when the ROE (net profit/equity) is high, the leverage ratio (total assets/equity) is likely to show a higher value due to low equity. This means that bank profitability, measured by ROE, ignores the higher risks of high leverage (Dietrich & Wanzenried, 2011). NIM can be interpreted as a rough index of bank efficiency (Demirgüç-Kunt & Huizinga, 1999), but it focuses on the profit earned on interest activities without considering the impact of non-interest income (Dietrich & Wanzenried, 2014).

**Table 5** The traditional determinants of bank profitability

<i>Literature</i>	<i>Factors</i>	<i>Scope</i>	<i>Research method</i>	<i>China included</i>
Bourke (1989); Molyneux and Thornton (1992)	(1)(2)(3)	12 countries in Europe; 1972-1981 18 countries in Europe; 1986-1989	OLS	NO
Demirgüç-Kunt and Huizinga (1999)	(1)(2)(3)	80 OECD, developing countries and economies in transition; 1988-1995	Weighted least square	NO
Athanasoglou et al. (2008)	(1)(2)(3)	Greek banks; 1985-2001	GMM	NO
Sufian and Habibullah (2009)	(1)(3)	Chinese 220 banks; 2000-2005	FE	YES
Dietrich and Wanzenried (2011)	(1)(2)(3)	Switzerland 372 banks; 1999-2009	GMM	NO
Dietrich and Wanzenried (2014)	(1)(2)(3)	118 low-, middle-, and high-income countries; 10165 banks; 1998-2012	GMM	YES
Kohlscheen et al. (2018)	(1)(2)	19 emerging countries, 534 banks; 2000-2014	GMM	YES
Lin and Zhang (2009)	(1)(3)	60 Chinese banks; 1997-2004	OLS	YES
García-Herrero, Gavilá, and Santabàrbara (2009)	(1)(2)(3)	87 Chinese banks; 1997-2004	GMM	YES
Heffernan and Fu (2010)	(1)(2)	76 Chinese banks; 1999-2006	GMM	YES
Said and Tumin (2011)	(1)(2)	4 Chinese SOCBs, 9 Malaysia banks; 2001-2007	FE	YES
Tan and Floros (2012)	(1)(3)	101 Chinese banks; 2003-2009	GMM	YES
Tan (2016)	(1)(2)(3)	41 Chinese banks; 2003-2011	GMM	YES

**Note:** The last column is to identify whether these traditional determinants apply to research in the context of China

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As shown in *Table 5*, a bank's profitability depends on (1) bank-specific factors (2) macro factors and (3) industry-level factors.

### ***3.1.1 Bank-specific factors***

Generally speaking, the analyses of bank-specific factors involves bank size, capitalization, liquidity risk, credit risk and operating efficiency.

*Bank size:* At the level of multi-country study, 80 countries from 1988 to 1995 were selected as a sample by Demirgüç-Kunt and Huizinga (1999). The result seems to be inconsistent with the efficiency hypothesis referred to the introduction: Although large banks are more efficient, it does not have a positive impact on their profitability. This finding has been confirmed in developed economies studied from Goddard, Molyneux, and Wilson (2004); Pasiouras and Kosmidou (2007) or Dietrich and Wanzenried (2014)'s updated empirical research on 118 countries from 1998 to 2012. The latest study found that in emerging economies, as banks grow in size measured by the logarithm of total assets, their profitability even decline (Kohlscheen et al., 2018). Using the same proxy of bank size, Sufian and Habibullah (2009) and Lin and Zhang (2009) also found negative relationship between size and bank profitability for Chinese banking industry. Similar to Demirgüç-Kunt and Huizinga (1999)'s research, there is also evidence from Said and Tumin (2011) and Tan and Floros (2012), showing that the bank size does not affect bank profitability for Chinese cases.

*Capitalization:* Studies of capital ratios show a uniform result, that is, more well-capitalized banks are considered safer (i.e. lower risk), lower-risk banks might reduce

funding cost due to increased creditworthiness thus more profitable (Athanasoglou et al., 2008; Bourke, 1989; Demirgüç-Kunt & Huizinga, 1999; Dietrich & Wanzenried, 2014; García-Herrero et al., 2009; Kohlscheen et al., 2018; Molyneux & Thornton, 1992; Said & Tumin, 2011; Sufian & Habibullah, 2009). In particular, when Dietrich and Wanzenried (2014) subdivided the research scope into banks from three-level income countries (low-, medium- and high-level), using generalized method of moments (GMM), this variable only showed a positive effect for banks in high-income countries, but the effect was not significant for banks in other two categories. Here, the risk-return hypothesis was proposed to argue that lower profitability resulted from lower risk (i.e. higher capitalization) undertaken by banks, which forms opposite effect against the positive safety effect mentioned in the first line of the paragraph. Then, in high-income countries, positive safety effect might overcompensate negative risk effect. In medium- and low-income countries, however, these two effects cancel each other out. In addition, using GMM method as well, in the study of Dietrich and Wanzenried (2011), based on the background of financial crisis, the capital ratio presents negative sign related to the profitability of Swiss banks. In terms of improving the profitability of China's commercial banks, the higher CAR does not show a consistent result: Some empirical results show positive effect (García-Herrero et al., 2009; Said & Tumin, 2011), while some evidence shows no effect (Heffernan & Fu, 2010; Tan, 2016).

*Liquidity risk:* There is no uniform standard for measuring liquidity risk. Proxies include liquidity ratio (i.e. liquid assets/total assets) (Bourke, 1989; Heffernan & Fu, 2010; Kohlscheen et al., 2018; Molyneux & Thornton, 1992; Said & Tumin, 2011), loan assets ratio (total loan/total assets) (Demirgüç-Kunt & Huizinga, 1999; García-Herrero et al., 2009; Lin &

Zhang, 2009; Sufian, 2009; Tan, 2016; Tan & Floros, 2012), loan-to-deposit ratio (total loans/total deposits) (Liu & Lin, 2016). Based on the review of above literature, it is found that the research results of this variable are not uniform neither at the multi-country level nor single-country level, so the following focus is on Chinese studies: Sufian and Habibullah (2009) has chosen Chinese state-owned commercial banks (SOCBs), joint-stock commercial banks (JSCBs) and urban commercial banks (UCBs) from 2000 to 2005 as three group samples, using loan assets ratio to measure the effect of liquidity risk on bank profitability. The mixed panel data was estimated with fixed-effect model. They found that this variable only has significant impact on profitability of SOCBs. Furthermore, SOCBs group with less liquidity show higher profitability. Moreover, for a sample from 2003 to 2011 including three types of banks above: In the newer study, using GMM method to conduct regression analysis on the data of 41 Chinese commercial banks, Tan (2016) also found evidence of negative relationship of liquidity with profitability. Besides, there are also some evidence that this variable does not affect Chinese bank performance (García-Herrero et al., 2009; Lin & Zhang, 2009; Said & Tumin, 2011; Tan & Floros, 2012).

*Credit risk:* Some empirical studies confirmed that higher credit quality leads to lower credit risk and higher profitability - fewer bad loans are expected, so are loan-loss provisions (Athanasoglou et al., 2008; Dietrich & Wanzenried, 2011, 2014). Studies of China, to the contrary, have found evidence supporting that higher credit risk can leads to higher profitability (Heffernan & Fu, 2010; Sufian & Habibullah, 2009; Tan, 2016). Among them, the positive effect of loan loss provision (i.e. higher credit risk) on the performance of SOCBs and JSCBs is significantly greater

than that of UCBs (Sufian & Habibullah, 2009). The probably reason is the former two types of banks with bigger size have the capacity to take greater risks, so they enjoy greater immediate profits brought from higher-risk bonds. But at some point, they have to reserve more for possible losses (Heffernan & Fu, 2010).

*Operating efficiency:* Operating efficiency is a very important factor to measure a bank's profitability. Whether measuring operating efficiency based on cost-to-income ratio (operating costs/total revenue) (Dietrich & Wanzenried, 2014; Heffernan & Fu, 2010; Kohlscheen et al., 2018; Lin & Zhang, 2009; Said & Tumin, 2011) or management efficiency (overheads/total assets) (Athanasoglou et al., 2008; Demirgüç-Kunt & Huizinga, 1999; Sufian & Habibullah, 2009; Tan & Floros, 2012), a large number of results show that higher operating efficiency can lead to greater profits for banks. Moreover, studies in China provide similar evidence (Heffernan & Fu, 2010; Lin & Zhang, 2009; Said & Tumin, 2011; Tan & Floros, 2012).

Finally, as noted in Sufian and Habibullah (2009)'s study, more non-traditional activities measured by non-interest income related to total assets could explain higher bank profitability in China. However, this factor is insignificant in Lin and Zhang (2009) and Tan (2016)'s research. Another factor noticed in Demirgüç-Kunt and Huizinga (1999)'s paper, that is, asset structure measured by non-interest earning assets related to total assets has negative relation with bank performance.

### 3.1.2 Macro factors

The second set of determinants of profitability involves *inflation, gross domestic product(GDP) growth* and *long-term interest rates*. For these three variables, most studies show that they are positively correlated with profitability (Demirgüç-Kunt & Huizinga, 1999; Kohlscheen et al., 2018; Molyneux & Thornton, 1992; Sufian & Habibullah, 2009). GDP is the most commonly used macroeconomic indicator to measure total economic activity within an economy. Better economic conditions will promote the increase of loan demand, and the increase of loan interest income will lead to the improvement of performance (Dietrich & Wanzenried, 2011; Sufian & Habibullah, 2009). In the case of anticipated inflation, the interest rates are adjusted accordingly resulting in faster increasing of revenues than costs, subsequently, exerting positive impact on bank profitability (Sufian & Habibullah, 2009). Higher levels of long-term interest rates tend to increase bank profitability by raising net interest margins, since a higher rate could be charged from borrowers (Kohlscheen et al., 2018). In addition, Athanasoglou et al. (2008); Bikker and Hu (2002); Demirgüç-Kunt and Huizinga (2000) noted the impact of the business cycle on bank profitability and found a correlation between them.

Recently, Kohlscheen et al. (2018) compared the influence of long-term interest rate and short-term interest rate on bank profits, observing that the coefficient of long-term interest rate was 2-4 times larger than that of short-term interest rate, which indicates that movements on the longer end of the yield curve have much stronger implications for profits: The increase of one percentage point in the long-term rate could raise the ROA by between 12 and 15 basis points, while only 3-6 basis points decrease of ROA regarding short-term rate.

### 3.1.3 Industry-level factors

The third group of variables are industry-level factors representing market structure, which are carried out in terms of market concentration and financial system development:

*Market concentration:* The market concentration has a significant influence on the profitability of banks, and some studies found that the influence is positive (Bourke, 1989; Demirgüç-Kunt & Huizinga, 1999; Dietrich & Wanzenried, 2011; Molyneux & Thornton, 1992; Tan, 2016). This supports the SCP hypothesis by Bikker and Bos (2008), arguing that banks in highly concentrated markets earn oligopolistic rents, because they tend to collude. In addition, the efficiency hypothesis, mentioned in the introduction, stating that "A greater market share and stronger performance are the results of higher efficiency.", can also give a reasonable explanation for this result. However, recent empirical studies, including for China, have shown the opposite result: More asset-intensive industry environments undermine bank profits (Dietrich & Wanzenried, 2014; Tan & Floros, 2012). This finding echoes Baumol (1988)'s contestable market theory (CMT), suggesting that if there is no barrier for entrants, the weak would be driven out of the market as competition intensifies and only the strong survive, which results in higher concentration but less profitability. In other words, in this case, a concentrated industry can still behave competitively thus less profitability, with a negative relationship between bank concentration and performance. Meanwhile, Boone and Weigand (2000) gave a similar explanation for the negative correlation between performance and market concentration: Increased competition might force the least efficient firms to exit, thereby raised concentration having a negative effect for profitability.

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*Financial system development:* As an indicator reflecting the scale of the industry, the development level of the banking industry also plays a significant role. Demirgüç-Kunt and Huizinga (1999) constructed a data set of 80 countries including all OECD countries, many developing countries and economies in transition from 1988 to 1995, to compare the impact of the development level of banking industry and stock market on bank performance. The results show that the more developed the financial system is, the more intense competition among banks would be, and bank profitability would be negatively affected. However, the impact will be weakened in the relatively richer countries. The possible reason is in richer countries, where stock markets are more developed, better availability of information makes it easier for banks to identify and monitor potential borrowers. The banks are willing to lend to them, thus boosting their business and profits. Moreover, a bigger stock market brings wider interest margin to banks. But this effect is limited, especially in richer countries. For richer countries, because more developed stock markets can compete with banks in terms of financing, it is relatively more difficult for banks to attract shareholder, which reduces their loan capacity and indirectly leads to less demand for deposits and lower interest margins. Recent developments in Chinese banking sector seem to tell a different story: Because of large population in China, demand for banking services is high. Although a more developed banking sector would increase competition, increased demand would do more to boost bank profitability (Tan, 2016; Tan & Floros, 2012).

### 3.2 The impact of internet finance on the profitability of commercial banks

The literature that links internet finance and bank performance is limited, and previous studies mostly focus on internal internet finance.

#### 3.2.1 *Internal internet finance(IIF)*

Positioned in the context of IIF, this part would review the literature concerned with the impact of online banking on bank profitability.

Because the world's first bank using internet technology was born in the United States (DeYoung et al., 2007), and United States is very advanced in the field of electronic banking including online banking (Simpson, 2002), research on the early online banking mainly confined to American and later European banking systems. DeYoung et al. (2007) looked at 424 community banks that adopted online banking in the United States from 1999 to 2001 and compared them with brick-and-mortar banks that did not. They constructed dummy variables to capture the impact of online banking on the performance of physical banks and carried out regression analyses with ordinary least square (OLS) method on 38 performance determinants. The empirical results show that adding internet delivery channels into existing physical bank branches will greatly improve the profitability of banks. This is consistent with findings from Furst, Lang, and Nolle (2002); Hasan, Maccario, and Zazzara (2002). Meanwhile, similar to the literature by Hernando and Nieto (2007), they also propose that online banking and physical banking are complementary rather than substituted. Based on the unbalanced panel data of 72 commercial banks in Spain from 1994 to 2002, Hernando and Nieto (2007) used random-effect model with generalized least squares(GLS-RE) method and two step instrumental variable(IV) method to analyze the model. Under the IV method which could control possible endogeneity of

IIF dummies as well as bank-specific control variables with performance variables, the ROA and ROE of banks have been significantly improved after three years of internet adoption. With GLS-RE method, this effect only significantly affects ROE. A few scholars also found that online banking did not affect the profitability of banks (Carlson, Furst, Lang, & Nolle, 2001; Sathye, 2005; Sullivan, 2000). For new banks, however, the adoption of internet technology could even undermine their profitability (Furst et al., 2002; Sullivan, 2000). When new banks rely heavily on internet-based business strategy, they would spend full cost to offer online banking, which is not prohibitive but may be significant for them to be unprofitable (Furst et al., 2002).

As for recent years, there are just limited studies focused on relationship between bank performance and online banking in developing countries: Akhisar, Tunay, and Tunay (2015) collected data on the number of customers using online banking to be a proxy of IIF and performance-related data of 23 developed and developing countries from 2005 to 2013, to conduct regression analyses with GMM method. Their results show that the use of online banking has a negative impact on the profitability of banks, which is likely due to high infrastructure costs, high advertising costs and fewer customer groups. In addition, the study from Onay, Ozsoz, and Helvacioğlu (2008) provides another possible explanation, that is, the role of online banking has a time lag. Their samples are 13 Turkish banks using online banking services between 1996 and 2005, which estimated by OLS method. The regression results showed that although a significant decrease in profitability was observed in the first year of online banking adoption, the positive impact on ROE started in the second year and became significant in the third year. This is consistent with the findings of Hernando and Nieto (2007) in Spain and Sadr (2013) in Asian

countries. Based on the performance data of 85 commercial banks in India from 1998 to 2006 (49 of which have online banking services), the dummy variable of online banking was constructed. Using OLS method, Malhotra and Singh (2009) found that online banking was not related to the profitability of banks, and even reduced the performance of private and emerging banks. The only evaluation related to online banking from the perspective of China's banking system was carried out by Yang et al. (2018). However, the shortcoming is that this study aimed at a larger scope - electronic banking, so it cannot further explain the impact of online banking on bank performance. They selected 5 large SOCBs from 2003 to 2013 as the sample and divided the development stage of China's electronic banking into the development stage and the developed stage respectively. Then they carried out descriptive statistics on the cross-sectional data of the financial ratios of 5 banks in terms of these two stages. Next, t-test was used to judge whether there were significant differences between the two groups of data. The results show that the adoption of e-banking in China has significantly improved the performance of bank over time.

### 3.2.2 *External internet finance(EIF)*

The literature linking EIF to bank performance is very limited. De Roure, Pelizzon, and Thakor (2018); Tang (2019) found the substitution relationship between P2P and bank lending, predicting that the emergence of P2P might lead to the contraction of the banking sector, but did not point out the impact of P2P on bank performance. The only three papers that focus on the impact of P2P on bank performance were recently published by Tobing and Wijaya (2020), Chen et al. (2020) and Du and Lang (2020). Tobing and Wijaya (2020) took 86 commercial banks

in Indonesia from 2017 to 2019 as a sample, and most of their study referred to the research methods from Chen et al. (2020). They also found that the existence of P2P broke down bank profits, but the dependence of TPP on banking services will lead a positive impact on bank profitability. Obviously, the latter conclusion is different from the other two investigations that focus on the influence of EIF on bank performance in the context of China: Taking the data of 200 commercial banks in China from 2011 to 2016 as a sample and starting from the narrow sense of internet finance, Chen et al. (2020) constructed a fixed effect model containing P2P and TPP, and the empirical results showed that EIF measured by P2P and TPP transaction volume has a negative impact on the profitability of commercial banks, and this impact is more subject to TPP. The negative effect of TPP was caused by the increased competition on deposit from TPP platforms, forcing banks to raise interest rate on deposit to attract depositors thus more interest expenses then less profitability. Du and Lang (2020) adopted the same method as Chen et al. (2020) to measure EIF, but their research focuses on Chinese A-share listed commercial banks from 2007-2017. The innovation is the interest rate liberalization is considered as a determinant of bank performance and its interaction effect with the internet finance was captured: Consistently, P2P and TPP have negative impacts on bank profitability. Moreover, interest rate liberalization will exacerbate the negative effect. This phenomenon could be explained as the interest rate liberalization intensifies the market competition, thus more unfair competition as well. But China's immature financial markets are not ready to cope with it.

