Delft University of Technology

Master thesis

Chinese shadow banking – Scale, Risk and Regulation

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Acknowledgment

Looking back on the two years at TU Delft, I would like to thank all the people who have helped me throughout the whole journey, and myself who have been struggling hard and not giving up.

When I first came to Delft and started my master study, my major was not MOT but EPA. After spending my first quarter at EPA, I found that I didn't like dealing with policy making. At that moment, I was in a deep thought, should I continue to study for this master program that I didn't like? Or should I change my major? Despite some objections I faced at that time, I finally chose to switch to MOT, which was the best decision I made during my two years at TU Delft.

First of all, I would like to thank my thesis supervisors Prof. Storm and Prof. Kroesen. Prof. Storm is my first supervisor. I have taken many of his classes during the past 2 years. He is such as a nice professor who is always very kind and friendly to students. I remembered that in the second quarter of the first year, every time after the economics class, I always asked him a lot of questions and he always answered me very patiently. When I started my internship at Philips, he was the first person I asked to be my mentor. Thank you Prof Storm for all the help you have given me. I feel so fortunate to have met such approachable and knowledgeable professor like you at MOT. Prof. Kroesen, when I decided to have an empirical analysis part in my thesis, I approached him and asked him if he could be my second supervisor, and he readily agreed. Thank him very much for being my second supervisor. He gave me a lot of constructive suggestions during the writing process of my thesis, and also gave me a lot of guidance for econometric analysis part. Prof. Kroesen, thank you so much for your help during the past 4 months.

Two years' study at MOT is short but challenging. As a non-native English speaker, I was faced with a lot of essays and paper assignments, and sometimes I thought of giving up, feeling breathless with so many different tasks on hands, both from internship and schoolwork. But fortunately, I met my friends, Ludan and Chenlu, who worked side by side together with me. Thank you both for always helping me when I needed help. Although the past two years was very short, I believe our future paths will definitely cross again one day and our friendship will always be with us.

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Graduation is not the end. I am ready to move on!

Abstract

After the U.S. financial crisis in 2008, shadow banking business in China has shown rapid development. Shadow banking refer to credit intermediary involving financial entities and financial activities outside the traditional banking regulatory system. The shadow banking system in western countries represented by the United States is mainly based on securitization and various types of financial derivatives. Different from the shadow banking system in Western countries, the shadow banking activities in China mainly revolve around commercial banks, so it can also be called commercial bank-centric shadow banking system.

This master thesis first looks at the development history of Chinese shadow banking system, identifying two different phases of Chinese shadow banking system development. Then an overall picture of how the Chinese shadow banking system is constituted is given, covering the main components within the shadow banking system.

Further, this master thesis investigates the operation model of commercial bank-centric shadow banking system. As the two most important operation models, commercial bank wealth management business and interbank business are elaborated in this thesis. Besides, the main risks of the shadow banking business and the mechanisms of risk generation, transmission and amplification are also discussed. Based on the highly risky characteristics of shadow banking business, the current regulatory measures of Chinese financial regulators over the past 10 years are summarized and classified based on different regulation purposes.

In addition to the above qualitative analysis, this thesis constructs a panel data set based on the annual report and financial report data of 146 listed commercial banks in China from 2010 to 2020, as well as the regulatory data in the past 10 years, and conducts an econometric empirical analysis to investigate the correlation between commercial banks' shadow banking business scale, regulatory intensity and commercial banks' default risk. The findings show that as the scale of commercial banks' shadow banking business increases, the default risk of commercial banks increases; conversely, as the intensity of financial regulation increases, the default risk of commercial banks decreases accordingly.

Finally, based on the qualitative and quantitative analysis results, this thesis provides feasible suggestions for future regulation of Chinese shadow banking system, while reflecting on the research methods applied in this paper and providing possible improvement points for further research.

1 Introduction

1.1 Research background

Shadow banks refer to financial institutions that perform similar functions to banks but are out of normal banking regulation. The name of “shadow banking” was first proposed by the Federal Reserve of the United States of America in 2007. (McCulley, 2007) Highly leveraged financial intermediaries, money market funds, hedge funds, etc., are all defined as “shadow banking”. The Financial Stability Board (2011) defines shadow banking as a credit intermediary involving financial entities and financial activities outside the traditional banking regulatory system.

Today, when the academic world talks about the concept "Shadow banking", often people will associate it with the United States, mainly because of the 2007 U.S. subprime mortgage crisis, during which shadow banking business was one of the main factors contributing to this unprecedented financial crisis. Before taking a look into Chinese shadow banking system, as the country with the most active shadow banking activity and the first to start shadow banking business, it is reasonable to take a look at the shadow banking system in the United States. By clarifying the development history and composition of shadow banking system in the U.S. and identifying the similarities and differences between the shadow banking systems in China and the U.S., we can better understand the development history, reasons for formation, and potential risks of shadow banking in China.

The emergence and development of the U.S. shadow banking system began in the early 1970s. At that time, the U.S. economy was in stagflation. (Gorton et al., 2010) Under the regulatory framework of the Glass-Steagall Act and Regulation Q, commercial banks were restricted from capping interest rates on deposits while at that time period, the market interest rates were rising. Under these circumstances, money market funds became a better investment vehicle to evade interest rate cap regulation, and commercial banks became less attractive to investors due to much lower returns than money market funds. (Barth et al., 2000) For this reason, commercial banks carried out asset securitization business through financial innovation. This makes it possible for the shadow banking system to act as a credit intermediary indirectly by trading securitized loans. Financial innovations, mainly credit asset securitization, were the prerequisites that led to the rapid development of the US shadow banking system. (Gorton et al., 2010)

Asset securitization started the development of the U.S. shadow banking system, but the development of the U.S. shadow banking system was relatively stable throughout the 1970s and 1980s, and only began to grow rapidly after the 1990s. (Gorton et al., 2010) Since the 1990s, along with the improving domestic economic environment in the U.S. and the relaxation of financial regulation, the scale of the U.S. shadow banking system has expanded rapidly in just over a decade.

However, after years of development, the U.S. shadow banking system has become very large, including asset sales institutions (mortgage financing institutions represented by Freddie Mac and Fannie Mae and related commercial banks), structured investment vehicles, investment banks, private equity funds, money market funds, etc. (Da, 2012) At that moment, asset securitization-related business plays an important role in the U.S. shadow banking system, and the above-mentioned financial institutions involved in shadow banking are more or less involved in the asset securitization business, either as issuers of asset-backed securities or as the investors.