### *3.2.3 Review of Chinese-language literature*

Last but not least, in order to fully cover the scope of literature review, this paper also focuses on Chinese-language literature in line with the research topic published in Chinese core journals: Coinciding with the rapid development of internet finance in China, domestic research on internet finance has also increased since 2013 (Sheng & Liu, 2017). After searching the literature related to this research topic, we found that most of the existing literature stayed in the qualitative analysis of the impact of internet finance on bank profitability, and the literature of quantitative analysis was also relatively limited. This conclusion can be verified in statements of Huang and Huang (2016); Sheng and Liu (2017).

Since this study aims to quantitatively analyze the relationship between internet finance and bank profitability, the following pays more attention to the literature of quantitative analysis: By collecting questionnaires and based on the opinions of 42 experts, using mathematical statistics, Wang (2015) constructed a measure index system to capture the impact of internet finance on the profitability of commercial banks in China. The results show that the liability business of the bank has been greatly impacted, but the asset business and intermediary business have been little impacted. Besides, Huang and Huang (2016); Liu and Lin (2016); Sheng and Liu (2017) all adopted the "text mining method" in the study of Sheng and Guo (2015), which based on word frequency statistics using text mining to construct the internet finance index, thus indirectly measuring the development trend of internet finance. This indicator can only measure internet finance in aggregate level instead of measuring various modes of internet finance separately. The research of Liu and Lin (2016); Sheng and Liu (2017) shows that the

development of internet finance significantly reduces the profitability of commercial banks, and has the greatest impact on UCBs, but little impact on SOCBs. However, the study of Huang and Huang (2016) shows the opposite result: Internet finance improves the profitability of commercial banks through technology spillover. Finally, the most similar research to this paper is from Gu and Yan (2019). They took the quarterly data of 125 commercial banks from 2013 to 2017 as the research sample and used fixed-effect model with ordinary least squares(OLS-FE) method, with the measurement of EIF using nature logarithm of transaction volume of P2P and TPP. The results show that TPP has a significant and negative impact on the profitability of commercial banks, with the largest impact on JSCBs and the smallest impact on UCBs. However, P2P has no significant relationship with bank performance.

So far, based on existing literature, it is found that:

- (1) The bank-specific factors that determine the profitability of commercial banks mainly include bank size, capital ratio, liquidity risk, credit risk and operating efficiency. Among them, there is plenty of evidence suggesting sufficient capital and higher operating efficiency can bring greater profits to banks. But the impact of capital ratios in Chinese banking system seems uncertain. In most countries, bank size does not seem to improve performance, as it does in China. There is no consistent conclusion on the impact of liquidity risk in the studies of various countries, while the empirical experience of China shows that this indicator cannot improve the performance of banks. In general, banks with less credit risk are more profitable, but evidence to the contrary has emerged among China's large banks.

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- (2) In terms of macro factors, GDP growth, inflation and long-term interest rate have positive effects on banking sector. In addition, industry-level factors such as market concentration and financial system development represent the characteristics of the whole banking market, playing a significant role in the performance of each bank.
- (3) Up to now, the research on the relationship between internet finance and bank profitability is quite limited, and most of them focus on the scope of IIF: In developed countries, there is more evidence that the adoption of online banking can improve the profitability of banks. Although some experience shows that the impact is not significant, it is likely due to time lag. Consistent evidence of this effect has also been found in developing countries. In the field of EIF, among the English-language literature, only three papers published in 2020 studied the influence of P2P and TPP on bank performance. If the scope is confined to China, there are less literature that echoes this topic. Regarding Chinese-language literature, most studies focus on qualitative analysis. While in the quantitative analysis studies noted by this paper, there is only one that used P2P and TPP transaction volume to measure internet finance. So far, no research has focused on exploring the impact of both IIF and EIF simultaneously on bank profitability.
- (4) From the perspective of data and research methods, according to the literature reviewed above (*Table 5 and Table 6*): GMM and OLS-FE method are the most frequently employed in exploring the relationship between traditional factors and bank performance. Employing dummy variables to capture IIF, most studies use OLS and GLS-RE method to examine association of IIF and bank profitability. And the research on China is only limited to

**Table 6** Internet finance and bank profitability

	<i>Study</i>	<i>Country, time period and sample size analyzed</i>	<i>IF proxy</i>	<i>Research method</i>	<i>Impact of IF</i>
<i>Internal Internet Finance</i>	Sullivan (2000)	Tenth Federal Reserve District, 2000; 1618 banks	Comparison between internet and non-internet banks	Descriptive statistics	Insignificant
	Carlson et al. (2001)	U.S., 1998-2000; 2517 National Banks	Dummy variable	OLS	Insignificant
	Hasan et al. (2002)	Italy, 1993-2000; 105 banks	Dummy variable	OLS	+
	Sathye (2005)	Australia,1997-2001 ; 61 Credit Unions	Dummy variable	Descriptive statistics	Insignificant
	Hernando and Nieto (2007)	Spain, 1994-2002 ; 72 commercial banks	Dummy variable	GLS-RE, IV	+
	DeYoung et al. (2007)	U.S.1999-2001; 434 community banks	Dummy variable	OLS	+
	Onay et al. (2008)	Turkey,1996-2005; 14 commercial banks	Dummy variable	OLS-FE	+
	Malhotra and Singh (2009)	India,1998-2006; 85 commercial banks	Dummy variable	OLS	Insignificant
	Akhisar et al. (2015)	23 developed and developing countries, 2005-2013; country-level data	The number of customers using IB	GMM	-
	Yang et al. (2018)	China,2003-2013; 5 state-owned banks	Comparison between developing and developed IF stage for 5 SOCBs	Descriptive statistics	+
<i>External Internet Finance</i>	Tobing and Wijaya (2020)	Indonesia, 2017-2019; 86 commercial banks	The transaction volume of P2P and TTP	OLS-FE	P2P: - TTP: +
	Chen et al. (2020)	China, 2003-2013; 200 commercial banks			P2P: - TTP: -
	Du and Lang (2020)	China, 2007-2017; A-share listed banks		OLS	
<i>Chinese-language Literature</i>	Wang (2015)	China	Measure index system	Questionnaire, statistics	Liability business has been impacted most
	Liu and Lin (2016)	China, 2003-2014; 145 commercial banks	Index of internet finance	GMM	-
	Sheng and Liu (2017)	China,2005-2015 ; 101 commercial banks			
	Huang and Huang (2016)	China,2006-2014 ; 98 commercial banks		OLS-FE	+
	Gu and Yan (2019)	China, 2013-2017 ; 125 commercial banks		The transaction volume of P2P and TTP	OLS-FE

descriptive statistics of cross-sectional data. As regards EIF, in the only three English-language studies reviewed above, two scholars adopted OLS-FE method to estimate the impact of internet finance on bank performance. Looking at Chinese-language literature, Index of internet finance is mostly used to capture IF in China. Both GMM and OLS-FE are used to serve as the estimation methods.



## CHAPTER IV CONCEPTUAL FRAMEWORK

As shown by Hernando and Nieto (2007), traditional banks can reduce branch and labor costs after adopting online banking, thus reducing administrative costs. In addition, the internet delivery channel is a technology of low variable cost, that is, its unit cost falls rapidly as output increases. The rapid decline in unit costs of online banking is due to the existence of economies of scale : Economies of scale are defined as the rate at which output changes as all inputs are varied simultaneously (Bikker & Bos, 2008). Internet delivery channels generate economies of scale that exceed traditional distribution channels. So as output grows, unit costs fall faster than traditional banks' business mode (Delgado et al., 2007; DeYoung, 2005), which makes a bank more efficient. On the basis of efficiency hypothesis, IIF might serve as one of bank-specific determinants, which could raise efficiency through lower transaction cost, leading to higher bank profitability.

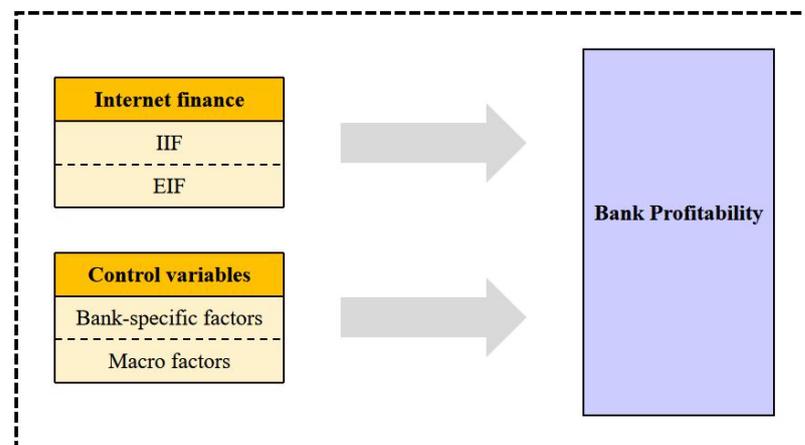
EIF is operated by non-financial institutions. TPP institutions and P2P platforms upgrade the contestability of the banking industry from the following aspects: First, studies from De Roure et al. (2018) and Tang (2019) show that P2P platforms are complementary to banks in microfinance. However, for marginal borrowers of banks, loans provided by banks can be substituted by loans from P2P. In other words, to some extent, P2P usurps the loan service of traditional banks, making the loan market more competitive. Second, based on the analysis in the background of study, it can be found that aiming at the same customer group, TPP has formed a competitive relationship in terms of the deposit, loan and intermediary business with commercial

banks. This could increase the competition of bank industry. In other words, TPP might be substitution rather than complement for banks. Based on the SCP hypothesis, as new entrants to the financial industry, EIF could be probably one of industry-level determinants, forming the increase of competition with the decrease of market concentration. Eventually, bank profitability would be impact for the loss of oligopolistic rent.

Besides, traditional determinants<sup>1</sup> including bank-specific and macro factors are considered as control variables. Bank-specific factors are bank specific attributes, influencing bank efficiency to directly determine bank performance. Encompassing national economic conditions, macro factors could change competition in banking industry, then affecting profitability (Claessens & Laeven, 2003; Tan & Floros, 2012). On the other hand, they might affect the revenue and cost related to efficiency of banks thus change performance (Athanasoglou et al., 2008; Demirgüç-Kunt & Huizinga, 1999; Sufian & Habibullah, 2009).

In conclusion, conceptual framework of this study is shown in *Figure 4*.

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**Figure 4** Conceptual framework



<sup>1</sup> In this study, we did not include industry-level factors (e.g., concentration, yearly) to be control variables as they are collinear with EIF variables (i.e., GTPP and GP2P, yearly). Nevertheless, if SCP hypothesis holds, changing in bank competition caused by EIF industry would contain information of bank concentration.

## CHAPTER V RESEARCH METHODS

### 5.1 Data and measures

#### 5.1.1 Data source

Annual data during 2011 and 2018 were employed in this study. The data on online-banking transaction volume of 10 commercial banks (firm-level) comes from annual reports and Analysys Databases. EIF data (i.e., annual transaction volume of P2P and TPP, country-level) comes from iResearch website. The financial data with data cleaning<sup>2</sup> of 43 commercial banks (firm-level) comes from annual report<sup>3</sup> and CBRC. Macroeconomics data comes from State Statistics Bureau and China bond website. The *Table 7* lists the variable definitions and data sources used in the model.

#### 5.1.2 Bank profitability measure

Return on assets (ROA) and return on equity (ROE) are the most widely used indicators for commercial banks to comprehensively measure their profitability. ROA is used to measure the contribution of each unit of assets to net profits. The higher the index is, the stronger ability for commercial banks to convert total assets into net profits, indicating that enterprises have achieved good results by effectively using funds and increasing revenue. Following Dietrich and Wanzenried (2014); García-Herrero et al. (2009); Kohlscheen et al. (2018), return on average

<sup>2</sup> Datasets are supposed to originally contained 80 and 344 observations for each variable of 10 and 43 banks, respectively. (1) Omissions firstly made where financial data was not available, then remaining observations of ROAA, ROAE, MS, ETA, LPR and NIEAR are 340, 339, 340, 338, 339, 338 and 332 for 43 banks. No omissions appeared in 10 banks. (2) When collecting data, it is noted that ROAA and ROAE are positive in our samples, unless there are some problems with corporate governance in a given fiscal year. Negative ROAA or ROAE reflected losses for a bank, which is identified as outlier in this study. If a bank reported negative ROAA or ROAE, considering it probably resulted from other contemporaneous financial data serving as explanatory variables, all financial data has been omitted in that year. In 43-bank sample, remaining observations, in the order of the above variables listed in the first step, are 338,337,338,336,337,336 and 330. Regarding 10 banks, there are still no omissions, we finally got 80 observations for each variable.

<sup>3</sup> Consolidated statements are employed. Since the consolidated statement can better reflect the real financial and operating information of the enterprise group, to prevent the holding company from manipulating profits and modifying data.

assets (ROAA) is applied as the main indicator to measure bank profitability. Average assets value is employed, for the purpose of capturing changes in assets during the fiscal year (Dietrich & Wanzenried, 2014; Said & Tumin, 2011).

As an alternative measure, ROE reflects the efficiency of the use of shareholder funds in commercial banks, which focuses more on measuring the return on owners' investment. Following Athanasoglou et al. (2008); Dietrich and Wanzenried (2011, 2014), return on average equity (ROAE) is employed as the second measure of profitability. Similar to ROAA, average equity value is used in this study in order to capture changes in equity during the fiscal year. However, as noted in the literature review, ROE might ignore the higher risks associated with high leverage.

Therefore, ROAA is regarded as better to serve as main measure of bank profitability in the analysis. ROAE would be set as an alternative measure for a robustness check.

### ***5.1.3 Core explanatory variables***

#### ***5.1.3.1 Internal internet finance(IIF)***

IIF refers to banks expand payment business with the help of internet technology. Internet payment services of commercial banks mainly include online banking and mobile banking, depending on PC and smartphones to complete transactions, respectively. Online banking predates mobile banking in China and entered a mature stage in 2005 (ISC, 2014). Moreover, during 2013-2018, the transaction volume of online banking has far outstripped mobile banking (Analysys, 2018). Hence, we focused on the largest component of IIF, that is, online banking. In order to observe the importance level of online banking in a bank, the transaction

volume of online banking relative to total assets of each bank ( $OB_{it}/TA_{it}$ ) is selected as the proxy of IIF. Referring to DeYoung et al. (2007)'s suggestion, we have chosen the transaction volume of online banking instead of dummy variable to be a composition of IIF proxy. As discussed in conceptual framework, with the support of efficiency hypothesis, the adoption of online banking might raise efficiency for a bank due to lower transaction cost, leading to higher profitability. Therefore, the coefficient of  $OB_{it}/TA_{it}$  is predicted to be positive.

#### **5.1.3.2 External internet finance (EIF)**

EIF refers to mode2 (i.e., TPP) and mode3 (i.e., P2P and crowdfunding) mentioned in introduction. Although the demand of crowdfunding is not small in China, the development of this mode is slow and the scale is small due to the immaturity of Chinese financial market (ISC, 2014), causing data missing. Therefore, we looked at TPP for mode2 and P2P only for mode3. Considering above reasons and referring to the research of Chen et al. (2020), in this paper the transaction volume of TPP and P2P would be selected firstly. Furthermore, this study pays attention to both the development level and speed of EIF. Hence, the annual growth rate for the transaction volume of TPP and P2P ( $GTPP_{it}$  and  $GP2P_{it}$ ) would be finalized as proxies of TPP and P2P, respectively. In addition, as discussed in the conceptual framework, TPP probably bring more competition in terms of deposits, loan and intermediary business. P2P perhaps make higher contestability in terms of loan market. Therefore, both variables are predicted to be negative.

### 5.1.4 Control variables

#### 5.1.4.1 Bank-specific variables

This paper selects bank-specific variables in terms of four aspects: bank size, safety, liquidity risk and asset structure.

*Bank size:* For general commercial banks, the size of their assets can reflect their own profitability to a certain extent. That is, economies of scale enable commercial banks to reduce the marginal cost with the expansion of scale measured by assets. Big banks are more efficient to gain more market share, thus possessing market power and increasing the degree of monopoly. This could create more profit for banks. Therefore, with the support of the efficiency hypothesis, this paper employed market share on assets ( $MS_{it}$ , total assets of bank  $i$ /total assets of commercial bank industry) to capture both bank size and market power. And its coefficient is predicted to be positive.

*Safety:* The safety of banks can be reflected by capitalization and loan quality. Better-capitalized banks are considered safer (i.e. lower risk), then lower-risk banks might reduce funding cost due to increased creditworthiness thus more profits (Bourke, 1989; Demirgüç-Kunt & Huizinga, 1999; Kohlscheen et al., 2018). Consequently, equity assets ratio ( $ETA_{i,t-1}$ , equity/total assets lagged 1 year) represents capitalization of banks and the coefficient is expected as positive. Noticing a fact related to cash dividend, when it is declared, it does not mean profit has been paid out in form of dividends. Then contemporaneous equity would decrease because of less retained earnings, which corresponds to argument from Demirgüç-Kunt and Huizinga (1999). Nevertheless, total assets would be still constant because the increase of same amount happened in dividends payable belonging to liability items, leading to bias of ETA. In this case, following

their study, we also used the total assets lagged 1 year which have not included contemporaneous profits, to correct the bias for equity asset ratio as far as possible. Secondly, the loan quality of commercial banks is an important aspect of its safety and a necessary condition for its sustainable development. Banks with high-quality loans have correspondingly low credit risks and more expected interest income, which improves performance. The credit risks of banks can be captured by the loan provision ratio ( $LPR_{it}$ , loan loss provision/total loan) (Dietrich & Wanzenried, 2011), with a negative sign to be predicted. To sum up, this paper selected  $ETA_{i,t-1}$  and  $LPR_{it}$  as control variables to measure the impact of asset safety on bank profitability.

*Liquidity risk:* Liquidity risk arising from the possible inability of banks to accommodate decreases in liability or fund increases on assets' side of balance sheet (Sufian & Habibullah, 2009; Tan, 2016), is regarded as an important factor of bank profitability. Following studies of Demirgüç-Kunt and Huizinga (1999), Sufian and Habibullah (2009) and Tan (2016), this paper chose loan assets ratio ( $LAR_{it}$ ) to measure liquidity risk. With less liquidity (i.e., higher liquidity risk), commercial banks depend on more loans to generate more interest income, thereby being more profitable. From this perspective, a positive relationship is predicted between liquidity risk and profitability. However, if a bank lacks a good risk management system (Tan, 2016), more specifically, if probability of default would increase when a bank holds fewer liquid assets (i.e. higher liquidity risk) (Bordeleau & Graham, 2010), the bank might not only lose expected interest income but also pay more management cost on non-performing loans. On the contrary, liquidity risk is probably impact bank profitability negatively. So, there is no prior expectation for this variable.

*Asset structure:* Depending on whether assets could generate interest income or not, bank assets are classified into interest-earning assets and non-interest earning assets. Considering balance sheet of commercial banks in China, referring to literature of Doliente (2005); Owoputi, Olawale, and Adeyefa (2014), it is found that: (1) earning-assets include loans and investment; (2) non-earning assets comprise fixed assets, vault cash and non-interest deposits with PBOC, total reserves of banks and foreclosed collateral. Following Du, Worthington, and Zelenyuk (2018) and Demirgüç-Kunt and Huizinga (1999), to account for asset structure, we include non-interest earning ratio ( $NIEAR_{it}$ , non-interest earning assets/total assets) to be a proxy of cost that banks need to pay for the purpose of operating in market. Banks prefer holding interest-earning assets as profits are often generated by them (Owoputi et al., 2014), which means a bank would be depressed for interest income and less profitable if there is more proportion of non-interest earning assets (Demirgüç-Kunt & Huizinga, 1999). Consequently, it is predicted NIEAR has a negative relationship with bank profitability.

Based on Bikker and Bos (2008)'s efficiency hypothesis, it is noticed MS selected above is likely to include information of operating efficiency, that is, operating efficiency is likely to be collinear with market share. Considering this reason, operating efficiency was not considered as one of the control variables in this study.

Table 7 Variables, definitions, and data source

	Variable	Measure (Notation)	Definition	Expected Sign	Obs.10 banks	Obs.43 banks	Data Source
<b>Dependent variables</b>	Profitability	Return on average assets ( $ROAA_{it}$ )	$ROAA_{it} = \frac{\text{Net profit}}{\text{Average total assets}}$		80	338	Annual Report of banks
		Return on average equity ( $ROAE_{it}$ )	$ROAE_{it} = \frac{\text{Net profit}}{\text{Average total equity}}$		80	337	
<b>Core explanatory variables</b>	Internal internet finance (IIF)	$OB_{it} / TA_{it}$	$OB_{it} / TA_{it} =$ The transaction volume of online banking Total assets of bank $i$	+	80	-	Annual Reports of banks & Analysys Database ( <a href="http://www.analysys.cn">www.analysys.cn</a> )
	External internet finance (EIF)	TPP growth ( $GTPP_{it}$ )	$GTPP_{it} = \frac{TPP_t - TPP_{t-1}}{TPP_{t-1}}$ TPP is defined as TPP transaction volume.	-	80	344	iResearch website ( <a href="http://www.iresearch.cn">www.iresearch.cn</a> )
		P2P growth ( $GP2P_{it}$ )	$GP2P_{it} = \frac{P2P_t - P2P_{t-1}}{P2P_{t-1}}$ P2P is defined as P2P transaction volume,	-	80	344	
<b>Control variables</b>	Bank-specific variables						
	Market power	Market share ( $MS_{it}$ )	$MS_{it} = \frac{\text{Total assets of bank } i}{\text{Total assets of commercial banks}}$	+	80	338	Annual Report of banks & CBRC
	Capitalization	Equity assets ratio ( $ETA_{i,t-1}$ )	$ETA_{i,t-1} = \frac{\text{Equity}}{\text{Total assets lagged 1 year}}$	+	80	336	
	Credit risk	Loan provision ratio ( $LPR_{it}$ )	$LPR_{it} = \frac{\text{Loan loss provision}}{\text{Total loan}}$	-	80	337	
	Liquidity risk	Loan assets ratio ( $LAR_{it}$ )	$LAR_{it} = \frac{\text{Total loan}}{\text{Total assets}}$	?	80	336	
	Asset structure	Non-interest earning assets ratio ( $NIEAR_{it}$ )	$NIEAR_{it} =$ $\frac{\text{Non - interest earning assets}}{\text{Total assets}}$	-	80	330	
	Macro variables						
Macroeconomic environment	GDP growth ( $GDP_{t-1}$ )	$GDP_{t-1} =$ Nominal GDP growth lagged 1 year	+	80	344	State Statistics Bureau & China Bond Website ( <a href="http://www.chinabond.com.cn">www.chinabond.com.cn</a> )	
Long-term interest rate	Long-term interest rate ( $LR_{t-1}$ )	$LR_{t-1} =$ 10-year bond yield rate lagged 1 year	+	80	344		

Note: Reasons underlying the expected signs are shown in 5.1.3 and 5.1.4

#### **5.1.4.2 Macro variables**

For the following reasons, this paper selects GDP growth and long-term interest rate as the macro variables:

As mentioned in literature review, the increase in GDP indicates that the economy has achieved growth and the macroeconomic trend is good, which would promote the loan demand and improve the profitability of commercial banks. Higher long-term interest rates tend to increase bank profitability by charging borrowers higher rates (Kohlscheen et al., 2018). The studies of Demirgüç-Kunt and Huizinga (1999); Kohlscheen et al. (2018); Sufian and Habibullah (2009) all show the macro variable (GDP growth) affect bank profitability significantly. In particular, with reference to Heffernan and Fu (2010)'s study, assuming that it takes time for banks and customers to respond to macro policies after they are implemented, all macro variables are lagged by 1 year in this paper. Finally, this paper selected the annual nominal growth rate of GDP lagged 1 year ( $GGDP_{t-1}$ ) and 10-year bond yield rate lagged 1 year ( $LR_{t-1}$ ) to measure macroeconomic environment and long-term interest rate, respectively. It is predicted that the coefficients of the two variables are positive.

#### **5.2 Empirical method**

This study employed the panel data of commercial banks in China from 2011 to 2018. Using a balanced dataset of top 10 banks (5 SOCBs and 5 JSCBs) in terms of online-banking transaction volume (sample size is limited by the availability of online banking data), model (1) was applied to study the relationship of IIF (i.e., online banking) and EIF (i.e., TPP and P2P) with bank performance. In addition to 10 banks in model (1), adding more 7 JSCBs, 18 UCBs and 8

RCBs, model (2) used an unbalanced panel data<sup>4</sup> of total 43 commercial banks<sup>5</sup> (*Table A-20 in appendix*), to further examine the impact of EIF (i.e., P2P and TPP) on bank profitability.

Model (2) is used to see if the results with respect to EIF hold if a larger sample, which is more representative of Chinese banking system and comprises different types of banks.

To be specific:

(1) EIF is considered as a determinant of bank profitability, but only a small sample can be used<sup>6</sup>.

The market share on total assets of 10 banks is only 64% of commercial banking system.

However, when the sample is expanded to 43 banks, the market share can reach 83%. Such a larger sample could better represent the entire Chinese banking system. Nevertheless, it also means that only EIF can be left in model (2).

(2) In the studies of Heffernan and Fu (2010); Sufian and Habibullah (2009); Tan (2016), it is shown that in different-type banks, some factors have inconsistent effects on profitability. In model (2), UCBs and RCBs are included besides SOCBs and JSCBs contained in model(1), so 43-bank sample could avoid the bias caused by the characteristics of 10-bank sample itself in order that it could make the influence of EIF more generalized.

<sup>4</sup> Data unavailability: financial data in 2017 of Hengfeng bank; LAR in 2011 bank of Jinzhou; ROAE in 2014 of Zhongyuan bank; LPR and NIEAR in 2011 of Jiangsu changshu rural commercial bank; NIEAR in 2011-2012 of Wuxi rural commercial bank; ETA in 2012-2013, LAR in 2012 and NIEAR in 2011-2014 of Jiangsu Suzhou rural commercial bank. NIEAR in 2011 of Harbin Bank; data in 2011-2013 of Zhongyuan Bank.

<sup>5</sup> Selection criteria of 43 banks: (1)Bank size: In order to select a sample to represent entire commercial bank industry, market share is firstly considered. A sample with larger market share could be representative, so we look at bank size measured by total assets of each bank in 2018. (2)Data availability. Listed banks in China has a more complete annual reports released every year, so we look at listed banks in 2018. Finally, 43-bank sample with market share over 80% is selected.

<sup>6</sup> Most transaction volume of online banking are concentrated in 10 banks belonging to SOCBs and JSCBs. After reviewing the annual reports of banks, it is found that although UCBs and RCBs in this study also adopted online banking, most transaction volume data in their annual reports were largely missing or even not released. This suggests that expanding the bank sample would make the EIF data unavailable.

The opportunity to use pool OLS, fixed-effect (FE) or random-effect (RE) model has been determined by F-test of fixed-effect regression, Lagrange Multiplier (LM) test and Hausman test. Based on *Table A-17* in appendix, FE or RE model was decided in this study. Furthermore, following Chen et al. (2020); Gu and Yan (2019) and Hernando and Nieto (2007), we use OLS method to estimate FE model, and GLS method to estimate RE model.

### 5.2.1 Model specification

Based on the model from Chen et al. (2020); Gu and Yan (2019); Tobing and Wijaya (2020), the following models are specified:

IIF and EIF --- Model(1):

$$\text{Profitability}_{it} = \alpha + \beta \text{IIF}_{it} + \sum_{j=1}^2 \gamma_j \text{EIF}_t + \sum_{j=1}^5 \omega_j \text{Bank-specific}_{it} + \sum_{j=1}^2 \nu_j \text{Macro}_t + u_i + \varepsilon_{it} \quad (1)$$

EIF --- Model(2):

$$\text{Profitability}_{it} = \alpha + \sum_{j=1}^2 \gamma_j \text{EIF}_t + \sum_{j=1}^5 \omega_j \text{Bank-specific}_{it} + \sum_{j=1}^2 \nu_j \text{Macro}_t + u_i + \varepsilon_{it} \quad (2)$$

$\text{Profitability}_{it}$ : the profitability measure of bank  $i$ , at time  $t$

$\alpha$ : constant

$\beta$ : the coefficient of IIF variable

$\gamma$ : the coefficients of EIF variables

$\omega$ : the coefficients of bank-specific control variables

$v$ : the coefficients of macro control variables

$j$ : the ordinal number of the explanatory variables

$IIF_{it}$ : the IIF measure of bank  $i$ , at time  $t$

$EIF_t$ : a vector of EIF measure at time  $t$

$Bank-specific_{it}$ : bank-specific control variables of bank  $i$ , at time  $t$

$Macro_t$ : macro control variables at time  $t$

$u_i$ : the unobserved bank-specific effect of bank  $i$

$\varepsilon_{it}$ : error term

For each model, first of all, considering bank-specific and macro control variables (i.e., total 7 explanatory variables) only, a baseline model could be obtained. Next, for model (1) separately adding IIF or EIF variables into baseline, we could observe the independent effects of components within the internet finance; For model (2), separately adding TPP or P2P variable into baseline, we could compare the independent effects of TPP and P2P. Finally, we conducted regressions for a full set of 10 explanatory variables on model (1) and 9 explanatory variables on model (2).

Employing White test, *Table A-13* (appendix) suggested the heteroscedasticity is existent in model (2) but not in model (1). Consequently, Eq.(1) and (2) are estimated using cluster-robust standard errors consistently to control cross section heteroscedasticity of variables.

When estimating the profitability of banks, based on previous literature, this study might face the following econometric challenges:

First, it is endogeneity: As an example, more profitable banks are probably easier to increase their equity because of higher profits (Tan & Floros, 2012). They could also pay more for advertising and expand their scale, which in turn could affect performance (García-Herrero et al., 2009). Especially for model (1), IIF is probably not fully exogenous to the dependent variables in some of the regressions. High-profit banks are more likely to offer higher-quality online banking services to expand transaction volume of online banking (DeYoung et al., 2007). Hence, in model (1) and (2), we could identify the possible endogeneity problems resulted from capitalization (ETA), IIF (OB/TA) and market share (MS). Depending on Durbin-Wu-Hausman test(DWH) using instrumental variables lagged 1 year of variables above, *Table A-14 in appendix* displayed test results, showing all of them are exogenous.

The second important problem is unobserved heterogeneity across banks, which could be very large in the Chinese case given differences in corporate governance and we cannot measure well (García-Herrero et al., 2009). This point is likely to be prominent in the estimation for 43 banks of model (2). Because model (1) only includes SOCBs and JSCBs, model (2) also includes UCBs and RCBs, which are smaller and operate narrower scope of business than the above types of banks (Heffernan & Fu, 2010). Considering the FE or RE model selected in this study, specially, a bank-specific disturbance component ( $u_i$ ) is included to control the unobserved heterogeneity.

Besides, to avoid biased estimations derived from multicollinearity problems, we reported the variance inflation factor (VIF) value as 1.70 for Eq.(1) and 1.32 for Eq.(2), respectively. Accordingly, *Table A-15* and *Table A-16* in appendix provide correlation

information between explanatory variables. The correlation matrixes suggested multicollinearity problems are not severe.

### **5.2.2 Hypotheses**

Firstly, banks with adoption of online banking could reduce administrative cost (Hernando & Nieto, 2007), and economies of scale for online banking makes the falling of unit cost might exceed that of traditional distribution channels (Delgado et al., 2007; DeYoung, 2005). Efficient banks with lower cost would be more profitable. Therefore, this paper assumes that IIF will have a positive impact on bank profitability.

*H1:  $\beta$  is positive.*

On the one hand, P2P lending will be possible to substitute commercial banks for marginal borrowers of banks (De Roure et al., 2018; Tang, 2019), leading to less profit because of lower interest income. On the other hand, TPP platforms increased competition on deposit business, forcing banks to raise interest rates to attract depositors thus more interest expenses than less profitability (Chen et al., 2020). Besides, iResearch (2018) report denoted TPP platforms might compete with banks on loan and intermediary business as well, leading to less income further less profit. Therefore, this paper assumes that both TPP and P2P will have negative impact on bank profitability.

*H2:  $\gamma_1$  and  $\gamma_2$  are negative.*

### 5.3 Descriptive statistics

*Table 8* reports descriptive statistics of 10-bank sample and 43-bank sample. In general, Chinese macroeconomic condition appeared basically good over recent years. The interest rate on the 10-year bond fluctuates slightly, with a small S.D. value as 0.36. Regarding transaction volume in terms of online banking, 10 banks composed by 5SOCBs and 5JSCBs ranked top 10 in China. With the highest standard deviation of 5.29 relative to other financial ratios, clearly, 10 banks have attached different-level importance to online banking service so that they could craft differentiated products to attract customers and boost the transaction volume. After adding more 33 banks (7JSCBs, 18UCBs and 8RCBs) whose online-banking transaction volume is relatively small, the mean of profitability indicator ROAA significantly decreased and the mean of ROAE decreased as well but not significant. This might correspond to the argument from DeYoung (2005) and iResearch (2015), supporting that bank can reduce unit cost thus earn more profit if the internet banking delivering is run at a large enough scale, as a bank accumulates experience using technology. Turning to EIF, we see, compared to P2P growth, the growth in TPP seems steadier, which probably resulted from improved regulation in terms of TPP business in China. On the contrary, considering P2P platforms still have some regulatory flaws as mentioned before, the growth rate of P2P have fluctuated significantly from 2011 to 2018. In addition, compared with 10 banks, average market share on assets declined significantly for 43 banks, implying that online banking business perhaps concentrated in larger banks in China. Looking at liquidity indicator LAR and asset structure indicator NIEAR, we

see, t-test on both mean and standard deviation difference between 10 banks and 43 banks are significant. It is probably due to the heterogeneity from different type of banks.