When looking back at the US financial system before the crisis happened, it could be argued that asset securitization was the catalyst for the rapid growth of U.S. shadow banking system in the first decade of the 21st century. Based on asset securitization, shadow banks developed various structured financial products such as asset-backed securities (ABS), mortgage-backed securities (MBS), collateralized debt obligations (CDO), and other hedging, speculative and arbitrage instruments such as credit default swaps (CDS). These financial derivatives, as financial innovation tools, added liquidity to the entire financial market, but at the same time, they also lowered credit approval standards due to the blind pursuit of business profits by major financial institutions, and posed huge challenges to financial regulation due to such asset-backed securities products and their complex product structures. All these factors together ultimately led to the collapse of the U.S. shadow banking system, remarked by the subprime mortgage crisis in 2007, which caused the entire U.S. financial market to collapse and had a huge impact on the entire country and the global economy. (H.-w. Du and Chu, 2008)

Studying the U.S. shadow banking system will provide significant reference for our research into Chinese shadow banking system, in particular, the learning from the 2007 subprime mortgage crisis caused by the U.S. shadow banking system can provide warnings and cautions to the Chinese financial regulators about the possible risks shadow banking activities could bring, so as to avoid the recurrence of the same global financial crisis.

Now let us go back to the main focus of this master thesis. Unlike shadow banking in the U.S., Chinese shadow banking has its own unique characteristics. The relationship between shadow banking and traditional commercial banks in Western countries is usually independent of each other, that is "parallel banks", while the relationship between shadow banking and traditional commercial banks in China is close to “shadow of banks". The reason is that China’s shadow banking business is centered on commercial banks. Compared with other non-bank institutions in terms of the number of products and transaction amount, the shadow banking business of commercial banks has always occupied a dominant position in the Chinese financial market. (Ehlers et al., 2018) Therefore, in China, the shadow banking centered on commercial banks is also called "shadow of banks".

Recently, the speed of financial system reformation and financial innovation in China continues to accelerate rapidly and the number of participants in financial markets are constantly increasing, which makes shadow banking boom in the financial markets after many years of development. To a certain extent, shadow banking has fulfilled the functions of traditional financial institutions, provided new financing methods for the society, and injected new vitality into China's currently imperfect financial market. However, shadow banking also has hidden potential systemic risks due to its high leverage ratio, maturity mismatch, opaque information, and high endogenous vulnerability. At the same time, its characteristics that shadow banking is closely related to commercial banks and widely used in financial markets may expose the financial system to risks and even cause systemic risks.

Different from the early rise of shadow banking in western countries, Chinese shadow banking has only been developed since 2008, and it is still in the early stages of development, with fewer functions and simple structure. However, even so, it may still bring risks and should not be underestimated. For example, the financial products issued by HuaXia Bank (one of the biggest commercial banks in China) over 100 million RMB caused a redemption crisis, the 3 billion trust plan sold by ICBC also had a redemption crisis, and Lufax's (one of the biggest fintech companies in China) 140 million asset management plan defaulted. With the rapid development of shadow banking, the risks it brings cannot be underestimated. The Global Financial Stability Report issued by the International Monetary Fund emphasized that the risks brought by the development of Chinese shadow banking should be paid attention to, and then the next year's report again emphasized the importance of paying attention to the risks of Chinese shadow banking and the need to implement stricter regulation of shadow banking. ((IMF), 2014)

In order to control the risk level of shadow banking, Chinese financial regulation authorities have successively issued several documents to strengthen shadow banking regulation since 2018. The China Central Bank, which is called People's Bank of China, the China Banking Regulatory Commission, and the China Securities Regulatory Commission have respectively issued corresponding regulatory documents for commercial banks' wealth management, non-standard, trust, income right transfer, off-balance sheet business, and interbank business in the last few years, which demonstrated the authorities' attention to the shadow banking regulation issue.

1.2 Problem Statement

Based on the background information mentioned aboveit's crucial to conduct in-dept research in Chinese shadow banking domain in order to fully understand how Chinese shadow banking system works and its potential impact on Chinese financial system.

Due to the fundamental differences in the development model and stage of the financial systems of different countries, the shadow banking systems of different countries are not the same in terms of market entities, business models, and development motivations. Generally speaking, the shadow banking system of emerging economies is relatively simple, while the shadow banking system of developed economies involves many financial institutions and financial instruments are more complex. Unlike the shadow banking systems in Western countries represented by the United States, China has a unique definition of shadow banking. The development of shadow banking in the United States began with the relaxation of financial regulation in the 1970s. After years of development, the shadow banking system in the United States has formed a set of complex business models based on asset management and asset-based securitization. However, China's shadow banking business has a relatively short development history and a relatively simple business model, which has many characteristics that are different from the shadow banking system of America. Commercial banks take the dominant position in Chinese shadow banking system. The specific operation process is that commercial banks issue wealth management products or raise funds through interbank liabilities, and then use trusts, securities and other non-bank financial institutions as channels to achieve investment activities.

The current research on Chinese shadow banking mainly focuses on shadow banking business led by commercial banks, which is embodied in three aspects: the scale of shadow banking business, the potential risks it brings, and the regulation. Most of the quantitative studies mainly use empirical analysis to explore the relationship between the scale of shadow banking business and the risks that can be generated by shadow banking activities.

From the perspective of scale measurement, scholars represented by Qing and Xue (2016) have measured the scale from a macro perspective. They believe that the scale of shadow banking is equivalent to the scale of unobserved credit. At the same time, scholars represented by J. Zhu et al. (2016) have measured the scale from a micro perspective, that is the commercial banks' balance sheet. They defined the financial assets purchased under resale agreements in the balance sheet of commercial banks as the scale of on-balance sheet shadow banking business.

From the perspective of the risks that shadow banking may bring, most scholars believe that the growth of shadow banking is accompanied by the deepening of the involvement between financial institutions, which increases the possibility of risk spreading among financial institutions. Meanwhile, due to the existence of cash pool, institutions that conduct shadow banking business are more inclined to make use of maturity mismatch to obtain excess returns. However, when asset allocation and capital flows are not effectively regulated, liquidity risks will arise. In this case, if the liquidity risk is not resolved in time, it will also trigger the risk of default. Once the above-mentioned risks are concentrated, coupled with imperfect regulation, the systemic risks of the entire financial system will increase, which is absolutely something the economists and regulatory authorities want to avoid. On the contrary, there are still a small number of scholars who are optimistic about the risks posed by Chinese shadow banking activities, but mostly before 2013. Scholars represented by Xiaochuan (2011) and Ba (2013) believe that the maturity mismatch and high leverage of Chinese shadow banking system are not prominent, and the structure of shadow banking products is still relatively simple, which will not bring any big challenges to the financial system stability in the short term.

In term of financial regulation, most of the Chinese domestic scholars believe that the development of shadow banking should focus on improving the level of marketization of shadow banking, enhancing the information transparency of shadow banking and maintaining the leverage ratio at a reasonable level. Scholars represented by Lanbiao and Shanshan (2018) and Yang et al. (2019) pointed out that relying solely on external regulation is not sufficient to control and reduce the risks brought by Chinese shadow banking system. Along with the stronger regulation intensity, Chinese shadow banking system is constantly changing its operation mechanism as well, which brings challenges to regulation to a great extent. Thus, the Chinese financial authorities should pay special attention to the structuralization and risk assessment methods of financial innovation in shadow banking domain.

1.3 Knowledge Gaps

Knowledge gaps in the existing research can be identified from three aspects, that is research angel, research scope and research content.

From the perspective of research angles, most of the current research on shadow banking is focusing on macro perspective. (CHENG et al., 2016; Grillet-Aubert et al., 2016; Qing and Xue, 2016) The scale of shadow banking is measured from the macro perspective and based on this, researchers further explore the relationship between shadow banking scale and macro economy. However, there are few measurements from a micro perspective. Very few literature uses micro level data of commercial banks to measure the scale of on-balance sheet shadow banking, and explore the relationship between the commercial bank's individual risk and on-balance sheet shadow banking activities. Meanwhile, most of the current research has a relatively small sample size (around 10) and the data are also outdated (2008 to 2015). Thus, new research with bigger sample size and more up-to-date data on this topic is regarded to be necessary.

From the perspective of research scope, in terms of the measurement of regulation intensity, there is very little literature on this topic. When it comes to the scale of shadow banking business, most of the current literature mainly focuses on traditional shadow banking business, and rarely involves emerging businesses. When selecting the accounts of shadow banking business in commercial banks' balance sheet, most of them only record the sum of "assets purchased under resale agreements + investments in receivables" as the scale of shadow banking activities, which has great limitation in measuring the actual size of shadow banking activities. For better and more accurate measurement, the scope of shadow banking activities should extend to "inter-bank payment + assets purchased under resale agreements + available-for-sale financial assets + investment in receivables ". The sum of these four items mentioned above should be recorded as the scale of shadow banking on the balance sheet.

To better understand the above-mentioned four financial accounts which will be used when calculating the shadow banking business scale, a short introduction of these four items are given below.

1) Interbank payment: Short-term financing between financial institutions (mainly commercial banks) that take deposits from the public, with the purpose of solving temporary shortages of cash and increasing liquidity, thus meeting regulatory requirements from the financial regulators.

2) Assets purchased under resale agreements: Financial institutions or enterprises buy financial assets such as stocks and bonds from another institution according to a pre-agreed agreement, and then sell them back to the institution at a fixed price as agreed in the contract, after holding them for a certain period of time.

3) Available-for-sale financial assets: Financial institutions or enterprises purchase available-for-sale financial assets and hold them for the purpose of obtaining interest, dividends or market value appreciation, and then obtain corresponding profits. Usually the available-for-sale financial assets are supposed to be hold for more than one year, which distinguish them from financial assets for trading purpose.

4) Investment in receivables: Financial institutions or enterprises invest in accounts receivable from other institutions. Investors receive corresponding interest and are also exposed to the risk of not being able to repay the accounts receivable upon maturity.

In terms of why these four financial accounts are selected to represent the shadow banking business scale in this thesis, they are mainly due to the following reasons. First, these four financial accounts mentioned above all follow the same pattern, namely investing the cash/money for a short period of time to institutions in need of liquidity, when the contract ends, then they will be paid back with a profit margin. This pattern is quite similar to traditional credit issuing business of commercial banks, however the difference lies in whether the funds lent out will be counted into commercial banks' balance sheet or not, which may influence commercial banks' core KPIs, such as loan-to deposit ratio, capital adequacy ration, etc. Through these four different business patterns, the commercial banks can issue loans to other financial institutions or enterprise without recording the credit asset (loans) in their balance sheet, so they can avoid the financial regulations and generate more profits through these activities, which is significantly risky of course. Second, these four items all occupy considerable share of total assets in commercial banks' balance sheet, which means they should be treated with more attention compared with other minor items on balance sheet, Third, these four items are commonly used in the existing research of other scholars, however, as mentioned before, most of the time only two or three items are included in other scholar's research scope. Thus in this thesis, including four items will provide a more comprehensive view in terms of the measurement of on-balance sheet shadow banking business scale.

From the perspective of research content, the previous research mainly focused on the impact of shadow banking scale on commercial banks' business risk, or the relationship between regulation intensity and shadow banking scale. There is very little research considering these three variables simultaneously, investigating the relationship between commercial banks' business risk, on-balance sheet shadow banking scale and financial regulation intensity together.

In summary, the current research has a relatively small sample size and the old data, focusing more on macro-level instead of micro-level on-balance sheet shadow banking business. Besides, most of the current research has a limited scope regarding the coverage for shadow banking business, mainly focusing on traditional shadow banking business, and rarely involving emerging businesses. Thirdly, there is very little research taking commercial banks' risk, shadow banking scale and financial regulation intensity together into consideration. Based on these facts, a good research question could be investigating the relationship between the risks of commercial banks and the scale and regulatory intensity of shadow banking in China from a micro perspective.

1.4 Research significance

1.4.1 Scholarly significance

Chinese shadow banking business has developed rapidly since 2008. The existing literature has focused on the definition, scale measurement, characteristic scope, and current status of risk regulation of shadow banking in China. Most of the current studies started from a macro perspective, and rarely studied shadow banking from a micro perspective. Therefore, this paper investigates the relationship between shadow banking business, regulation intensity and the risk of commercial banks from a micro perspective, which is a good filling for the existing academic research of the Chinese shadow banking system. Besides, revealing the relationship between regulation intensity imposed by authorities and the risk of commercial banks can also provide insights for theoretical research in risk control and regulation of shadow banking.

1.4.2 Practical significance

Commercial banks are a very important financial entity in China. Since 2008, the on-balance sheet shadow banking business of commercial banks, that is, the "banks of shadow" business, has continued to develop. While promoting economic development, it has also increased the risks of commercial banks. To mitigate risks, Chinese regulatory authorities is continuing to issue corresponding regulatory policies, laws in this area. Based on these facts, the research on the relationship between the business risk of commercial banks and the scale of on-balance sheet shadow banking as well as the intensity of regulation can provide practical significance from multiple perspectives. Firstly, it can clarify the future development direction of shadow banking activities in China, and secondly, it can explore the potential future operation mode of shadow banking business. Finally, from a regulation point of view, it can provide the authorities some ideas on how to strengthen financial regulation of the shadow banking system, maintain the stable operation of the financial system, and resolve the risk that could be brought by shadow banking.

Meanwhile, in international wide, most of the existing research on shadow banking is aimed at developed countries, and there are relatively few studies on shadow banking in developing countries. However, due to the underdevelopment of capital markets in developing countries, shadow banking activities show many different characteristics from those of mature and developed capital markets. For example, shadow banking in mature capital markets is more centered on non-financial institutions, while shadow banking in the emerging capital markets is more bank centric. Since China is the world's largest developing country and the second largest economy, researching the relationship between Chinese shadow banking activities and the risk of commercial banks will be helpful for further research on the economic consequences of shadow banking in developing countries.

1.5 Main research question and sub-questions

Main research question:
What is the relationship between the risk of commercial banks and the scale and regulatory intensity of shadow banking in China?

Sub questions:
1. How has the shadow banking business been developing in China?

Shadow banking system has been developing rapidly in China since 2008. To understand how the Chinese shadow banking system work, it's essential to know which phase the current Chinese shadow banking is in and which historical trajectories it has been going through. Besides, what are the main components of this giant shadow banking system? This question will be addressed in later chapter.