**Table 8** Descriptive statistics of 10-bank sample and 43-bank sample

Variable	10 banks					43 banks					Test on $\Delta$ mean	Test on $\Delta$ S.D.
	Mean	S. D.	Min	Max	Obs	Mean	S. D.	Min	Max	Obs		
Dependent variables												
ROAA	1.13	0.20	0.74	1.47	80	1.05	0.26	0.05	1.82	340	-0.08*** (0.0014)	0.06*** (0.0050)
ROAE	17.18	4.07	10.49	25.31	80	16.69	4.31	4.65	29.10	338	-0.49 (0.3517)	0.24 (0.5487)
Core explanatory variables												
OB/TA	12.59	5.34	4.34	26.83	80							
GTPP	71.07	35.65	12.10	120.10	80	71.07	35.48	12.10	120.10	344		
GP2P	192.64	160.91	-36.01	514.60	80	192.64	160.14	-36.01	514.60	344		
Control variables												
Bank-specific variables												
MS	6.94	4.78	1.96	17.51	80	2.04	3.60	0.02	17.51	342	-4.90*** (0.0000)	-1.18*** (0.0006)
ETA	7.65	0.75	6.19	9.00	80	7.70	1.43	4.59	16.14	337	0.05 (0.7448)	0.69*** (0.0000)
LPR	2.69	0.70	1.46	4.87	80	2.86	1.02	1.00	15.56	340	0.17* (0.0744)	0.32*** (0.0001)
LAR	51.73	5.11	34.17	59.48	80	44.50	8.79	22.62	61.87	338	-7.23*** (0.0000)	3.68*** (0.0000)
NIEAR	3.98	2.03	0.96	8.98	80	3.31	2.94	0.20	22.12	330	-0.68** (0.0160)	0.91*** (0.0001)
Macro variables												
GGDP	11.57	4.11	7.04	18.40	80	11.57	4.11	7.04	18.40	344		
LR	3.56	0.36	2.85	4.10	80	3.56	0.36	2.85	4.10	344		

a.  $\Delta$ Mean= mean on variables of 43-bank sample - mean on variables of 10-bank sample. If  $\Delta$ S.D. is significant, t-test on

$\Delta$ Mean is conducted with unequal variances, otherwise, with equal one.

b.  $\Delta$ S.D. =S.D. on variables of 43-bank sample - S.D. on variables of 10-bank sample

P-value reported in parentheses.

\* Significant at 10%.

\*\* Significant at 5%.

\*\*\* Significant at 1%.

Consequently, we could further explore based on descriptive statistics of 5 SOCBs, 12 JSCBs, 18 UCBs and 8 RCBs reported in *Table A-11*(appendix). For the two profitability indicators, looking at the mean of ROAA firstly, although it is greater in SOCBs than JSCBs, the difference is small. In UCBs and RCBs, it is approximately the same. However, the difference of ROAE mean is significant: UCBs is 2.28% higher than RCBs. As mentioned in literature review, it might be the sign that UCBs profitability proxy, ROAE, ignores the risks associated with high leverage. In addition, the smaller ETA mean of UCBs relative to RCBs indicates that leverage ratio of UCBs is indeed higher, which further supports the inference above. With much larger values than that in SOCBs, the standard deviation of LAR is 8.21, 7.14 and 7.02 in JSCBs, UCBs and RCBs respectively, indicating that the liquidity could vary apparently among these 3 types of banks. As to asset structure measured by NIEAR, the mean in SOCBs is 4.75%, as the largest value. It is not surprising that SOCBs need to pay more to support its nationwide operation.

## CHAPTER VI EMPIRICAL RESULTS

### 6.1. 10-bank sample

Based on 10-bank sample, *Table 9* summarizes the empirical results for the main profitability measure ROAA. Considering only the control variables as explanatory variables, column (1) serves as a baseline regression. Column (2) adds indicator of IIF, OB/TA. Column (3) uses indicators of EIF, GTPP and GP2P as regressors. The idea here is to observe the independent effects of components within the internet finance. IIF and EIF are operated by two different sectors (i.e., bank sector and non-bank sector, respectively), and they perhaps have a competitive relationship. Last column includes all explanatory variables. The results of Hausman test show GLS-RE method should be used in specifications (1)-(4).

First of all, concerning the core variables, we see that IIF, which is captured by the transaction volume of online banking relative to total assets of a bank (OB/TA), has a negative impact with a level of 10% significance on ROAA in specification (4). Consistent result could be found in Akhisar et al. (2015)'s research. The negative effect of IIF, which is different from the hypothesis proposed before, probably stems from the following three aspects:

- (1) Increased cost. To keep online-banking service competitive in the market, banks have to spend time and money with respect to: Firstly, the maintenance and updating of equipment, systems and software in the later stage, on the basis of the purchase of them in the early stage (Akhisar et al., 2015; Hernando & Nieto, 2007; Yang et al., 2018). Secondly, operation cost. Banks need to provide training for staffs responsible for the operation of online banking. In

addition, the demand for strong-technology talents means the rising cost of recruitment (Yang et al., 2018). Thirdly, marketing cost. In order to obtain a sufficient number of customers, banks would spend time and money to promote online banking (Gutu, 2014).

- (2) Economic incentives. For the purpose of shifting old customers from traditional distribution channels to the internet, banks with online banking tend to offer economic incentives, such as higher deposit rates and lower commission for banking services (Hernando & Nieto, 2007).
- (3) Increased competition. Recap the SCP hypothesis, banks lose the oligopoly position as well as the economic rent due to the intensified competition, which eventually leads to the losses of profit. The competitions associated with online banking are reflected in the two aspects: On the one hand, with the decreasing of time cost, online banking makes it easy for customers to decide the best one by comparing similar services and products from different banks. This convenience probably leads to increased competition among banks offering online-banking service (Angelakopoulos & Mihiotis, 2011). On the other hand, the emergence of EIF, especially TPP that is similar to online banking, might have formed fierce competition between bank and non-bank sectors. TPP attracts customers to transfer the core deposits (current accounts, savings accounts, and time deposits) originally held by commercial banks. Internet finance provides the convenience of funds transfer, making the core deposits of commercial banks more volatile, which might increase banks' dependence on more costly financing channel such as asset securitization, mutual funds and interbank market. As the result, more funding cost perhaps further weakened bank profitability (Hernando & Nieto, 2007).

**Table 9** Empirical results of 10-bank sample on ROAA

Independent variables	Regression results			
	(1) RE	(2) RE	(3) RE	(4) RE
<i>Core explanatory variables</i>				
OB/TA		-0.0062 (0.114)		-0.00591* (0.080)
GTPP			-0.00050*** (0.002)	-0.00047*** (0.001)
GP2P			0.00035*** (0.002)	0.00034*** (0.002)
<i>Control variables</i>				
<i>Bank-specific variables</i>				
MS	0.0240*** (0.002)	0.0258*** (0.003)	0.0167* (0.059)	0.0185* (0.056)
ETA	-0.0324 (0.299)	-0.0284 (0.376)	0.0053 (0.848)	0.0083 (0.766)
LPR	-0.0593 (0.123)	-0.0503 (0.248)	-0.0237 (0.461)	-0.0155 (0.679)
LAR	0.0007 (0.663)	0.0001 (0.960)	-0.0007 (0.682)	-0.0012 (0.494)
NIEAR	-0.0354*** (0.000)	-0.0342*** (0.000)	-0.0252*** (0.000)	-0.0241*** (0.002)
<i>Macro variables</i>				
GGDP	0.0094* (0.068)	0.0069 (0.182)	0.0065* (0.069)	0.0042 (0.264)
LR	0.0951*** (0.010)	0.1039*** (0.010)	0.1038*** (0.000)	0.1115*** (0.000)
Constant	1.0288*** (0.000)	1.0631*** (0.000)	0.6958*** (0.002)	0.7312*** (0.001)
Observations	80	80	80	80
R-squared	0.5166	0.4574	0.5578	0.4994

P-value reported in parenthesis. Regressions (1)-(4) used GLS-RE method.

\* Significant at 10%

\*\* Significant at 5%

\*\*\* Significant at 1%

With regard to EIF, GTPP has a negative effect on bank profitability (significant at 1% level), with coherence in column(3) and (4). Chen et al. (2020) offers the potential explanation for which TPP has negative relationship with bank performance. Mainly concerning deposit business, TPP platforms probably have competition relationship with commercial banks. In response, in order to attract depositors, banks would be forced to raise interest rate on deposit thus more interest expenses then less profitability.

Interestingly, in contrast to our hypothesis as formulated above, with high significance at 1% level, GP2P have positively influenced bank profitability in China, which supports Huang and Huang (2016)'s finding. For banking sector, competition could be further divided into business competition and customer-group competition (iResearch, 2015). Generally, with more transparent financial data, which is the key factor of credit assessment, large enterprises are preferred by banks as lenders. Although overlapping with loan business, differently, P2P targets individuals as well as SMEs ignored by most banks. In this case, P2P platforms may be complementary to banks since they basically serve two different customer groups (De Roure et al., 2018; Tang, 2019), then the competitive effect is probably weak. However, we could find some signs associated with possible technology spillover effect: (1) P2P prompts banking sector to create emerging business modes such as microfinance (e.g. payday loan) and consumer finance to expand lending channels for physical branches (iResearch, 2017). To support online lending, banks might have improved technology as well as efficiency. Besides, banks imitate P2P to obtain more extensive credit data regarding SMEs and individuals, which is from behavioral data accumulated by users on the internet, to be the supplement for original database composed by

credit card and bank loan records offline (iResearch, 2015). Due to the more comprehensive credit investigation system, more SMEs and/or individuals are perhaps able to be approved by banks for loans. (2) The personnel quality and technical support of commercial banks might have increased when employees of non-bank institutions with high-level technologies flow to the banking sector. (3) Cooperating with P2P platforms, banks could absorb more advanced technologies from partners through the communication of business (Huang & Huang, 2016; Sheng & Guo, 2015). Based on above analyses, banks probably benefit from technology spillover effect of P2P platforms.

Turning to control variables, first of all, the basic specification (column(1)) confirms that there is a positive relationship between market share (MS, represent bank size as well) and bank profitability measured by ROAA. This result meets the expectation explained as efficiency hypothesis and stands in line with the result of Sufian (2009). Furthermore, the relation is consistent despite a decrease of significance from 1% to 10% level with EIF variables being added. The main reason might be the increasing competition resulting from new participants.

Notice that 3 bank-specific control variables, capitalization(ETA), liquidity risk(LAR), and credit risk(LPR), suggested insignificant on ROAA in regression(1)-(4). From a perspective of bank types that consist of 10-bank sample (5 SOCBs and 5JSCBs), some reasons are going as follows: By reducing funding cost due to increased creditworthiness, well-capitalized banks could be more profitable. However, because of government guarantee, the fact is SOCBs are banks that obtain Chinese trust best (García-Herrero et al., 2009), which implicitly decides ETA might not positively associate with some SOCBs profitability anymore. Looking at *Table A-12* of appendix,

we found that although there is 0.61% higher mean of ETA in 5SOCBs versus 5JSCBs, the profitability measured by ROAA only slightly increased 0.07% in 5SOCBs. Based on the discussion above, in 10 banks, the negative impact might exist between ETA and profitability for some SOCBs now, to offset positive ones on other banks. Besides, some large SOCBs have been expanding their credit business aggressively due to the fact government provides full support when necessary (Tan, 2016). 5SOCBs in China are totally controlled by government and directed to lend to SOEs that tend to be loss-making, which has led to the accumulation of low-quality loans hampering profitability (García-Herrero et al., 2006). Further evidence is shown in *Table A-12* (appendix), with 3.49% higher on LAR mean, 5 SOCBs performed only 0.07% more on ROAA mean and even lower value on ROAE mean than 5 JSCBs. Similar to ETA, LAR might also negatively impact some SOCBs performance, to offset positive impact on other banks in 10-bank sample. Offering a potential reason for the positive relationship between LPR and profitability, Sufian and Habibullah (2009) argues that since a bank is entitled to decide loan loss provision at discretion, in order to maximize the long-run profit, a bank may rationally choose to have lower cost in the short run by reducing resources cost on monitoring loans, causing provision for loan loss less than it should have reserved. In 10 banks of this study, some banks perhaps correspond to above situation. A sign could be noticed in *Table A-12* (appendix), compared with 5SOCBs, although with lower LPR mean in 5JSCBs, it seems the lower profitability measured by ROAA as well. That is, LPR of some banks perhaps have positive effect on profitability, to offset negative impact from others.

Concerning the impact of asset structure, the coefficient of NIEAR entered all specifications with negative and statistically significant at the 1% level. Apparently, if a bank holds more non-interest earning assets as cost to operate in market, it would depress its interest income thereby reduce profitability, which corresponds to Demirgüç-Kunt and Huizinga (1999)'s research.

As expected, the results about the macro variables, both GDP growth (GGDP) and long-term interest rates (LR) are positively related to Chinese bank profitability. The empirical finding is consistent with Athanasoglou et al. (2008) , Dietrich and Wanzenried (2011) and Kohlscheen et al. (2018), providing support to the argument that the increase of loan demand driven by the good macroeconomic conditions and higher lending rate brought from higher level of long-term interest rates might contribute more interest income to banks.

## 6.2. 43-bank sample

In order to generalize the results into the entire Chinese commercial banking sector, the other 33 commercial banks were added but variable OB/TA was dropped because of data unavailability. Based on 43-bank sample, *Table 10* reports the regression results for the main profitability measure ROAA as well. Again, we estimate the model from the basic specification with only control variables (column(1)) included. With GTPP being added, we got column(2). Column(3) uses GP2P as a regressor. Here, we intend to compare the influence of GTPP against GP2P on bank profitability, to further confirm our findings. Column(4) covers all variables.

As shown in column(1)-(4), all results of 10-bank sample on GTPP and GP2P are applicable for Chinese commercial banking sector, which further provided support for our findings.

**Table 10** Empirical results of 43-bank sample on ROAA

Independent variables	Regression results			
	(1) FE	(2) FE	(3) RE	(4) RE
<i>Core explanatory variables</i>				
GTPP		-0.000340** (0.046)		-0.00041*** (0.009)
GP2P			0.00043*** (0.000)	0.00043*** (0.000)
<i>Control variables</i>				
<i>Bank-specific variables</i>				
MS	0.0601** (0.001)	0.0605*** (0.001)	0.0173*** (0.001)	0.0179*** (0.000)
ETA	0.0443** (0.032)	0.0469*** (0.021)	0.0522*** (0.000)	0.0556*** (0.000)
LPR	-0.0948* (0.060)	-0.0937* (0.063)	-0.0224 (0.541)	-0.0184 (0.600)
LAR	0.0029 (0.486)	0.0025 (0.560)	-0.0003 (0.920)	-0.0011 (0.711)
NIEAR	-0.0164** (0.043)	-0.0169** (0.040)	-0.0136** (0.029)	-0.0140** (0.025)
<i>Macro variables</i>				
GGDP	0.0138*** (0.000)	0.0126*** (0.001)	0.0112*** (0.000)	0.0099*** (0.000)
LR	0.0590*** (0.005)	0.0664*** (0.001)	0.0624*** (0.001)	0.0718*** (0.000)
Constant	0.3971* (0.059)	0.4058* (0.058)	0.2927** (0.040)	0.2994** (0.033)
Observations	329	329	329	329
R-squared	0.4358	0.4389	0.3983	0.4097

P-value reported in parenthesis.

Regressions (1) and (2) used OLS-FE method; regressions (3) and (4) used GLS-RE method.

\* Significant at 10%

\*\* Significant at 5%

\*\*\* Significant at 1%

Regarding control variables, the empirical results are basically consistent with results of 10-bank sample, except for the shifting of capitalization (ETA), approximated by total equity over total assets. ETA seems to have a significant and positive impact on bank profitability, which is consistent with studies from Bourke (1989); García-Herrero et al. (2009); Molyneux and Thornton (1992) and Sufian (2009), providing support to the argument that better-capitalized banks are considered safer (i.e. lower risk), lower-risk banks might reduce funding cost due to increased creditworthiness thus earn more profits.

### 6.3. Robustness test

We conducted robustness tests for both 10-bank and 43-bank sample, which were reported in *Table A-18* and *Table A-19* (appendix) respectively for the alternative profitability measure ROAE.

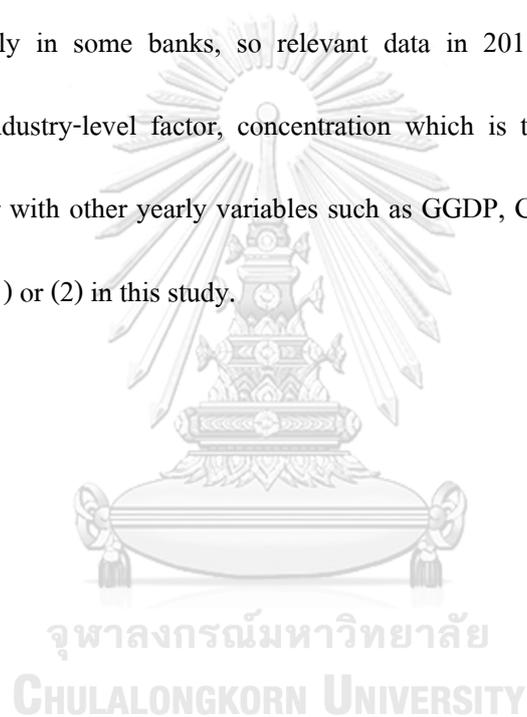
Overall, in contrast to the results for ROAA, differences exist related to bank-specific variables. Noticing that one of the core explanatory variables, OB/TA has no impact on bank profitability when measured by the ROAE. This result might be driven by ROAE itself, which could not capture influence of the liability items, particularly deposits, on the net profit of banks. However, as analyzed above, the fluctuation of deposits caused by IIF is one of the major possible reasons for the negative impact. Therefore, this might be the reason why OB/TA is not significant. Not only that, but we also found evidence from the impact of TPP, a business mode similar to online banking, would reduce as well when measured by ROAE.

The coefficient of ETA is negative when profitability is measured by ROAE. This holds for 10-bank and 43-bank sample. This finding is in line with the results of Kohlscheen et al. (2018) and Du and Lang (2020). In fact, Athanasoglou et al. (2008), Dietrich and Wanzenried (2014) and Kohlscheen et al. (2018) have found that banks with relatively more equity usually report higher ROAA but will correspondently have lower ROAE, as equity is actually the numerator to calculate ETA but the denominator to calculator ROAE.

Liquidity risk captured by loan asset ratio (LAR) entered the regression models with a negative sign and statistically significant at 5% level for 10-bank and 43-bank sample, a fact that supports the results of Demirgüç-Kunt and Huizinga (1999) and Kohlscheen et al. (2018). Some possible explanations for the negative relationship could be: First of all, the high loan growth rate might lead to the decline of credit quality (Dietrich & Wanzenried, 2011), corresponding to situation of SOCBs that we discussed before, which implies the resulting losses of interest income have weakened the profitability of commercial banks. Secondly, since loans are the assets with the highest operating cost, a high proportion of loans will actually increase the required screening and monitoring costs (Sufian & Habibullah, 2009). If the bank lacks a reliable risk management system, the increasing of loans would further cause more expenditure, which might instead become a burden of the bank (Tan, 2016). Finally, Heffernan and Fu (2010) argues that, to some extent, too little liquidity means too few deposits or excessive loans, which might force banks to borrow at penal rates from other banks or central bank, increasing interest expenses inversely.

**Limitation of the study**

First of all, with data limitation, we could only examine the impact of online banking business on a small sample covering 10 banks only. As IIF development in China, we intend to collect more online-banking transaction data from other type of banks in future. Secondly, as noted in introduction of this paper, mobile banking tends to replace personal online banking in future. However, we could not include mobile banking business into IIF in this study. Mobile banking started lately in some banks, so relevant data in 2011-2014 is difficult to collect. Ultimately, as an industry-level factor, concentration which is the measure of competition is yearly. It is collinear with other yearly variables such as GGDP, GTPP and GP2P. We could not add it into equation(1) or (2) in this study.



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## CHAPTER VII CONCLUSION

Internet finance, as the initial stage of fintech in China, has rapidly developed to make effect on commercial bank profitability.

Focusing on two types of internet finance, internal internet finance (online banking) and external internet finance(third-party payment (TPP) and peer-to-peer lending(P2P)), this study examined how these three business modes affect the profitability of 43 commercial banks in China over the period from 2011 to 2018. In particular, as the contribution to existing literature, we selected 10 banks (included in 43 banks) with data availability of transaction volume of online banking, to calculate an improved IIF measure and be able to investigate both internal and external internet finance on bank profitability simultaneously.

Our findings suggested that banks attaching more importance to online banking might be less profitable, and the negative effect perhaps mainly resulted from increased cost in terms of operation, marketing and maintenance as well as upgrading of infrastructure. Higher TPP growth impacts bank profitability negatively, which is likely due to increased competition on deposit business. On the contrary, the rapid growth of P2P results in positive influence on bank performance, perhaps coming from possible technology spillover effect of P2P platforms.

As recommendations, regarding IIF, controlling cost input should be highly thought of during the period of fintech applying. Besides, instead of economic incentives through higher deposit rates or lower commission to shift customers from offline to online channel, an applicable strategy is that to associate online-banking service with more life-oriented scenarios and provide

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simpler, safer and faster operation process, by improving the user experience to guide offline customers to use online banking and cultivate stickiness. At the same time, increased customer flows could attract new customers as well. Finally, concerning possible inter-bank competition in terms of online banking, to acquire comparative advantages through innovative products or patented technology is suggested. To withstand probable competitive effect on deposits from TPP platforms, banks need to optimize their online channels. For instance, the convenience of integrating deposit, loan, payment and wealth management business into one platform would attract more deposits without at the cost of more interest expenses. Based on possible technology spillover effect of P2P platforms, it is suggested that banks could integrate online behavioral data with initial credit data, to penetrate lending group into more SMEs and individuals. Besides, instead of competing with EIF companies, seeking for win-win cooperation might be better choice for commercial banks to take more advantages from technology spillover effect thus achieve higher profitability.

From perspective of the country's level, while encouraging banks to make business innovations, government could also formulate relevant policies to spur in-depth cooperation between banks and EIF companies, so as to help Chinese banking industry absorb technology spillover effects.

Several other topics remain for further study. Different type of commercial banks in China differs in the extent of market share, ownership and lending groups. An interesting issue is how online banking, TPP and P2P impact profitability for different type of commercial banks in China. What is more, it would be interesting to know how corporate online banking, personal

online banking and mobile banking (i.e., 3 compositions of IIF) influence bank performance in China. Noted that online lending is appearing in succession on banks' websites, it might be another point to examine its relationship with bank profitability in future. Last but not least, as fintech is popular worldwide, it is meaningful to know what result differences exist among countries' banking system regarding this topic. Thus, a multi-country study in future is expected.



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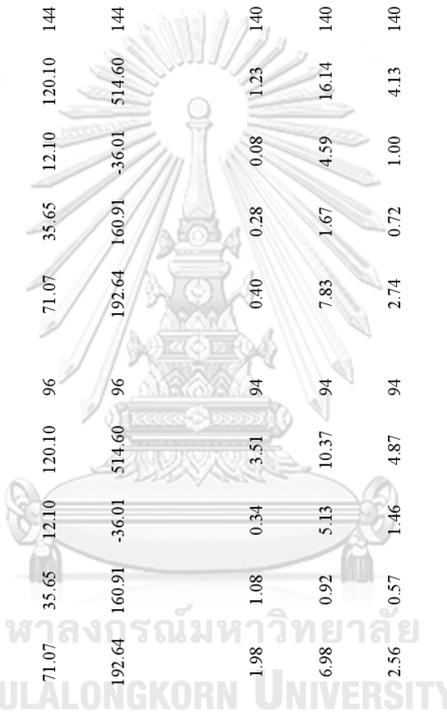
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*Table A-11* Descriptive statistics of 4 types of commercial banks of 43 banks

Variable	5 SOCBs					12 JSOBs					18UCBs					8RCBs					
	Mean	S.D.	Min	Max	Obs	Mean	S.D.	Min	Max	Obs	Mean	S.D.	Min	Max	Obs	Mean	S.D.	Min	Max	Obs	
<b>Dependent variables</b>																					
ROAA	1.16	0.18	0.80	1.47	40	0.98	0.21	0.48	1.46	94	1.06	0.27	0.41	1.82	140	1.06	0.25	0.63	1.65	64	
ROAE	16.68	3.68	10.74	23.43	40	16.90	4.12	7.86	25.33	94	17.28	4.74	4.65	29.10	139	15.00	3.79	7.80	27.54	64	
<b>Core explanatory variables</b>																					
GTPP	71.07	35.65	12.10	120.10	40	71.07	35.65	12.10	120.10	96	71.07	35.65	12.10	120.10	144	71.07	35.65	12.10	120.10	64	
GP2P	192.64	160.91	-36.01	514.60	40	192.64	160.91	-36.01	514.60	96	192.64	160.91	-36.01	514.60	144	192.64	160.91	-36.01	514.60	64	
<b>Control variables</b>																					
<b>Bank-specific variables</b>																					
MS	10.97	3.56	4.54	17.51	40	1.98	1.08	0.34	3.51	94	0.40	0.28	0.08	1.23	140	0.23	0.17	0.04	0.46	64	
ETA	7.95	0.78	6.29	9.00	40	6.98	0.92	5.13	10.37	94	7.83	1.67	4.59	16.14	140	8.35	1.37	4.91	11.03	62	
LPR	2.77	0.76	2.20	4.53	40	2.56	0.57	1.46	4.87	94	2.74	0.72	1.00	4.13	140	3.35	0.68	2.06	5.44	63	
LAR	53.48	2.73	48.30	59.35	40	47.33	8.21	26.84	60.19	94	38.65	7.14	22.62	56.56	139	47.40	7.02	33.34	61.87	63	
NIEAR	4.75	2.12	2.29	8.98	40	3.03	2.12	0.51	10.12	94	3.28	3.44	0.20	17.24	139	2.95	2.92	0.31	17.24	57	
<b>Macro variables</b>																					
GGDP	11.57	4.11	7.04	18.40	40	11.57	4.11	7.04	18.40	96	11.57	4.11	7.04	18.40	144	11.57	4.11	7.04	18.40	64	
LR	3.56	0.36	2.85	4.10	40	3.56	0.36	2.85	4.10	96	3.56	0.36	2.85	4.10	144	3.56	0.36	2.85	4.10	64	



**Table A-12** Descriptive statistics of 5 SOCBs and 5 JSCBs of 10-bank sample

Variable	5 SOCBs of 10-bank sample					5 JSCBs of 10-bank sample				
	Mean	S. D.	Min	Max	Obs	Mean	S. D.	Min	Max	Obs
<b>Dependent variables</b>										
ROAA	1.16	0.18	0.80	1.47	40	1.09	0.20	0.74	1.46	40
ROAE	16.68	3.68	10.74	23.43	40	17.69	4.41	10.49	25.31	40
<b>Core explanatory variables</b>										
OB/TA	13.26	6.02	5.60	26.83	40	11.81	4.40	4.34	22.44	40
GTPP	71.07	35.65	12.10	120.10	40	71.07	35.65	12.10	120.10	40
GP2P	192.64	160.91	-36.01	514.60	40	192.64	160.91	-36.01	514.60	40
<b>Control variables</b>										
<b>Bank-specific variables</b>										
MS	10.97	3.56	4.54	17.51	40	2.91	0.47	1.96	3.51	40
ETA	7.95	0.78	6.29	9.00	40	7.34	0.57	6.19	8.59	40
LPR	2.77	0.76	2.20	4.53	40	2.60	0.63	1.46	4.87	40
LAR	53.48	2.73	48.30	59.35	40	49.99	6.26	34.17	59.48	40
NIEAR	4.75	2.12	2.29	8.98	40	3.22	1.62	0.96	7.95	40
<b>Macro variables</b>										
GGDP	11.57	4.11	7.04	18.40	40	11.57	4.11	7.04	18.40	40
LR	3.56	0.36	2.85	4.10	40	3.56	0.36	2.85	4.10	40

**Table A-13** White test for model (1) and model (2)

	H <sub>0</sub>	p-value
Model(1)	homoskedasticity	0.6611
		0.5785
Model(2)		0.0016
		0.0381

**Table A-14** Durbin-Wu-Hausman test for model (1) and model (2)

	H <sub>0</sub>	variables	p-value
Model(1)	variables are exogenous	OB/TA	0.6992
		MS	0.1899
		ETA	0.5974
Model(2)		MS	0.7163
		ETA	0.9510

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**Table A-15** Correlation matrix of 10-bank sample

	OB/TA	GTPP	GP2P	MS	ETA	LPR	LAR	NIEAR	GGDP	LR
OB/TA	1.0000									
GTPP	0.2135	1.0000								
GP2P	-0.2581	-0.1953	1.0000							
MS	0.1175	-0.0247	0.0785	1.0000						
ETA	0.3404	0.2689	-0.3987	0.2735	1.0000					
LPR	0.0523	0.0194	-0.2777	0.1861	-0.2130	1.0000				
LAR	0.0978	-0.1441	-0.0107	0.2812	0.4143	-0.0367	1.0000			
NIEAR	0.2340	0.0680	-0.3750	0.3401	0.4365	-0.0754	0.1203	1.0000		
GGDP	-0.3767	-0.4173	0.5027	0.0755	-0.3734	-0.1854	-0.0094	-0.3008	1.0000	
LR	0.0003	0.1545	0.1482	0.0331	0.0616	-0.0818	0.0143	-0.1996	0.2368	1.0000

**Table A-16** Correlation matrix of 43-bank sample

	GTPP	GP2P	MS	ETA	LPR	LAR	NIEAR	GGDP	LR
GTPP	1.0000								
GP2P	-0.1990	1.0000							
MS	-0.0155	0.0353	1.0000						
ETA	0.1368	-0.0984	0.0099	1.0000					
LPR	0.0785	-0.3458	-0.0291	0.1459	1.0000				
LAR	-0.1599	0.0762	0.4392	0.1423	-0.0204	1.0000			
NIEAR	-0.0402	-0.2500	0.1655	0.2165	0.2083	0.1235	1.0000		
GGDP	-0.4258	0.4856	0.0388	-0.0745	-0.2451	0.1702	-0.0919	1.0000	
LR	0.1566	0.1660	0.0076	0.0823	-0.1319	0.0155	-0.1798	0.2396	1.0000

**Table A-17** Results of F-test, LM test and Hausman test.

	H <sub>0</sub>	10-bank sample	43-bank sample
F test	all $\mu_i=0$	(0.0000)	(0.0000)
(p-value)		(0.0000)	(0.0000)
LM test	$\sigma_\mu^2=0$	(0.0000)	(0.0000)
(p-value)		(0.0000)	(0.0000)
Hausman test	difference in coefficients is not systematic	(0.7789)	(0.0584)
(p-value)		(0.8712)	(0.2327)

For each test method, the 1st. line is on ROAA as profitability measure, the 2nd. line is on ROAE as profitability measure.

**Table A-18** Robustness test of 10-bank sample on ROAE

Independent variables	Regression results			
	(1) RE	(2) RE	(3) RE	(4) RE
<i>Core explanatory variables</i>				
OB/TA		-0.0647 (0.417)		-0.05831 (0.398)
GTPP			-0.00771** (0.020)	-0.00742** (0.016)
GP2P			0.00602*** (0.006)	0.00598*** (0.006)
<i>Control variables</i>				
<i>Bank-specific variables</i>				
MS	0.3280*** (0.007)	0.3452*** (0.008)	0.2047 (0.167)	0.2216 (0.143)
ETA	-2.2461*** (0.000)	-2.2029*** (0.000)	-1.5948*** (0.004)	-1.5638*** (0.006)
LPR	-1.3899*** (0.006)	-1.3030** (0.019)	-0.7783* (0.086)	-0.7019 (0.183)
LAR	-0.0653* (0.057)	-0.07090* (0.072)	-0.0855** (0.030)	-0.0899** (0.041)
NIEAR	-0.7995*** (0.000)	-0.7857*** (0.000)	-0.6204*** (0.000)	-0.6088*** (0.000)
<i>Macro variables</i>				
GGDP	0.2448** (0.010)	0.2178** (0.014)	0.1966*** (0.008)	0.1735** (0.015)
LR	1.7149*** (0.005)	1.8059*** (0.007)	1.8388*** (0.000)	1.9150*** (0.000)
Constant	33.4465*** (0.000)	33.7958*** (0.000)	27.5124*** (0.000)	27.8480*** (0.000)
Observations	80	80	80	80
R-squared	0.6661	0.6473	0.6956	0.6794

P-value reported in parenthesis.

Regressions (1)-(4) used GLS-RE method.

\* Significant at 10%

\*\* Significant at 5%

\*\*\* Significant at 1%

**Table A-19** Robustness test of 43-bank sample on ROAE

Independent variables	Regression results			
	(1) FE	(2) FE	(3) RE	(4) RE
<i>Core explanatory variables</i>				
GTPP		-0.00421 (0.138)		-0.00430* (0.055)
GP2P			0.00936*** (0.000)	0.00934*** (0.000)
<i>Control variables</i>				
<i>Bank-specific variables</i>				
MS	0.7824** (0.021)	0.7864** (0.020)	0.2101*** (0.007)	0.2155*** (0.005)
ETA	-0.7939** (0.014)	-0.7625** (0.018)	-0.6829*** (0.001)	-0.6613*** (0.002)
LPR	-1.3823 (0.134)	-1.3677 (0.140)	-0.0958 (0.860)	-0.0938 (0.864)
LAR	-0.0514 (0.467)	-0.0569 (0.431)	-0.1005** (0.031)	-0.1046** (0.025)
NIEAR	-0.3639** (0.024)	-0.3712** (0.022)	-0.2584** (0.017)	-0.2644** (0.015)
<i>Macro variables</i>				
GGDP	0.3738*** (0.000)	0.3583*** (0.000)	0.2915*** (0.000)	0.2750*** (0.000)
LR	1.1794*** (0.001)	1.2690*** (0.000)	1.3059*** (0.000)	1.4027*** (0.000)
Constant	19.9348*** (0.000)	20.0727*** (0.000)	17.2082*** (0.000)	17.3830*** (0.000)
Observations	328	328	328	328
R-squared	0.4880	0.4892	0.4972	0.4988

P-value reported in parenthesis.

Regressions (1) and (2) used OLS-FE method; regressions (3) and (4) used GLS-RE method.

\* Significant at 10%

\*\* Significant at 5%

\*\*\* Significant at 1%

**Table A-20** 10 commercial banks and 43 commercial banks

5 Large State-owned Commercial Banks	Industrial & Commercial Bank of China (The) - ICBC
	China Construction Bank Co., Ltd
	Agricultural Bank of China Limited
	Bank of China Limited
	Bank of Communications Co. Ltd
12 Joint-stock Commercial Banks	China Merchants Bank Co Ltd
	Industrial Bank Co Ltd
	Shanghai Pudong Development Bank
	China CITIC Bank Corporation Limited
	China Minsheng Banking Corporation
	China Everbright Bank Company Limited
	Hua Xia Bank co., Limited
	China Guangfa Bank Co Ltd
	Ping An Bank Co Ltd
	China Zheshang Bank Co Ltd
	Hengfeng Bank Co Ltd
	China Bohai Bank
18 City Commercial Banks	Bank of Beijing Co Ltd
	Bank of Shanghai
	Bank of Jiangsu Co Ltd
	Bank of Nanjing
	Bank of Ningbo
	Huishang Bank Co Ltd
	Shengjing Bank
	Bank of Hangzhou Co Ltd
	Bank of Jinzhou Co Ltd
	Xiamen International Bank
	Bank of Tianjin
	Zhongyuan Bank Co Ltd
	Harbin Bank
	Bank of Changsha Co Ltd
	Bank of Guangzhou Co., Ltd
	Bank of Guiyang Co Ltd
	Bank of Chengdu Co Ltd
	Bank of Zhengzhou Co., Ltd.
8 Rural Commercial Banks	Chongqing Rural Commercial Bank
	Beijing Rural Commercial Bank Co Ltd
	Shanghai Rural Commercial Bank
	Guangzhou Rural Commercial Bank Co., Ltd.
	Jiangsu Changshu Rural Commercial Bank Co., Ltd
	Wuxi Rural Commercial Bank Co.,Ltd
	Jiangsu Suzhou Rural Commercial Bank Co
	Jiangsu Jiangyin Rural Commercial Bank

*Note:* 10 commercial banks are highlighted with yellow color.