2. How does the "commercial banking-centric" Chinese shadow banking system work? What's the mechanism?

In Chinese financial system, commercial banks have always been taking up the dominate position, not only because its money creation role, but also its size are much more significant than the non-bank institutions, compared with our developed financial markets, such as the United States. In such a commercial bank-centric financial system, shadow banking activities will also be revolving around commercial banks. In terms of commercial banking-centric Chinese shadow banking system, under which kind of mechanism does it operate. What are the main operating models for this special shadow banking system? These questions will be discussed in this thesis.

3. What is the correlation between the risk of default of commercial banks and the scale and regulatory intensity of shadow banking in China from a quantitative perspective?

Answering the previous two sub-questions, we should have gained thorough understanding of how the Chinese shadow banking system work, and how it will impact the overall Chinese financial system. However, before going to the quantitative part, first we should look at the overall relationship between shadow banking activities and commercial banks' risk of default from a qualitative perspective.

Based on the characteristics of commercial bank, its main functions can be divided into two parts. First, in modern financial system, commercial banks work money-creating institutions. The commercial banks take deposit and issue loans to consumers, households, businesses and other actors, providing liquidity the whole financial system needs. During the money-creation process, commercial banks create a creditor-debtor relationship with the loan-taker and the money created will be circulated within the whole financial system. As the creditor, commercial banks take risks for the loan issued to debtors. Once the debtors cannot pay back the loans, commercial banks will be faced with loss. Thus in each country all over the world, there are strict regulations imposed by central banks on commercial banks, with regards to the maximum value of loans to be issued by commercial banks, with the purpose of avoiding potential loan default.

Second, commercial banks work as financial intermediaries, which means commercial banks will not directly take risks conducting the intermediary business, acting as pure middleman during the financial transaction process. Taking wealth/asset management business as an example, the business logic is that commercial banks act most of the time as asset manager, absorbing money from investors, conducting investment activities on their behalf, then returning the investment income, net of the management fee, to the investors. During the whole process, commercial banks only perform their expertise in investment and portfolio management. The investors bear the investment risk themselves. However, this is just an ideal situation, In reality, in order to obtain higher profit, many commercial banks are taking risk through rigid redemption promise to investors, also creating maturity mismatch when building the investment portfolio, which creates huge risk exposure for commercial banks and greatly increase their risk of default. This second type of intermediary business is exactly the main form of commercial banks' shadow banking business. In chapter 4 we will take a critical look at its operation mechanism at more detailed level but something can be concluded by now is that, shadow banking business will increase commercial banks' risk of default to a certain degree, depending on the size and scale of shadow banking activities commercial banks engaged in.

Meanwhile, since 2008, the three biggest Chinese financial authorities (People's Bank of China, China Banking and Insurance Regulatory Commission and China Banking and Insurance Regulatory Commission) has introduced many regulatory measures and published tens of official documents in order to regulate commercial banks' increasing shadow banking business scale. With strong regulatory intensity imposed by government, it will be much more difficult for commercial banks to engage in shadow banking activities, thus a potential decrease in default risk could be expected.

To answer the main research question "What is the relationship between the risk of commercial banks and the scale and regulatory intensity of shadow banking in China", based on the qualitative analysis above, we could formulate a hypothesis that the default risk of commercial banks is positively correlated with the scale of shadow banking activities while negatively correlated with the regulatory intensity of shadow banking activities imposed by government.

To test our hypothesis, a quantitative analysis based on empirical data with econometric method could be helpful. By conducting empirical analysis based on historical commercial banks and government shadow banking-related data, we could investigate the correlation between the risk of default of commercial banks and the scale and regulatory intensity of shadow banking in China from a qualitative perspective, thus testing our hypothesis and answering the main research question.

In order to quantitatively measure the default risk of commercial banks, the scale of shadow banking activities as well as the regulatory intensity of government for shadow banking activities, several indicators will be select as explained and explanatory variables, with the final goal to conduct regression analysis to see the correlation between these three items mentioned above.

1.6 Research methods

1.6.1 Literature study

This thesis paper collects the current academic definition and operating mechanism of shadow banking, the measurement approaches of shadow banking business scale, and the measurement approaches of financial risk brought by shadow banking activities. After intensive literature review, the author compares and analyzes the similarities and differences among these approaches, makes a thorough evaluation of all the approaches and conduct further analysis and research based on previous studies.

1.6.2 Empirical analysis and Econometric methods

In this paper, a quantitative study on the correlation between the scale and regulation intensity of shadow banking and the risk of commercial banks will be conducted. Thus, indicators have to be identified to measure the above-mentioned variables. Based on the definition of shadow banking, an appropriate approach is selected to estimate the scale of Chinese commercial banks' on-balance sheet shadow banking business from a micro perspective as well as the proxy for default risk of commercial banks and regulation intensity. Then empirical data will be collected through annual reports and financial statements of listed commercial banks. Finally, a panel data regression model will be built to investigate the relationship between the scale of on-balance sheet shadow banking business, regulation intensity and the risk of commercial banks.

1.7 Research approach/framework

The first chapter is the introduction. This chapter first analyzes the research background of shadow banking, combined with the latest Chinese shadow banking risks and regulation. Based on the background, the problem statement is formed, followed by the research significance of Chinese commercial bank-centric shadow banking system, including theoretical significance and practical significance, and the main research question and sub-questions of this master thesis are presented as well. To answer the research questions raised, three main research methods will be implemented in this paper, namely literature study, comparative analysis and quantitative empirical analysis. Meanwhile, the research framework will be also presented in the form of flow diagram. At the end of this chapter, a concrete timeline for this master thesis will be provided.

The second chapter is the literature review. This chapter starts with the overall definition of shadow banking, summaries the research on shadow banking from both western and Chinese researchers, and at the same time identified the scale of shadow banking business in China from the macro and micro perspectives. Secondly, I sorted out the literature of Western and Chinese researchers on the risks of shadow banking. With regards to this question, there are two different views. Some researchers are very concerned about the risks brought by shadow banking while others are relatively optimistic about the risks of shadow banking. Finally, this chapter reviews the literature on shadow banking regulation by different researchers. Though a few researchers have reservations about the necessity of regulation, the mainstream still believes that the lack of regulation of shadow banking is one of the key reasons for financial crisis.

The third chapter is related to the current development status of shadow banking system in China. This chapter will first take a look at the development history of Chinese shadow banking system, which can be divided into two phases based on different shadow banking operating model. Then the main components of Chinese shadow banking system will be illustrated, consisting of two types, namely Chinese shadow banking business in financial institutions without financial licenses (e.g. Internet finance company, Third-party wealth management products/services, etc.) and with financial licenses (Commercial Bank wealth management products/services and interbank business). The latter one will be explained in Chapter four with more detailed illustration.