Table A-21 Raw data of 10 banks

Bank	Year	ROAA	ROAE	OB/TA	GTPP	GP2P	MS	ETA	LPR	LAR	NIEAR	GGDP	LR
Industrial & Commercial Bank of China	2011	1.44	23.43	18.35	64.71	514.60	17.51	7.12	2.50	50.33	4.27	18.25	3.47
	2012	1.45	22.88	21.55	47.62	171.50	16.78	7.29	2.50	50.19	5.61	18.40	3.85
	2013	1.44	21.85	25.51	12.10	326.73	15.92	7.29	2.43	52.45	5.18	10.38	3.46
	2014	1.40	19.62	19.59	117.27	157.79	15.29	8.13	2.34	53.50	5.54	10.10	3.83
	2015	1.30	16.64	22.34	96.03	248.19	14.25	8.74	2.35	53.73	5.96	8.53	4.10
	2016	1.20	14.76	23.53	120.10	70.80	13.28	8.92	2.22	54.09	6.34	7.04	3.33
	2017	1.14	13.95	18.41	68.00	87.55	13.26	8.87	2.39	54.56	5.77	8.35	2.85
	2018	1.11	13.32	18.62	42.71	-36.01	13.19	8.99	2.68	55.67	4.93	11.47	3.59
	2018	1.47	22.33	7.85	64.71	514.60	13.89	7.55	2.64	52.89	3.82	18.25	3.47
China Construction Bank Co., Ltd	2012	1.47	21.92	7.31	47.62	171.50	13.36	7.73	2.69	53.76	3.66	18.40	3.85
	2013	1.47	21.26	8.90	12.10	326.73	12.93	7.69	2.66	55.91	3.24	10.38	3.46
	2014	1.42	19.62	10.06	117.27	157.79	12.42	8.15	2.66	56.58	3.24	10.10	3.83
	2015	1.30	16.97	12.13	96.03	248.19	11.78	8.63	2.39	57.14	3.37	8.53	4.10
	2016	1.18	15.32	13.58	120.10	70.80	11.54	8.66	2.29	56.08	5.31	7.04	3.33
	2017	1.13	14.39	13.96	68.00	87.55	11.24	8.57	2.55	58.32	4.10	8.35	2.85
	2018	1.13	13.50	10.35	42.71	-36.01	11.06	9.00	3.04	59.35	3.52	11.47	3.59
	2011	1.11	20.46	9.16	64.71	514.60	13.21	6.29	4.08	48.30	2.29	18.25	3.47
	2012	1.16	20.72	9.58	47.62	171.50	12.67	6.43	4.35	48.57	2.34	18.40	3.85
Agricultural Bank of China Limited	2013	1.20	20.83	11.69	12.10	326.73	12.26	6.38	4.46	49.61	2.39	10.38	3.46
	2014	1.18	19.13	10.96	117.27	157.79	11.85	7.09	4.42	50.69	2.58	10.10	3.83
	2015	1.07	16.11	10.37	96.03	248.19	11.42	7.59	4.53	50.08	2.81	8.53	4.10
	2016	0.99	14.53	6.21	120.10	70.80	10.77	7.43	4.12	49.67	2.67	7.04	3.33
	2017	0.95	14.04	5.72	68.00	87.55	10.70	7.30	3.77	50.92	2.32	8.35	2.85
	2018	0.93	13.06	9.46	42.71	-36.01	10.77	7.95	4.02	52.81	2.46	11.47	3.59
	2011	1.17	18.21	5.60	64.71	514.60	13.38	7.24	2.20	53.62	6.09	18.25	3.47
	2012	1.19	17.98	8.82	47.62	171.50	12.13	7.28	2.25	54.14	7.01	18.40	3.85
	2013	1.23	17.96	7.69	12.10	326.73	11.68	7.58	2.21	54.83	7.59	10.38	3.46
Bank of China Limited	2014	1.22	16.52	8.52	117.27	157.79	11.31	8.53	2.22	55.62	8.08	10.10	3.83
	2015	1.12	14.12	8.87	96.03	248.19	10.79	8.90	2.20	54.33	7.78	8.53	4.10
	2016	1.05	12.94	8.61	120.10	70.80	9.99	8.84	2.38	54.95	8.35	7.04	3.33
	2017	0.98	12.08	9.68	68.00	87.55	9.89	8.69	2.31	55.97	8.25	8.35	2.85
	2018	0.94	11.66	10.35	42.71	-36.01	10.13	8.86	2.57	55.57	8.40	11.47	3.59
	2011	1.19	20.47	9.56	64.71	514.60	5.22	6.90	2.20	55.56	2.49	18.25	3.47
	2012	1.18	17.88	16.14	47.62	171.50	5.04	8.27	2.30	55.89	2.58	18.40	3.85
	2013	1.11	15.56	13.00	12.10	326.73	5.02	7.99	2.24	54.80	2.96	10.38	3.46
	2014	1.08	14.75	7.97	117.27	157.79	4.65	7.95	2.24	54.75	2.77	10.10	3.83
Bank of Communications Co. Ltd	2015	1.00	13.21	21.84	96.03	248.19	4.59	8.58	2.35	52.02	3.90	8.53	4.10
	2016	0.87	11.56	26.83	120.10	70.80	4.63	8.84	2.30	50.23	3.81	7.04	3.33
	2017	0.81	10.80	20.65	68.00	87.55	4.59	8.05	2.31	50.67	7.18	8.35	2.85
	2018	0.80	10.74	20.95	42.71	-36.01	4.54	7.80	2.59	50.93	8.98	11.47	3.59
	2011	1.39	24.16	11.77	64.71	514.60	3.16	6.87	2.24	58.72	2.44	18.25	3.47
	2012	1.46	24.77	11.69	47.62	171.50	3.26	7.17	2.16	55.88	2.42	18.40	3.85
	2013	1.39	22.18	13.40	12.10	326.73	3.38	7.80	2.22	54.70	2.75	10.38	3.46
	2014	1.28	19.29	15.74	117.27	157.79	3.51	7.84	2.59	53.13	3.06	10.10	3.83
	2015	1.13	17.14	20.83	96.03	248.19	3.51	7.65	3.00	51.59	3.22	8.53	4.10
China Merchants Bank Co Ltd	2016	1.09	16.67	22.44	120.10	70.80	3.27	7.06	3.37	54.89	3.15	7.04	3.33
	2017	1.15	16.66	19.64	68.00	87.55	3.20	7.76	4.22	56.61	3.63	8.35	2.85
	2018	1.24	16.57	21.84	42.71	-36.01	3.21	8.17	4.87	58.30	4.22	11.47	3.59
	2011	1.27	17.47	7.12	64.71	514.60	3.13	8.59	1.62	51.85	1.77	18.25	3.47
	2012	1.10	16.44	8.33	47.62	171.50	2.83	7.34	2.12	56.18	1.82	18.40	3.85
	2013	1.20	18.31	9.24	12.10	326.73	3.07	7.79	2.13	53.31	1.87	10.38	3.46
	2014	1.07	16.65	11.47	117.27	157.79	3.07	7.34	2.36	52.86	2.19	10.10	3.83
	2015	0.90	14.22	11.28	96.03	248.19	3.29	7.72	2.39	49.37	2.54	8.53	4.10
	2016	0.76	11.87	11.96	120.10	70.80	3.26	7.51	2.63	48.52	3.99	7.04	3.33
China CITIC Bank Corporation Limited	2017	0.74	10.76	10.29	68.00	87.55	2.89	6.95	2.84	56.31	6.42	8.35	2.85
	2018	0.77	10.49	8.76	42.71	-36.01	2.89	7.98	2.80	59.48	6.52	11.47	3.59
	2011	1.40	23.77	5.33	64.71	514.60	2.52	7.35	2.23	54.07	1.93	18.25	3.47
	2012	1.41	25.31	5.85	47.62	171.50	3.07	7.56	2.39	43.11	1.86	18.40	3.85
	2013	1.34	23.22	8.97	12.10	326.73	2.72	6.36	2.21	48.80	3.35	10.38	3.46
	2014	1.26	20.16	13.56	117.27	157.79	2.98	7.68	2.12	45.15	4.19	10.10	3.83
	2015	1.10	16.87	15.15	96.03	248.19	2.90	7.72	2.46	45.30	4.16	8.53	4.10
	2016	0.94	14.74	13.83	120.10	70.80	3.25	7.79	2.62	41.75	3.65	7.04	3.33
	2017	0.86	13.73	11.09	68.00	87.55	3.00	6.61	2.66	47.51	3.73	8.35	2.85
China Minsheng Banking Corporation	2018	0.85	12.26	12.22	42.71	-36.01	2.86	7.30	2.36	50.99	3.18	11.47	3.59
	2011	1.20	24.60	8.37	64.71	514.60	2.72	6.28	1.46	40.82	0.96	18.25	3.47
	2012	1.23	24.36	7.93	47.62	171.50	3.11	7.08	2.00	37.81	1.22	18.40	3.85
	2013	1.20	22.33	10.65	12.10	326.73	3.10	6.19	2.68	56.54	1.33	10.38	3.46
	2014	1.18	20.56	12.92	117.27	157.79	3.27	7.10	2.76	55.16	1.23	10.10	3.83
	2015	1.04	17.51	15.11	96.03	248.19	3.40	7.20	3.07	55.37	3.69	8.53	4.10
	2016	0.95	16.17	14.76	120.10	70.80	3.35	6.69	3.48	34.17	6.37	7.04	3.33
	2017	0.92	14.86	9.88	68.00	87.55	3.26	6.95	3.37	37.88	6.26	8.35	2.85
	2018	0.93	13.68	9.15	42.71	-36.01	3.20	7.36	3.26	43.72	7.95	11.47	3.59
China Everbright Bank Company Limited	2011	1.13	20.36	4.54	64.71	514.60	1.96	6.50	2.36	51.34	1.97	18.25	3.47
	2012	1.18	22.44	4.34	47.62	171.50	2.18	6.60	2.53	44.89	1.89	18.40	3.85
	2013	1.14	20.01	7.29	12.10	326.73	2.03	6.71	2.07	48.29	2.21	10.38	3.46
	2014	1.12	17.40	10.47	117.27	157.79	2.03	7.43	2.16	47.48	2.02	10.10	3.83
	2015	1.00	14.66	16.26	96.03	248.19	2.03	8.19	2.52	47.78	2.84	8.53	4.10
	2016	0.85	12.79	15.29	120.10	70.80	2.21	7.93	2.43	44.66	3.09	7.04	3.33
	2017	0.78	11.36	12.72	68.00	87.55	2.08	7.60	2.52	49.70	3.84	8.35	2.85
	2018	0.80	10.74	11.06	42.71	-36.01	2.08	7.89	2.80	55.57	3.92	11.47	3.59

Table A-22 Raw data of 43 banks

Bank	Year	ROAA	ROAE	GTPP	GP2P	MS	ETA	LPR	LAR	NIEAR	GGDP	LR
Industrial & Commercial Bank of China	2011	1.44	23.43	64.71	514.60	17.51	7.12	2.50	50.33	4.27	18.25	3.47
	2012	1.45	22.88	47.62	171.50	16.78	7.29	2.50	50.19	5.61	18.40	3.85
	2013	1.44	21.85	12.10	326.73	15.92	7.29	2.43	52.45	5.18	10.38	3.46
	2014	1.40	19.62	117.27	157.79	15.29	8.13	2.34	53.50	5.54	10.10	3.83
	2015	1.30	16.64	96.03	248.19	14.25	8.74	2.35	53.73	5.96	8.53	4.10
	2016	1.20	14.76	120.10	70.80	13.28	8.92	2.22	54.09	6.34	7.04	3.33
	2017	1.14	13.95	68.00	87.55	13.26	8.87	2.39	54.56	5.77	8.35	2.85
	2018	1.11	13.32	42.71	-36.01	13.19	8.99	2.68	55.67	4.93	11.47	3.59
China Construction Bank Co., Ltd	2011	1.47	22.33	64.71	514.60	13.89	7.55	2.64	52.89	3.82	18.25	3.47
	2012	1.47	21.92	47.62	171.50	13.36	7.73	2.69	53.76	3.66	18.40	3.85
	2013	1.47	21.26	12.10	326.73	12.93	7.69	2.66	55.91	3.24	10.38	3.46
	2014	1.42	19.62	117.27	157.79	12.42	8.15	2.66	56.58	3.24	10.10	3.83
	2015	1.30	16.97	96.03	248.19	11.78	8.63	2.39	57.14	3.37	8.53	4.10
	2016	1.18	15.32	120.10	70.80	11.54	8.66	2.29	56.08	5.31	7.04	3.33
	2017	1.13	14.39	68.00	87.55	11.24	8.57	2.55	58.32	4.10	8.35	2.85
	2018	1.13	13.50	42.71	-36.01	11.06	9.00	3.04	59.35	3.52	11.47	3.59
Agricultural Bank of China Limited	2011	1.11	20.46	64.71	514.60	13.21	6.29	4.08	48.30	2.29	18.25	3.47
	2012	1.16	20.72	47.62	171.50	12.67	6.43	4.35	48.57	2.34	18.40	3.85
	2013	1.20	20.83	12.10	326.73	12.26	6.38	4.46	49.61	2.39	10.38	3.46
	2014	1.18	19.13	117.27	157.79	11.85	7.09	4.42	50.69	2.58	10.10	3.83
	2015	1.07	16.11	96.03	248.19	11.42	7.59	4.53	50.08	2.81	8.53	4.10
	2016	0.99	14.53	120.10	70.80	10.77	7.43	4.12	49.67	2.67	7.04	3.33
	2017	0.95	14.04	68.00	87.55	10.70	7.30	3.77	50.92	2.32	8.35	2.85
	2018	0.93	13.06	42.71	-36.01	10.77	7.95	4.02	52.81	2.46	11.47	3.59
Bank of China Limited	2011	1.17	18.21	64.71	514.60	13.38	7.24	2.20	53.62	6.09	18.25	3.47
	2012	1.19	17.98	47.62	171.50	12.13	7.28	2.25	54.14	7.01	18.40	3.85
	2013	1.23	17.96	12.10	326.73	11.68	7.58	2.21	54.83	7.59	10.38	3.46
	2014	1.22	16.52	117.27	157.79	11.31	8.53	2.22	55.62	8.08	10.10	3.83
	2015	1.12	14.12	96.03	248.19	10.79	8.90	2.20	54.33	7.78	8.53	4.10
	2016	1.05	12.94	120.10	70.80	9.99	8.84	2.38	54.95	8.35	7.04	3.33
	2017	0.98	12.08	68.00	87.55	9.89	8.69	2.31	55.97	8.25	8.35	2.85
	2018	0.94	11.66	42.71	-36.01	10.13	8.86	2.57	55.57	8.40	11.47	3.59
Bank of Communications Co. Ltd	2011	1.19	20.47	64.71	514.60	5.22	6.90	2.20	55.56	2.49	18.25	3.47
	2012	1.18	17.88	47.62	171.50	5.04	8.27	2.30	55.89	2.58	18.40	3.85
	2013	1.11	15.56	12.10	326.73	5.02	7.99	2.24	54.80	2.96	10.38	3.46
	2014	1.08	14.75	117.27	157.79	4.65	7.95	2.24	54.75	2.77	10.10	3.83
	2015	1.00	13.21	96.03	248.19	4.59	8.58	2.35	52.02	3.90	8.53	4.10
	2016	0.87	11.56	120.10	70.80	4.63	8.84	2.30	50.23	3.81	7.04	3.33
	2017	0.81	10.80	68.00	87.55	4.59	8.05	2.31	50.67	7.18	8.35	2.85
	2018	0.80	10.74	42.71	-36.01	4.54	7.80	2.59	50.93	8.98	11.47	3.59
China Merchants Bank Co Ltd	2011	1.39	24.16	64.71	514.60	3.16	6.87	2.24	58.72	2.44	18.25	3.47
	2012	1.46	24.77	47.62	171.50	3.26	7.17	2.16	55.88	2.42	18.40	3.85
	2013	1.39	22.18	12.10	326.73	3.38	7.80	2.22	54.70	2.75	10.38	3.46
	2014	1.28	19.29	117.27	157.79	3.51	7.84	2.59	53.13	3.06	10.10	3.83
	2015	1.14	17.14	96.03	248.19	3.51	7.65	3.00	51.59	3.22	8.53	4.10
	2016	1.09	16.67	120.10	70.80	3.27	7.06	3.37	54.89	3.15	7.04	3.33
	2017	1.15	16.66	68.00	87.55	3.20	7.76	4.22	56.61	3.63	8.35	2.85
	2018	1.24	16.57	42.71	-36.01	3.21	8.17	4.87	58.30	4.22	11.47	3.59
Industrial Bank Co Ltd	2011	1.20	24.60	64.71	514.60	2.72	6.28	1.46	40.82	0.96	18.25	3.47
	2012	1.23	24.36	47.62	171.50	3.11	7.08	2.00	37.81	1.22	18.40	3.85
	2013	1.20	22.33	12.10	326.73	3.10	6.19	2.68	56.54	1.33	10.38	3.46
	2014	1.18	20.56	117.27	157.79	3.27	7.10	2.76	55.16	1.23	10.10	3.83
	2015	1.04	17.51	96.03	248.19	3.40	7.20	3.07	55.37	3.69	8.53	4.10
	2016	0.95	16.17	120.10	70.80	3.35	6.69	3.48	34.17	6.37	7.04	3.33
	2017	0.92	14.86	68.00	87.55	3.26	6.95	3.37	37.88	6.26	8.35	2.85
	2018	0.93	13.68	42.71	-36.01	3.20	7.36	3.26	43.72	7.95	11.47	3.59
Shanghai Pudong Development Ban	2011	1.12	20.05	64.71	514.60	3.04	6.82	2.19	49.59	0.73	18.25	3.47
	2012	1.18	20.85	47.62	171.50	3.01	6.69	2.31	49.10	0.89	18.40	3.85
	2013	1.21	21.30	12.10	326.73	3.10	6.59	2.36	48.03	0.90	10.38	3.46
	2014	1.20	20.13	117.27	157.79	3.11	7.15	2.65	48.34	0.99	10.10	3.83
	2015	1.10	17.53	96.03	248.19	3.24	7.59	3.30	44.52	1.57	8.53	4.10
	2016	0.98	15.52	120.10	70.80	3.22	7.39	3.19	47.17	1.19	7.04	3.33
	2017	0.92	13.68	68.00	87.55	3.12	7.36	2.84	52.05	2.18	8.35	2.85
	2018	0.91	12.43	42.71	-36.01	3.00	7.79	2.97	56.43	6.35	11.47	3.59
China CITIC Bank Corporation Li	2011	1.27	17.47	64.71	514.60	3.13	8.59	1.62	51.85	1.77	18.25	3.47
	2012	1.10	16.44	47.62	171.50	2.83	7.34	2.12	56.18	1.82	18.40	3.85
	2013	1.20	18.31	12.10	326.73	3.07	7.79	2.13	53.31	1.87	10.38	3.46
	2014	1.07	16.65	117.27	157.79	3.07	7.34	2.36	52.86	2.19	10.10	3.83
	2015	0.90	14.22	96.03	248.19	3.29	7.72	2.39	49.37	2.54	8.53	4.10
	2016	0.76	11.87	120.10	70.80	3.26	7.51	2.63	48.52	3.99	7.04	3.33
	2017	0.74	10.76	68.00	87.55	2.89	6.95	2.84	56.31	6.42	8.35	2.85
	2018	0.77	10.49	42.71	-36.01	2.89	7.98	2.80	59.48	6.52	11.47	3.59
China Minsheng Banking Corporat	2011	1.40	23.77	64.71	514.60	2.52	7.35	2.23	54.07	1.93	18.25	3.47
	2012	1.41	25.31	47.62	171.50	3.07	7.56	2.39	43.11	1.86	18.40	3.85
	2013	1.34	23.22	12.10	326.73	2.72	6.36	2.21	48.80	3.35	10.38	3.46
	2014	1.26	20.16	117.27	157.79	2.98	7.68	2.12	45.15	4.19	10.10	3.83
	2015	1.10	16.87	96.03	248.19	2.90	7.72	2.46	45.30	4.16	8.53	4.10
	2016	0.94	14.74	120.10	70.80	3.25	7.79	2.62	41.75	3.65	7.04	3.33
	2017	0.86	13.73	68.00	87.55	3.00	6.61	2.66	47.51	3.73	8.35	2.85
	2018	0.85	12.26	42.71	-36.01	2.86	7.30	2.36	50.99	3.18	11.47	3.59

China Everbright Bank Company L	2011	1.13	20.36	64.71	514.60	1.96	6.50	2.36	51.34	1.97	18.25	3.47
	2012	1.18	22.44	47.62	171.50	2.18	6.60	2.53	44.89	1.89	18.40	3.85
	2013	1.14	20.01	12.10	326.73	2.03	6.71	2.07	48.29	2.21	10.38	3.46
	2014	1.12	17.40	117.27	157.79	2.03	7.43	2.16	47.48	2.02	10.10	3.83
	2015	1.00	14.66	96.03	248.19	2.03	8.19	2.52	47.78	2.84	8.53	4.10
	2016	0.85	12.79	120.10	70.80	2.21	7.93	2.43	44.66	3.09	7.04	3.33
	2017	0.78	11.36	68.00	87.55	2.08	7.60	2.52	49.70	3.84	8.35	2.85
	2018	0.80	10.74	42.71	-36.01	2.08	7.89	2.80	55.57	3.92	11.47	3.59
Hua Xia Bank co., Limited	2011	0.81	14.42	64.71	514.60	1.41	6.15	2.82	49.15	1.87	18.25	3.47
	2012	0.94	18.46	47.62	171.50	1.42	6.01	2.82	48.37	2.00	18.40	3.85
	2013	0.98	19.30	12.10	326.73	1.41	5.78	2.73	49.22	2.31	10.38	3.46
	2014	1.02	19.16	117.27	157.79	1.37	6.10	2.54	50.77	2.76	10.10	3.83
	2015	0.98	17.19	96.03	248.19	1.30	6.39	2.55	52.91	3.33	8.53	4.10
	2016	0.90	14.56	120.10	70.80	1.30	7.57	2.65	51.64	5.01	7.04	3.33
	2017	0.82	12.36	68.00	87.55	1.27	7.19	2.76	55.56	5.77	8.35	2.85
	2018	0.81	10.81	42.71	-36.01	1.28	8.72	2.93	60.19	6.22	11.47	3.59
China Guangfa Bank Co Ltd	2011	1.11	20.06	64.71	514.60	1.04	6.47	3.10	58.78	2.23	18.25	3.47
	2012	1.08	19.31	47.62	171.50	1.12	6.91	2.52	52.71	2.27	18.40	3.85
	2013	0.88	16.93	12.10	326.73	1.24	6.27	1.56	48.62	2.40	10.38	3.46
	2014	0.77	14.98	117.27	157.79	1.22	5.95	1.77	47.99	2.65	10.10	3.83
	2015	0.52	9.80	96.03	248.19	1.18	5.92	2.16	47.20	3.21	8.53	4.10
	2016	0.49	9.34	120.10	70.80	1.13	5.77	2.41	47.81	6.87	7.04	3.33
	2017	0.50	9.28	68.00	87.55	1.05	5.56	2.17	53.14	8.14	8.35	2.85
	2018	0.48	7.86	42.71	-36.01	1.12	7.65	2.20	56.70	8.15	11.47	3.59
Ping An Bank Co Ltd	2011	1.05	19.14	64.71	514.60	1.42	10.37	1.70	49.33	2.79	18.25	3.47
	2012	0.94	16.87	47.62	171.50	1.54	6.74	1.74	44.87	2.69	18.40	3.85
	2013	0.87	15.47	12.10	326.73	1.59	6.98	1.79	44.79	3.51	10.38	3.46
	2014	0.97	16.30	117.27	157.79	1.62	6.92	2.06	46.87	4.91	10.10	3.83
	2015	0.93	14.95	96.03	248.19	1.61	7.39	2.41	48.51	3.19	8.53	4.10
	2016	0.83	12.43	120.10	70.80	1.63	8.06	2.71	49.97	3.49	7.04	3.33
	2017	0.75	10.93	68.00	87.55	1.65	7.52	2.57	52.46	3.63	8.35	2.85
	2018	0.74	10.74	42.71	-36.01	1.63	7.39	2.71	58.43	3.57	11.47	3.59
China Zheshang Bank Co Ltd	2011	1.10	14.80	64.71	514.60	0.34	9.52	1.72	49.36	0.51	18.25	3.47
	2012	1.16	18.55	47.62	171.50	0.38	7.52	1.96	46.29	0.55	18.40	3.85
	2013	1.11	19.40	12.10	326.73	0.41	7.06	2.10	44.48	0.62	10.38	3.46
	2014	0.88	16.72	117.27	157.79	0.50	6.79	2.59	38.66	0.68	10.10	3.83
	2015	0.83	17.03	96.03	248.19	0.66	7.41	2.95	33.48	0.90	8.53	4.10
	2016	0.85	17.34	120.10	70.80	0.75	6.54	3.44	33.91	0.83	7.04	3.33
	2017	0.76	14.10	68.00	87.55	0.78	6.51	3.43	43.79	0.98	8.35	2.85
	2018	0.73	12.23	42.71	-36.01	0.78	6.56	3.25	52.54	6.46	11.47	3.59
Hengfeng Bank Co Ltd	2011	1.17	23.48	64.71	514.60	0.49	7.33	1.76	33.08	9.64	18.25	3.47
	2012	1.10	25.33	47.62	171.50	0.59	5.91	2.30	27.77	10.12	18.40	3.85
	2013	1.00	23.70	12.10	326.73	0.65	5.26	3.16	26.84	1.75	10.38	3.46
	2014	0.88	19.24	117.27	157.79	0.63	5.44	2.52	28.16	1.82	10.10	3.83
	2015	0.85	16.37	96.03	248.19	0.69	6.71	2.64	29.65	1.80	8.53	4.10
	2016	0.81	15.24	120.10	70.80	0.67	5.93	3.04	35.58	2.32	7.04	3.33
	2017			68.00	87.55						8.35	2.85
	2018			42.71	-36.01						11.47	3.59
China Bohai Bank	2011	0.64	14.18	64.71	514.60	0.35	6.23	1.70	36.02	0.68	18.25	3.47
	2012	0.85	18.39	47.62	171.50	0.45	6.34	1.85	29.97	0.77	18.40	3.85
	2013	0.88	20.73	12.10	326.73	0.48	5.13	2.21	29.55	0.73	10.38	3.46
	2014	0.81	18.74	117.27	157.79	0.49	5.19	2.46	30.78	0.69	10.10	3.83
	2015	0.79	17.49	96.03	248.19	0.49	5.33	2.77	35.93	0.79	8.53	4.10
	2016	0.80	16.81	120.10	70.80	0.47	5.43	3.06	41.31	0.82	7.04	3.33
	2017	0.73	15.02	68.00	87.55	0.51	5.66	3.24	46.37	1.90	8.35	2.85
	2018	0.70	13.57	42.71	-36.01	0.49	5.57	3.44	54.86	2.84	11.47	3.59
Bank of Beijing Co Ltd	2011	1.06	19.24	64.71	514.60	1.08	6.88	2.35	42.41	1.21	18.25	3.47
	2012	1.13	19.13	47.62	171.50	1.07	7.50	2.50	44.35	1.26	18.40	3.85
	2013	1.10	17.95	12.10	326.73	1.13	6.99	2.50	43.75	1.12	10.38	3.46
	2014	1.09	17.94	117.27	157.79	1.13	7.19	2.78	44.30	1.37	10.10	3.83
	2015	1.00	15.86	96.03	248.19	1.18	7.66	3.11	42.03	1.28	8.53	4.10
	2016	0.90	13.76	120.10	70.80	1.16	7.79	3.25	42.52	1.58	7.04	3.33
	2017	0.85	11.78	68.00	87.55	1.18	8.35	3.30	46.23	3.17	8.35	2.85
	2018	0.82	10.86	42.71	-36.01	1.23	8.33	3.18	49.04	4.15	11.47	3.59
Bank of Shanghai	2011	0.95	17.93	64.71	514.60	0.74	6.22	2.71	51.02	1.55	18.25	3.47
	2012	1.02	19.39	47.62	171.50	0.78	6.45	2.39	47.81	0.98	18.40	3.85
	2013	1.04	18.99	12.10	326.73	0.82	6.89	2.39	45.15	1.08	10.38	3.46
	2014	1.05	17.45	117.27	157.79	0.88	7.61	2.54	40.80	1.04	10.10	3.83
	2015	0.99	15.60	96.03	248.19	0.93	7.82	2.82	37.02	1.31	8.53	4.10
	2016	0.89	13.70	120.10	70.80	0.97	8.02	3.00	31.56	9.19	7.04	3.33
	2017	0.86	11.63	68.00	87.55	0.92	8.40	3.14	36.73	12.48	8.35	2.85
	2018	0.94	11.69	42.71	-36.01	0.97	8.95	3.80	41.95	9.82	11.47	3.59
Bank of Jiangsu Co Ltd	2011	1.24	23.10	64.71	514.60	0.58	6.46	2.54	56.56	2.47	18.25	3.47
	2012	1.21	22.71	47.62	171.50	0.62	6.64	2.67	54.17	2.30	18.40	3.85
	2013	1.16	19.98	12.10	326.73	0.64	7.34	2.58	53.76	2.35	10.38	3.46
	2014	0.97	16.78	117.27	157.79	0.77	7.32	2.69	47.05	2.12	10.10	3.83
	2015	0.82	15.70	96.03	248.19	0.83	6.28	2.74	43.54	1.62	8.53	4.10
	2016	0.74	14.24	120.10	70.80	0.88	6.53	2.59	40.63	1.25	7.04	3.33
	2017	0.71	12.20	68.00	87.55	0.90	7.06	2.60	42.21	2.22	8.35	2.85
	2018	0.72	11.18	42.71	-36.01	0.92	7.03	2.84	46.17	7.12	11.47	3.59