The fourth chapter focuses on Chinese commercial bank-centric shadow banking system and the operation models. As discussed in previous chapter, shadow banking business in China is mainly centered on commercial banks, due to the dominant position of commercial banks in Chinese financial system, which can be demonstrated by transaction amount and business scale. Thus in order to comprehensively understand the Chinese shadow banking system, it is essential to take a critical look at Chinese unique commercial bank-centric shadow banking system and its operation model. In this chapter, two major types of Chinese commercial bank-centric shadow banking business will be introduced, namely commercial banks' wealth management business and interbank business.

The fifth chapter will mainly focus on the risks of Chinese shadow banking activities to Chinese financial system. First we will investigate the risk generation, transmission and amplification mechanism during the whole operation process of shadow banking business. Then three main types of risks that shadow banking activities may bring to Chinese financial system will be illustrated, namely the liquidity risk, credit default risk and risk on monetary policy formulation and implementation.

The sixth chapter focuses on the current regulatory policies on Chinese shadow banking business imposed by the Chinese financial regulators, including PBOC (People's Bank of China), CBIRC (China Banking and Insurance Regulatory Commission) and CSRC (China Securities Regulatory Commission). The regulations are targeting at three aspects of shadow banking business, namely regulation of the source of shadow banking funds, regulation of shadow banking passageways/business channels, and regulation of the investment destinations of shadow banking funds, which constitute the total Chinese shadow banking system regulations.

The seventh chapter is empirical analysis. First, based on research of previous scholars, appropriate indicators will be selected as the proxy for the scale of on-balance sheet shadow banking business, regulation intensity and default risk of commercial banks. After the indicators are determined, raw empirical data of Chinese listed commercial banks will be collected from annual reports and financial statements. Then the statistical characteristics of each variable will be analyzed using Stata and the data will be cleaned. After that, the risk of commercial banks will be taken as the explained variable while the explanatory variables are the scale of shadow banking and the regulation intensity. A panel data regression model will be built, and the empirical analysis will be conducted with Stata.

The eighth chapter is conclusions and reflections. Based on the results of empirical analysis, final conclusions can be draw regarding the relationship between the risks of commercial banks and the scale and regulation intensity of shadow banking business in China. Based on the conclusions obtained above and the analysis for current regulation policies by Chinese financial authorities done in chapter 3, practical recommendations for shadow banking regulation are given. In the end, reflections on the approach and method used in this thesis will be given and suggestions for future research will be provided.

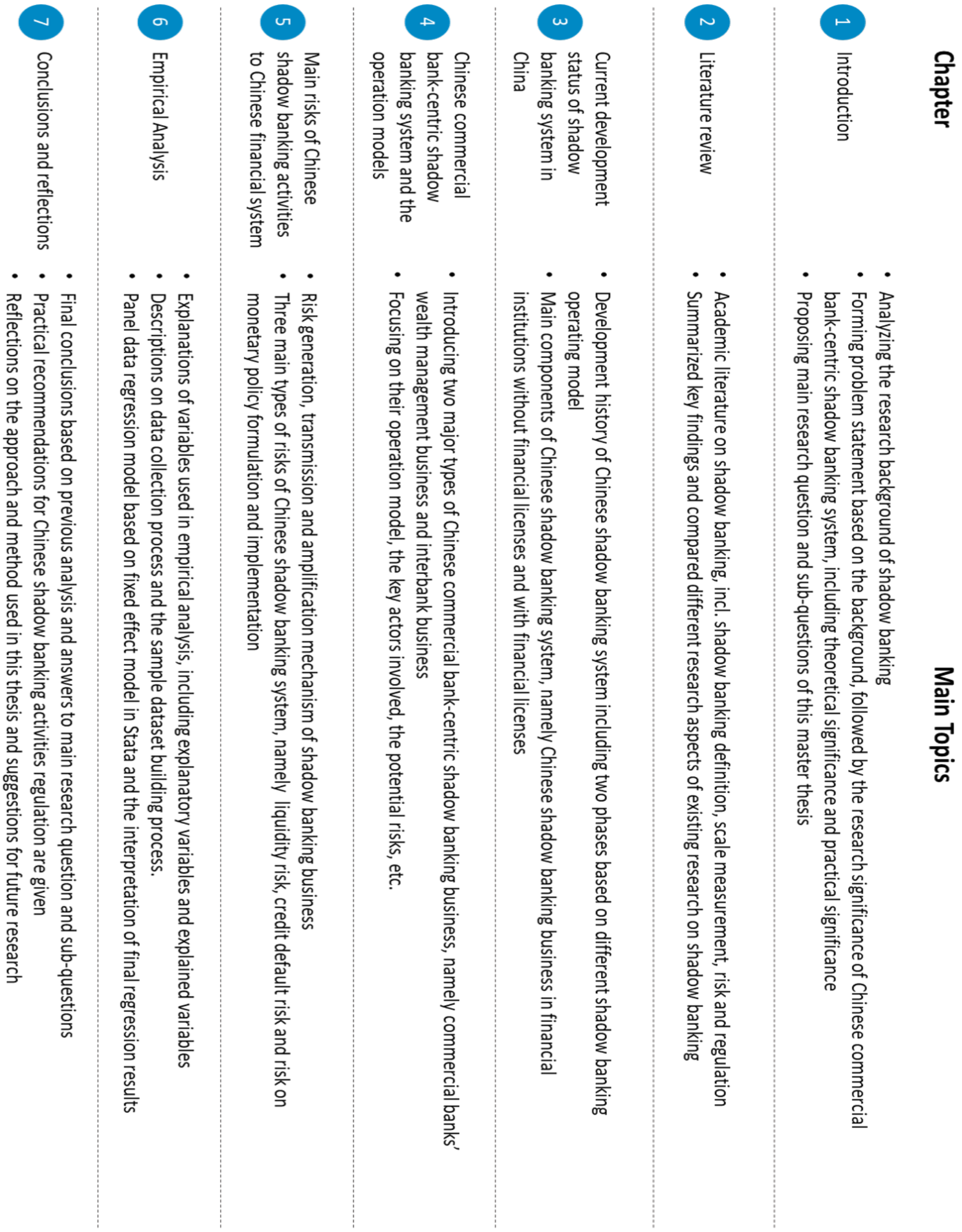

Figure 1: Thesis outline

2 Literature Review

2.1 Search Description and Selection Criteria

To start with my literature review, I started searching for "shadow banking" as key words at the very beginning. In Scopus there are 583 relevant literature with regards to this topic. Then I narrowed the scope down by refining the key words to "shadow banking risk" and searched again in Scopus. This time it has 183 document results. Among all the searching results, I find the "systemic risk" appear quite often. Since I want to investigate the potential impact of shadow banking business on the risk of financial system, then I further refined my searching key words to "shadow banking systemic risk" and got 56 document results. According to the chronological order, I selected three literatures which focus the relationship between "shadow banking" and its impact on "systemic risk". For the other literatures, since most of them are focusing on a single perspective such as the shadow insurance, or in countries like Croatia, etc., I exclude these literatures.

Then I searched "shadow banking definition" in Scopus, which displayed only 16 documents. I looked through the title of these three documents and find these papers not so relevant to my research topic, thus exclude all the papers out of my literature review.

Next step, I searched "China shadow banking" in Scopus, showing 124 document results. I noticed that "commercial banks" appear several times in the title of searching results. Then I narrowed down the scope again, refined the keywords to "China shadow banking commercial bank" and searched. There are 25 searching results. Based on chronological order, I looked through the titles of all 25 papers, find one paper with title "Shadow banking shadowed in banks' balance sheets: Evidence from China's commercial banks" quite related to my research topic, and include this one into my paper. Then I changed my searching key words to "shadow banking regulation" and found 187 document results in Scopus. I looked through all the searching results based on chronological order and selected papers with "regulation" or "regulatory" in the title.

After finishing researching in Scopus, I replicated the key words that I have mentioned above to google scholar and did the same literature searching. In the end, I downloaded 50+ paper based on the initial screening criteria mentioned above, so the paper should focus on "shadow banking", "risk" or "systemic risk", "commercial bank" and "China".

For the next step, I decided whether to include the literature in my review or not. Based on my research question, "What is the relationship between the risks of commercial banks and the scale and regulatory intensity of shadow banking in China?" I created the following inclusion criteria:
1. include the paper which contains quantitative empirical analysis
2. include the paper which compares the Chinese shadow banking systems with western countries
3. include the paper which addresses the shadow banking activities within commercial

banks

In the end, 34 papers are included in the literature review. The findings reading these papers will be presented in the following chapter.

2.2 Findings

This chapter starts with the definition of shadow banking, summaries the research on shadow banking from both western and Chinese researchers, and at the same time identified the scale of shadow banking business in China from the macro and micro perspectives. Secondly, I sorted out the literature of Western and Chinese researchers on the risks of shadow banking. With regards to this question, there are two different views. Some researchers are very concerned about the risks brought by shadow banking while others are relatively optimistic about the risks of shadow banking. Finally, this chapter reviews the literature on shadow banking regulation by different researchers. Though a few researchers have reservations about the necessity of regulation, the mainstream still believes that the lack of regulation of shadow banking is one of the key reasons for financial crisis.

2.2.1 Concept definition and scale calculation of shadow banking business

Definition

The term "shadow banking" was first proposed by McCulley (2007) at the annual meeting of the Federal Reserve in 2007, and highly leveraged financial intermediaries, money market funds, Financial companies, structured investment vehicles, independent investment banks and hedge funds are all defined as “shadow banking”. The Financial Stability Board (2011) defines shadow banking as a credit intermediary involving financial entities and financial activities outside the traditional banking regulatory system. The broad scope of shadow banking includes money market mutual funds, hedge funds, and real estate investment, trusts, etc.

Different from the definition of shadow banking in Western countries, China’s definition of shadow banking highlights "Chinese characteristics." The main player or component of Chinese shadow banking system is commercial banks, so "shadow of banks" embodies the characteristics of Chinese shadow banking. The essence of Chinese shadow banking is "loan-like" behavior. At present, there are two standards on how to define shadow banking. The first is the "substantial standard", which defines the subject of shadow banking as non-bank financial institutions other than traditional commercial banks; the second is the "functional standard", which determines the essential function of its credit intermediary, including its main non-bank financial institutions, the products and activities of shadow banking are also included. ((Sun and Jia, 2015))

Scale measurement

There are two different perspectives on how to measure the scale of shadow banking. The first is to measure its scale from a macro perspective. Grillet-Aubert et al. (2016) directly selected some non-bank financial institutions as shadow banking entities for scale measurement in Eurozone and European union area, including monetary financial institutions, money market funds, insurance corporations and pension funds, investment funds and other financial institutions, etc. Qing and Xue (2016) believes that the scale of shadow banking is equivalent to the scale of unobserved credit loans. CHENG et al. (2016) start from a macroscopic social perspective and take the sum of entrusted loans, trust loans and undiscounted bank acceptances included in social financing as the scale of shadow banking to measure.

The second is to measure the scale of shadow banking from a micro perspective. Dang et al. (2014) choose the sum of Wealth management products (WMPs), Trust products/loans, Entrusted loans, Informal lending, Interbank market lending and Repo in the commercial banks' balance sheet as the scale of on-balance sheet shadow banking. J. Zhu et al. (2016) regards the financial assets purchased under resale agreements in the balance sheet of commercial banks as the scale of on-balance sheet shadow banking business. Guo and Zhao (2017) calculate the on-balance sheet shadow banking scale of commercial banks as the sum of bills, trusts, and asset management plans. F. Zhu et al. (2019) believes that the two asset accounts of financial assets purchased under resale agreements and investments in receivables in the balance sheet of commercial banks represent on-balance sheet shadow banking business, so the sum of these two is recorded as on-balance sheet shadow banking business scale.

2.2.2 Risks of shadow banking

Judging from the current literature, there are many documents linking shadow banking with the subprime mortgage crisis in the United States. It is believed that the development of shadow banking led to the subprime mortgage crisis in the United States, which brought risks to the whole economy and society. Greenspan (2008) believes that the factors that motivate shadow banking business to develop include regulatory arbitrage and financial innovation. For the purpose of regulatory arbitrage, shadow banking transfers assets on the balance sheet to off-balance sheet, which makes commercial banks increasingly risky. Crotty and Epstein (2008) believe that shadow banking converts short-term assets into long-term loans, worsening liquidity, and maturity mismatches come accordingly.

Gennaioli et al. (2013) believe that if the financial institutions and investors are rational, then shadow banking will also be stable. However, they are irrational. If financial institutions and investors do not pay attention to the risks brought by shadow banking, let the risky loans continue to expand, and the risks will also increase, which will cause harm to the entire financial system and society. Delis and Kouretas (2011) proposed that because the shadow banking system is outside of regulation, there are a series of problems, including complex business structure, asymmetric information, untimely information disclosure and maturity mismatches, which tremendously intensify the liquidity risk in the financial market, and may even cause systemic risks. Ghosh et al. (2012) believe that Europe is now continuously reducing its financial leverage. In this context, unlike traditional sources of capital, shadow banking is becoming a new source and the risks it brings are also increasing. In this case, effective regulation is necessary. Meanwhile, Ghosh et al. (2012) conducted a research and analysis on the shadow banking system in Asia, and believed that compared with shadow banking in developed regions, shadow banking in Asia does not have a lengthy and hidden credit chain, but its risks are still not neglectable. It may be transmitted to the entire financial system through commercial banks, which is not conducive to the stable development of the financial market.