Bank of Nanjing	2011	1.29	15.87	64.71	514.60	0.32	9.84	2.53	36.48	1.26	18.25	3.47
	2012	1.29	17.35	47.62	171.50	0.33	8.80	2.64	36.44	0.96	18.40	3.85
	2013	1.16	17.54	12.10	326.73	0.37	7.81	2.66	33.86	1.10	10.38	3.46
	2014	1.12	18.97	117.27	157.79	0.43	7.55	3.06	30.48	1.15	10.10	3.83
	2015	1.03	16.59	96.03	248.19	0.52	9.14	3.57	31.20	2.53	8.53	4.10
	2016	0.89	14.54	120.10	70.80	0.59	7.75	3.99	31.19	4.51	7.04	3.33
	2017	0.89	14.95	68.00	87.55	0.58	6.41	3.98	34.08	5.04	8.35	2.85
	2018	0.94	15.22	42.71	-36.01	0.59	6.90	4.11	38.64	6.99	11.47	3.59
Bank of Ningbo	2011	1.24	18.81	64.71	514.60	0.29	7.11	1.63	47.12	3.81	18.25	3.47
	2012	1.28	19.93	47.62	171.50	0.36	8.49	2.10	38.98	5.19	18.40	3.85
	2013	1.16	20.35	12.10	326.73	0.39	6.83	2.27	37.04	4.32	10.38	3.46
	2014	1.11	18.88	117.27	157.79	0.41	7.39	2.53	37.91	4.35	10.10	3.83
	2015	1.03	16.57	96.03	248.19	0.46	8.14	2.85	35.69	8.35	8.53	4.10
	2016	0.98	16.39	120.10	70.80	0.49	7.03	3.21	34.18	7.40	7.04	3.33
	2017	0.98	17.39	68.00	87.55	0.52	6.46	4.04	33.55	17.24	8.35	2.85
	2018	1.04	16.21	42.71	-36.01	0.53	7.87	4.08	38.43	17.24	11.47	3.59
Huishang Bank Co Ltd	2011	1.50	22.22	64.71	514.60	0.29	8.17	2.54	53.47	0.77	18.25	3.47
	2012	1.48	22.93	47.62	171.50	0.31	7.97	2.35	50.52	0.93	18.40	3.85
	2013	1.39	18.91	12.10	326.73	0.32	9.75	2.13	51.15	0.83	10.38	3.46
	2014	1.31	16.70	117.27	157.79	0.36	9.52	2.13	45.45	0.69	10.10	3.83
	2015	1.11	15.78	96.03	248.19	0.41	8.77	2.47	38.27	0.86	8.53	4.10
	2016	1.01	14.65	120.10	70.80	0.42	8.36	2.90	36.75	0.68	7.04	3.33
	2017	0.94	13.90	68.00	87.55	0.46	7.85	3.01	34.65	0.98	8.35	2.85
	2018	0.90	13.69	42.71	-36.01	0.50	7.74	3.15	36.34	0.31	11.47	3.59
Shengjing Bank	2011	1.24	28.27	64.71	514.60	0.25	5.64	1.64	43.74	1.69	18.25	3.47
	2012	1.31	26.98	47.62	171.50	0.30	6.63	1.63	35.84	1.25	18.40	3.85
	2013	1.46	27.06	12.10	326.73	0.30	6.85	1.41	37.01	2.11	10.38	3.46
	2014	1.26	18.83	117.27	157.79	0.37	10.17	1.70	31.52	2.19	10.10	3.83
	2015	1.03	15.99	96.03	248.19	0.45	8.29	2.01	27.86	2.03	8.53	4.10
	2016	0.86	15.62	120.10	70.80	0.50	6.61	2.78	26.00	1.65	7.04	3.33
	2017	0.78	15.36	68.00	87.55	0.52	5.77	2.77	27.12	1.91	8.35	2.85
	2018	0.51	9.38	42.71	-36.01	0.47	5.53	2.75	38.22	1.55	11.47	3.59
Bank of Hangzhou Co Ltd	2011	1.17	20.42	64.71	514.60	0.28	6.64	2.12	52.00	2.61	18.25	3.47
	2012	1.25	22.28	47.62	171.50	0.31	7.18	2.50	46.81	1.63	18.40	3.85
	2013	1.14	19.93	12.10	326.73	0.29	6.34	2.52	51.06	2.01	10.38	3.46
	2014	0.93	15.01	117.27	157.79	0.31	7.69	2.35	46.99	1.88	10.10	3.83
	2015	0.77	12.76	96.03	248.19	0.35	7.62	2.64	39.47	2.11	8.53	4.10
	2016	0.63	11.32	120.10	70.80	0.40	7.07	3.03	34.23	1.83	7.04	3.33
	2017	0.59	10.07	68.00	87.55	0.42	7.19	3.36	34.07	5.16	8.35	2.85
	2018	0.62	9.93	42.71	-36.01	0.44	6.86	3.71	38.05	7.20	11.47	3.59
Bank of Jinzhou Co Ltd	2011	1.07	11.71	64.71	514.60	0.12	10.39	2.17		5.29	18.25	3.47
	2012	1.02	11.12	47.62	171.50	0.12	10.64	2.24	50.11	4.76	18.40	3.85
	2013	0.89	11.59	12.10	326.73	0.15	9.79	1.97	43.72	3.61	10.38	3.46
	2014	0.99	15.19	117.27	157.79	0.19	8.83	2.53	34.52	3.28	10.10	3.83
	2015	1.60	23.29	96.03	248.19	0.23	10.48	3.82	26.91	2.80	8.53	4.10
	2016	1.82	23.71	120.10	70.80	0.30	11.86	3.84	22.62	2.37	7.04	3.33
	2017	1.44	17.64	68.00	87.55	0.37	11.16	2.81	28.90	2.09	8.35	2.85
	2018			42.71	-36.01						11.47	3.59
Xiamen International Bank	2011	0.67	16.37	64.71	514.60	0.12	5.47	1.21	50.52	1.89	18.25	3.47
	2012	0.64	15.32	47.62	171.50	0.20	8.76	1.41	32.02	1.89	18.40	3.85
	2013	0.71	16.33	12.10	326.73	0.22	5.31	1.84	31.18	2.10	10.38	3.46
	2014	0.73	16.87	117.27	157.79	0.26	5.92	1.90	31.92	2.39	10.10	3.83
	2015	0.82	16.26	96.03	248.19	0.29	7.96	2.21	33.45	2.53	8.53	4.10
	2016	0.83	12.47	120.10	70.80	0.31	8.71	2.32	37.99	1.47	7.04	3.33
	2017	0.85	12.50	68.00	87.55	0.36	8.23	2.09	40.00	4.42	8.35	2.85
	2018	0.77	11.52	42.71	-36.01	0.38	7.68	2.26	44.64	3.64	11.47	3.59
Bank of Tianjin	2011	0.97	16.81	64.71	514.60	0.27	7.03	3.25	39.49	1.11	18.25	3.47
	2012	0.98	16.97	47.62	171.50	0.29	7.12	3.28	39.28	0.71	18.40	3.85
	2013	0.97	18.97	12.10	326.73	0.34	6.43	2.76	35.53	0.74	10.38	3.46
	2014	1.00	18.32	117.27	157.79	0.36	7.12	2.61	34.76	0.80	10.10	3.83
	2015	0.94	15.88	96.03	248.19	0.36	6.94	2.73	31.74	0.82	8.53	4.10
	2016	0.74	12.05	120.10	70.80	0.36	7.38	2.87	31.62	0.80	7.04	3.33
	2017	0.58	9.12	68.00	87.55	0.36	6.81	2.91	34.43	0.84	8.35	2.85
	2018	0.62	9.15	42.71	-36.01	0.31	6.80	4.13	42.00	1.32	11.47	3.59
Zhongyuan Bank Co Ltd	2011			64.71	514.60						18.25	3.47
	2012			47.62	171.50						18.40	3.85
	2013			12.10	326.73						10.38	3.46
	2014	1.35		117.27	157.79	0.15	14.94	4.10	51.44	17.24	10.10	3.83
	2015	1.17	9.81	96.03	248.19	0.20	16.14	3.85	43.77	3.67	8.53	4.10
	2016	0.91	9.75	120.10	70.80	0.24	11.61	3.62	36.61	1.63	7.04	3.33
	2017	0.82	9.57	68.00	87.55	0.27	10.64	3.81	36.73	3.31	8.35	2.85
	2018	0.41	4.65	42.71	-36.01	0.30	10.67	3.64	39.74	10.25	11.47	3.59
Harbin Bank	2011	1.12	22.21	64.71	514.60	0.23	9.16	2.14	32.43		18.25	3.47
	2012	1.20	20.12	47.62	171.50	0.26	8.20	2.25	31.58	4.20	18.40	3.85
	2013	1.13	18.18	12.10	326.73	0.27	7.38	2.29	32.13	0.98	10.38	3.46
	2014	1.15	15.34	117.27	157.79	0.25	9.36	2.35	36.06	1.43	10.10	3.83
	2015	1.14	14.09	96.03	248.19	0.29	9.85	2.43	33.42	1.99	8.53	4.10
	2016	1.01	13.94	120.10	70.80	0.30	8.39	2.55	37.41	2.70	7.04	3.33
	2017	0.96	13.31	68.00	87.55	0.29	7.87	2.84	42.07	3.50	8.35	2.85
	2018	0.94	12.40	42.71	-36.01	0.29	8.42	2.94	41.22	3.09	11.47	3.59

Bank of Changsha Co Ltd	2011	1.37	27.28	64.71	514.60	0.14	7.00	2.66	33.26	16.19	18.25	3.47
	2012	1.36	29.10	47.62	171.50	0.16	6.09	2.64	30.05	2.18	18.40	3.85
	2013	1.25	26.42	12.10	326.73	0.16	5.69	2.57	30.22	1.55	10.38	3.46
	2014	1.19	21.73	117.27	157.79	0.16	6.79	2.59	33.89	0.20	10.10	3.83
	2015	1.10	17.86	96.03	248.19	0.18	8.24	2.75	32.87	2.10	8.53	4.10
	2016	0.97	17.01	120.10	70.80	0.21	7.13	3.13	30.95	2.36	7.04	3.33
	2017	0.93	17.97	68.00	87.55	0.24	6.26	3.21	32.83	5.42	8.35	2.85
	2018	0.92	16.41	42.71	-36.01	0.25	6.75	3.56	38.81	7.64	11.47	3.59
Bank of Guangzhou Co., Ltd	2011	1.10	19.04	64.71	514.60	0.23	6.77	1.00	35.18	0.73	18.25	3.47
	2012	1.18	22.20	47.62	171.50	0.24	6.35	1.08	32.81	0.58	18.40	3.85
	2013	1.14	22.41	12.10	326.73	0.26	6.00	1.05	31.47	0.55	10.38	3.46
	2014	1.11	21.48	117.27	157.79	0.25	5.79	1.07	33.10	0.42	10.10	3.83
	2015	0.85	16.89	96.03	248.19	0.27	5.99	1.38	32.67	0.39	8.53	4.10
	2016	0.68	15.25	120.10	70.80	0.28	5.22	2.04	26.49	0.48	7.04	3.33
	2017	0.68	14.24	68.00	87.55	0.22	4.59	2.21	38.49	1.46	8.35	2.85
	2018	0.85	12.29	42.71	-36.01	0.21	8.58	1.99	53.96	3.33	11.47	3.59
Bank of Guiyang Co Ltd	2011	1.59	25.60	64.71	514.60	0.09	8.35	4.13	46.40	2.23	18.25	3.47
	2012	1.72	26.88	47.62	171.50	0.10	8.21	3.70	44.58	2.82	18.40	3.85
	2013	1.58	24.52	12.10	326.73	0.10	7.58	3.31	46.65	3.14	10.38	3.46
	2014	1.76	26.14	117.27	157.79	0.12	8.74	3.26	44.89	1.37	10.10	3.83
	2015	1.64	26.08	96.03	248.19	0.15	9.05	3.56	34.92	1.40	8.53	4.10
	2016	1.21	20.42	120.10	70.80	0.20	9.24	3.33	27.53	1.47	7.04	3.33
	2017	1.10	19.26	68.00	87.55	0.24	6.89	3.61	27.04	1.87	8.35	2.85
	2018	1.08	17.01	42.71	-36.01	0.24	7.72	3.60	33.84	1.86	11.47	3.59
Bank of Chengdu Co Ltd	2011	1.44	24.08	64.71	514.60	0.21	7.24	2.68	44.45	3.18	18.25	3.47
	2012	1.21	21.31	47.62	171.50	0.23	7.11	2.60	39.22	4.12	18.40	3.85
	2013	1.19	21.10	12.10	326.73	0.22	6.36	2.61	42.42	3.70	10.38	3.46
	2014	1.27	21.23	117.27	157.79	0.22	6.97	3.00	41.60	3.32	10.10	3.83
	2015	0.91	14.66	96.03	248.19	0.21	6.75	3.76	41.81	4.25	8.53	4.10
	2016	0.76	12.22	120.10	70.80	0.20	6.84	3.43	37.82	9.58	7.04	3.33
	2017	0.98	16.65	68.00	87.55	0.22	6.93	3.41	34.21	8.11	8.35	2.85
	2018	1.00	16.53	42.71	-36.01	0.23	7.20	3.64	37.75	3.70	11.47	3.59
Bank of Zhengzhou Co Ltd	2011	1.47	21.11	64.71	514.60	0.08	10.76	1.84	51.79	3.07	18.25	3.47
	2012	1.67	21.04	47.62	171.50	0.10	10.82	2.01	47.38	2.62	18.40	3.85
	2013	1.50	22.10	12.10	326.73	0.13	9.19	2.24	41.21	2.30	10.38	3.46
	2014	1.39	23.52	117.27	157.79	0.15	7.64	2.26	37.31	1.98	10.10	3.83
	2015	1.43	22.96	96.03	248.19	0.17	8.72	2.85	35.50	2.26	8.53	4.10
	2016	1.28	20.38	120.10	70.80	0.20	8.23	3.11	30.34	2.07	7.04	3.33
	2017	1.08	15.67	68.00	87.55	0.22	9.13	3.11	28.56	12.63	8.35	2.85
	2018	0.69	8.70	42.71	-36.01	0.22	8.69	3.82	33.04	11.81	11.47	3.59
Chongqing Rural Commercial Ban	2011	1.32	16.69	64.71	514.60	0.39	9.66	3.83	40.26	1.55	18.25	3.47
	2012	1.38	18.12	47.62	171.50	0.41	9.22	3.42	38.64	1.54	18.40	3.85
	2013	1.28	17.63	12.10	326.73	0.42	8.40	3.46	39.44	1.47	10.38	3.46
	2014	1.22	17.18	117.27	157.79	0.46	8.53	3.58	37.73	1.45	10.10	3.83
	2015	1.08	15.86	96.03	248.19	0.46	7.80	4.11	35.93	1.41	8.53	4.10
	2016	1.05	15.62	120.10	70.80	0.44	7.56	4.10	35.87	1.43	7.04	3.33
	2017	1.05	15.08	68.00	87.55	0.46	8.12	4.21	35.78	1.56	8.35	2.85
	2018	0.99	13.34	42.71	-36.01	0.45	7.97	4.50	38.29	2.73	11.47	3.59
Beijing Rural Commercial Ban	2011	0.63	27.54	64.71	514.60	0.43	4.91	5.44	44.95	1.69	18.25	3.47
	2012	0.81	18.47	47.62	171.50	0.41	5.01	4.72	47.75	1.22	18.40	3.85
	2013	0.86	19.04	12.10	326.73	0.39	5.03	4.14	50.59	0.84	10.38	3.46
	2014	1.02	19.04	117.27	157.79	0.39	6.79	3.69	50.48	0.88	10.10	3.83
	2015	0.90	15.38	96.03	248.19	0.40	6.86	3.71	42.63	0.47	8.53	4.10
	2016	0.81	14.52	120.10	70.80	0.40	6.36	3.58	36.66	0.64	7.04	3.33
	2017	0.83	15.11	68.00	87.55	0.41	6.23	3.32	33.34	0.67	8.35	2.85
	2018	0.85	15.02	42.71	-36.01	0.42	6.31	3.80	35.81	0.81	11.47	3.59
Shanghai Rural Commercial	2011	1.14	13.26	64.71	514.60	0.35	9.94	2.97	53.97	7.54	18.25	3.47
	2012	1.09	13.38	47.62	171.50	0.35	9.55	2.83	53.99	7.08	18.40	3.85
	2013	1.10	13.80	12.10	326.73	0.35	9.11	2.60	54.66	4.28	10.38	3.46
	2014	1.11	14.09	117.27	157.79	0.36	9.06	2.72	53.67	3.74	10.10	3.83
	2015	1.08	14.26	96.03	248.19	0.38	8.93	2.79	50.87	2.85	8.53	4.10
	2016	0.92	13.13	120.10	70.80	0.39	8.12	2.85	47.70	2.10	7.04	3.33
	2017	0.88	13.23	68.00	87.55	0.41	7.46	3.29	46.73	1.76	8.35	2.85
	2018	0.87	12.09	42.71	-36.01	0.40	8.08	3.86	49.38	1.46	11.47	3.59
Guangzhou Rural Commercial Bank	2011	1.20	16.37	64.71	514.60	0.31	10.13	2.06	43.44	1.53	18.25	3.47
	2012	1.32	17.84	47.62	171.50	0.33	8.91	2.42	38.81	1.65	18.40	3.85
	2013	1.36	19.09	12.10	326.73	0.32	7.92	2.52	41.19	1.74	10.38	3.46
	2014	1.30	18.16	117.27	157.79	0.35	8.61	2.83	38.73	2.22	10.10	3.83
	2015	0.95	14.65	96.03	248.19	0.37	7.65	3.08	37.20	2.93	8.53	4.10
	2016	0.82	13.89	120.10	70.80	0.36	6.49	3.24	37.20	2.67	7.04	3.33
	2017	0.84	13.65	68.00	87.55	0.37	7.33	2.83	38.83	1.26	8.35	2.85
	2018	0.91	13.13	42.71	-36.01	0.36	7.55	3.52	47.82	7.68	11.47	3.59
Jiangsu Changshu Rural Commerci	2011	1.27	17.46	64.71	514.60	0.08	9.38		44.11		18.25	3.47
	2012	1.18	16.22	47.62	171.50	0.07	8.00	3.56	49.11	3.85	18.40	3.85
	2013	1.27	17.25	12.10	326.73	0.07	7.84	3.31	49.18	4.08	10.38	3.46
	2014	1.11	15.59	117.27	157.79	0.08	8.56	3.03	46.58	3.54	10.10	3.83
	2015	0.97	12.56	96.03	248.19	0.07	8.55	3.14	51.47	4.64	8.53	4.10
	2016	0.89	11.00	120.10	70.80	0.07	10.09	3.30	51.10	4.06	7.04	3.33
	2017	0.96	12.27	68.00	87.55	0.07	8.55	3.72	53.36	5.01	8.35	2.85
	2018	1.01	12.86	42.71	-36.01	0.08	9.28	4.38	55.66	3.48	11.47	3.59

Wuxi Rural Commercial Bank Co.,	2011	1.36	20.57	64.71	514.60	0.07	9.57	2.49	54.80		18.25	3.47
	2012	1.30	18.30	47.62	171.50	0.07	8.48	2.57	51.66		18.40	3.85
	2013	1.18	17.20	12.10	326.73	0.07	7.71	2.58	51.89	3.37	10.38	3.46
	2014	1.00	15.56	117.27	157.79	0.08	7.72	2.57	47.72	2.24	10.10	3.83
	2015	0.75	11.93	96.03	248.19	0.07	7.04	2.61	47.52	2.97	8.53	4.10
	2016	0.74	10.91	120.10	70.80	0.07	7.70	2.80	48.35	2.60	7.04	3.33
	2017	0.76	10.90	68.00	87.55	0.07	7.50	2.67	48.19	2.48	8.35	2.85
	2018	0.74	10.61	42.71	-36.01	0.07	7.97	2.91	48.80	3.28	11.47	3.59
	Jiangsu Suzhou Rural Commercial	2011	1.63	19.25	64.71	514.60	0.06	10.63	2.77	46.91		18.25
2012		1.58	19.10	47.62	171.50	0.05		3.32			18.40	3.85
2013		1.63	18.81	12.10	326.73	0.05		3.23	54.16		10.38	3.46
2014		1.25	13.36	117.27	157.79	0.05	9.77	3.57	61.42		10.10	3.83
2015		0.92	9.58	96.03	248.19	0.05	10.75	3.52	57.37	1.86	8.53	4.10
2016		0.86	9.07	120.10	70.80	0.04	11.03	3.34	55.87	1.64	7.04	3.33
2017		0.84	9.04	68.00	87.55	0.05	10.42	3.31	51.52	1.60	8.35	2.85
2018		0.76	9.01	42.71	-36.01	0.06	9.99	3.26	50.86	1.46	11.47	3.59
Jiangsu Jiangyin Rural Commerci		2011	1.65	23.11	64.71	514.60	0.06	8.31	2.55	61.87	0.31	18.25
	2012	1.55	21.50	47.62	171.50	0.07	9.19	3.12	52.05	0.36	18.40	3.85
	2013	1.37	18.73	12.10	326.73	0.06	7.78	2.82	51.85	1.54	10.38	3.46
	2014	1.07	13.90	117.27	157.79	0.06	8.61	3.29	52.91	1.86	10.10	3.83
	2015	0.94	11.59	96.03	248.19	0.06	8.99	3.52	55.10	2.06	8.53	4.10
	2016	0.79	9.29	120.10	70.80	0.06	9.96	4.10	50.46	6.70	7.04	3.33
	2017	0.71	8.25	68.00	87.55	0.06	8.99	4.60	51.05	17.24	8.35	2.85
	2018	0.70	7.80	42.71	-36.01	0.05	9.72	5.03	54.84	12.78	11.47	3.59



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