Macro perspective

From macro perspective, the risks of shadow banking activities are emphasized on financial system level. Thus the researchers focus more on the overall impact shadow banking system will have on the financial system as a whole. Recently, more and more researchers have also begun to study the risks brought by shadow banking in China. Hachem (2018) believe that China's shadow banking has a distinctive feature, that is, the closed credit intermediation, which may result in aggravated risks and more vulnerabilities. In response, a risk prevention mechanism and an effective information disclosure mechanism should be established by the authorities in time. Elliott et al. (2015) believes that in recent years, the scale of shadow banking in China has been continuously expanding. The root cause lies in the unbalanced development of financial supply and demand structure in China. To a certain degree, shadow banking has positive significance to supplement the financing functions of traditional commercial banks, however, it will also produce a series of risk, which can do harm to the whole financial system stability. Some Chinese domestic researchers (Congwen and Shijun, 2015) focus on the risk spillover effects of shadow banking to traditional financial institutions. After including these risks into the inspection criteria, the operating risks of traditional financial institutions, such as commercial banks, increased significantly. Shenghua et al. (2016) found that the scale of shadow banking is related to real estate prices. Through empirical analysis, it is found that the former has a positive impact on the latter. Based on Chinese financial system, we can find that wealth management products issued by commercial banks, trust plans issued by trust institutions, and various other types of shadow banking services are all centered on commercial banks for capital turnover to varying degrees. In reality, to a great degree, these capitals have flowed to the real estate industry. This has aggravated the excessively high housing prices in China's first-tier cities and resulted in huge hidden risks for the development of the Chinese national economy. Tsai (2017) believes that the growing scale of real economy has brought huge financial demand. Especially small and medium enterprises have strong financing needs. Thus, Chinese shadow banking, as the alternative financing approach, has entered the financial market and expanded rapidly. While shadow banking meeting the financing needs of these small and private enterprises, at the same time, hidden dangers such as irregular information disclosure systems, lack of risk management, and regulatory arbitrage have been exposed, which results in that financial vulnerability has increased significantly.

Micro perspective

From micro perspective, the existing research focuses more on the risks that shadow banking activities might bring to single financial institutions, such as single commercial bank or single non-banking financial institution. However, what is worth mentioning is that since systemic risks often originates from the aggregation of a large number of financial institutions defaulting simultaneously, there exist linkage between the systemic risks of financial system and the risk of default of single financial institution. J. Zhu et al. (2016) recorded the financial assets purchased under resale agreements in the balance sheet as the on-balance sheet shadow banking business scale. Through model verification, as the scale of on-balance sheet shadow banking business expands, the potential risks of commercial banks will also increase. Acharya et al. (2020) recorded the data of commercial bank wealth management products as the scale of shadow banking, and analyzed whether shadow banking can promote the stability of banks' operations. The results show that the expansion of the scale of wealth management products is not conducive to promoting the stability of commercial banks' operation. The study found that different expected returns of financial products will also result in impacts of different levels.

Optimistic opinion about the risks of shadow banking

There are also a small number of researchers who are optimistic about the risks of China's shadow banking, but they are mainly concentrated before 2013. The Governor of the People's Bank of China, Xiaochuan (2011) believes that the product structure of Chinese shadow banking is quite different from that of developed countries. The product structure of Chinese shadow banking is relatively simple, and the risks have not yet been revealed. Ba (2013) believes that shadow banking has a positive impact on Chinese domestic economic development on the whole. The maturity mismatch and high leverage of shadow banking in China are not prominent, which should not be treated with over-caution.

2.2.3 Regulation of shadow banking

Opposition to regulation

There are two views on whether it is necessary to regulate shadow banking activities. Some researchers believe that there is no need to regulate shadow banking. Reinhart and Rogoff (2008) proposed that if the intensity of regulation for shadow banking increases, it may cause the market to panic in short term. The greater the intensity of regulation, the less conducive to economic development, and that regulation does more harm than good. It is precisely because of the above viewpoints that some researchers even believe that strong regulation has led to the emergence of shadow banking.

Advocating for regulation

However, most researchers believe that an important factor leading to the economic crisis is the lack of regulation for shadow banking, and it is recommended to strengthen the regulation of shadow banking to avoid economic recession. The Financial Stability Board proposed that all the countries should integrate the impact of shadow banking on their economic development to implement an appropriate degree of financial regulation to ensure the healthy and stable development of financial markets. Kenc and Dibooglu (2010) believe that shadow banking is one of the influencing factors of the US subprime mortgage crisis. Calmèsa and Théoretb (2011) pointed out that the existing regulatory system is no longer sufficient to regulate shadow banking in an all-round way, and a new regulatory model is needed to mitigate shadow banking risks. Schwarcz (2011) proposed that there is a competitive relationship between commercial banks that operate under financial regulation and other financial institutions with a higher degree of marketization. It is this competitive relationship that has led to the emergence of shadow banking. There are many financial institutions with different functions in the complex financial market system. The differences in regulatory principles and mechanisms have caused market segmentation. The opacity of financial derivatives transactions and the complex structure of shadow banking products have it more difficult for financial intermediaries to access market and business information, which leads to panic among investors, and may even evolve into systemic financial risks, threatening financial system stability and financial security.Greene and Broomfield (2013) emphasized that the important prerequisite for strengthening the risk regulation of shadow banking system is to clarify the source of its risks. At the same time, the regulation authorities should also increase flexibility to respond to the changing shadow banking system and its product innovation. Borst et al. (2013) stated that due to the insufficient banking regulation system during the world economic crisis, the risks of high-return businesses that traditional commercial banks participate in, such as intermediary businesses and offshore financial businesses, are all hidden through financial derivatives, causing different financial entities to be affected to varying degrees and having a huge impact on traditional commercial banks. In contrast, shadow banking has been further developed. Nelson et al. (2018) proposed that when central bank adopts a tightening monetary policy in response to overheated economic development, although it can bring back the economy on the right track to a certain degree, meanwhile it will result in that companies tend to raise capital through shadow banking channels, thus booming the shadow banking activities.

For Chinese domestic researchers, most of them believe that the development of domestic shadow banking should focus on improving the level of marketization of shadow banking, enhance information transparency shadow banking, and maintain the leverage ratio at a reasonable level. Lanbiao and Shanshan (2018) pointed out that relying solely on external regulation is insufficient to prevent the risks of shadow banking. The structural design and risk assessment methods of financial innovation products should also be improved and regulated by the authorities. Yang et al. (2019) found that Chinese domestic shadow banks are constantly improving their operating mode in the game with regulatory authorities. They have experienced passageway business, inter-bank business, and will change to securitization in the future. This requires the Chinese regulatory authorities to pay special attention to its impact on small and medium-sized commercial banks, and at the same time, regulators should also take measures to make the shadow banking operation mode more transparent.

2.2.4 Summary

By reviewing the relevant literature on shadow banking written by both western and Chinese researchers, it can be seen that the analysis and research of shadow banking in China started relatively late compared with developed countries, mostly after the 2008 economic crisis. At the same time, the research on Chinese shadow banking is still in the stage of qualitative analysis and scale calculation. The development of Chinese shadow banking system is still far behind that of developed countries, which can be concluded by several evidence, such as incomplete types of shadow banking products, simple internal framework, and not enough financial regulation by the authorities.

In terms of shadow banking scale calculation, more concentrates on off-balance sheet shadow banking business, and less focus on on-balance sheet business.

Regarding the risks of shadow banking, most researchers focus on the negative impact of shadow banking on the financial system, and very few researchers believe that the risks brought by shadow banking are conducive to promoting the development of financial markets. There are also differences in the research focus of shadow banking by researchers of different regions. Western researchers focus more on the problems of maturity mismatch and high leverage in the operation of shadow banking, while Chinese researchers are more inclined to study the impact of shadow banking on corporate financing approach and the macro economy.

From the regulatory perspective, western researchers pay more attention to the micro-level, such as the analysis of regulatory objectives, regulatory models, etc., while Chinese researchers focus more on putting forward suggestions for the regulation of shadow banking activities in China.

3 Current development status of shadow banking system in China

In the following chapter, the following topics will be addressed:

1) the development history of Chinese shadow banking system, which could be mainly divided into two core phases based on the prominent business model in respective period, namely the emerging stage from 2008 to 2013 and the interbank stage from 2013 to 2021;

2) Main components of Chinese shadow banking system. Based on whether the participating entities have financial licenses issued by China's central bank, the actors engaged in shadow banking activities in China can be classified into two categories.

3.1 The development history of Chinese shadow banking system

Before we dive deeper into the development of Chinese shadow banking system, first, we need to introduce two terms used in Chinese financial system exclusively, that is "standard (credit) assets" and "non-standard (credit) assets". According to the official website of People's Bank of China, which is also known as the Chinese central bank, "standard assets" refer to fixed-income securities, including treasury bonds, central bank bills, local government bonds, financial bonds and corporate bonds. All these fixed income assets mentioned above can be traded on the interbank exchange market and are under strict financial regulation posed by Chinese financial authorities. (CGW, 2020) On the contrary, "non-standard assets" refer to those credit assets, which are not traded on the interbank exchange market, including but not limited to loans on credit trust loans, entrusted claims, acceptance bills, letters of credit, accounts receivable, equity financing with repo terms, etc." Compared with "standard assets", "non-standard assets" embrace the following features: low transparency, flexible form, poor liquidity, and relatively high returns, and these assets are also out of financial regulation. (Zhiqiang, 2019)

The development of Chinese shadow banking system has gone through two stages, which are characterized by different business logic and operating models in terms of how commercial banks engage in shadow banking activities. (Zhe et al., 2017a) The first stage is from 2008 to 2013, which is an emerging stage of Chinese-style shadow banking, and its main operating model is "wealth management products - passageway business - non-standard assets". The second stage is from 2013 till now, which is the stage of further development of the shadow banking system in China. Especially after 2014, its main operating model is "interbank business - outsourcing investment - standardized assets". In the next section, we will analyze the changes in Chinese shadow banking development from three aspects, namely the interaction between banks and non-bank financial institutions, banks' liabilities, and the ultimate target assets.

3.1.1 2008 - 2013: "Wealth management products - passageway business - non-standard asset" business model

In 2005, the China Banking Regulatory Commission issued the "Interim Measures for the Management of Personal Wealth management Services of Commercial Banks".(CBRC, 2005c) The promulgation of this regulatory document represented the official launch of wealth management business of Chinese commercial banks. Along with the issuance of various types of wealth management products by commercial banks, at that time, the Chinese shadow banking business began to surge for the first time.

In terms of why shadow banking system arose at this stage, there are mainly three reasons. First, through issuing wealth management products, funds raised from investors are not accounted into “deposit” item within commercial banks’ balance sheet, which means that this amount of fund are not subject to regulatory restrictions such as capital adequacy ratio, deposit-to-loan ratio, liquidity requirement, etc., like the commercial banks’ traditional deposit and loan business. In this case, commercial banks can issue more loans and thus make more profits with the funds obtained from wealth management business. Second, at that moment, the regulations for the investment destination of these funds raised by wealth management products are not strict, which results in that many commercial banks would take great risk to issue loans to enterprises with low credit rating, which would otherwise be unable to obtain loans. However, usually the interest rate spread in these kinds of deals are much higher than normal spread obtained from deposit and loan business. Hence, the commercial banks were willing to conduct this kind of shadow banking business rather than its traditional business. Third, at that moment, Chinese commercial banks were facing fierce competition from foreign banks, which were permitted to enter the Chinese market since China’s accession to the WTO in 2001. Foreign banks from the US such as JP Morgen, Citi Bank, had much more mature business model than Chinese domestic commercial banks, so they succeeded in taking over a large proportion of domestic commercial banks’ customers. To maintain the competitiveness in more competitive Chinese financial market, Chinese commercial banks were pushed to be innovation in operation model, which accelerated the growth of shadow banking business at that moment.

Thanks to the rise of wealth management business, it became the main way for commercial banking sector to raise off-balance sheet funds at that stage. After absorbing customers’ funds, bank wealth managers cooperate with financial institutions such as investment banking, trusts and insurance companies to invest into assets such as commercial paper or give loans to corporates, in order to avoid regulation from the regulation authority. However, due to the changes in Chinese regulatory policies, the cooperation between the two parties has gone through the main forms of cooperation such as bank-trust, bank-mutual fund, bank-investment banking, and bank-insurance. The key feature of this stage of shadow banking in China is that different types of passageway businesses are used as intermediaries to invest wealth management funds into non-standard assets. On the whole, the above forms of cooperation have the attribute of "passageway", that is, the trust or asset management plan developed by the non-bank financial institutions, which becomes the passageway medium for absorbing financial funds from investors and investing in the underlying assets. Besides, the passageway business continued to evolve and innovate in order to evade regulation in this stage. Through the development of the passageway business, an innovative shadow banking business model emerged gradually, in which various types of financial institutions cooperated with each other and a variety of products were coupled with each other, which results in a more complex structure, often along with leveraged operations.

3.1.2 2013 - 2021: "Interbank business - outsourcing investment - standardized assets" business model

On March 25, 2013, the China Banking Regulatory Commission, which is also known as CBRC (2013b), issued the "Notice of the China Banking Regulatory Commission on Regulating the Investment and Operation of Commercial Banks' Wealth Management Business" to impose strong regulation on the direct or indirect investment of commercial banks' wealth management funds in “non-standardized assets” through non-bank financial institutions. As a result, the first phase of the model is subject to strict regulation, and it has become difficult to achieve off-balance sheet financing through wealth management products. Thus, the commercial banks are forced to switch their shadow banking business from off-balance sheet to on-balance sheet. (Zhe et al., 2017a) After 2013, interbank business emerged as the main form of shadow banking business. Interbank wealth management business and interbank deposit business have gradually developed into the mainstream, making banks' fund sources more diversified. This business has linked banks and banks as well as banks and non-bank institutions to each other, greatly expanded the interbank business, enriched the commercial banks' fund sources, and ultimately invested in standard assets via outsourcing investment.

At this stage, interbank wealth management and interbank deposits are the most important and popular approaches in interbank business. Interbank wealth management business refers to the business model that commercial banks issue wealth management products directly to its peer financial institutions, such as other commercial banks, insurance companies, mutual funds, investment banks, etc., in order to raise funds from these institutions, in most cases, with the purpose to meet regulation requirement. In return, the commercial banks issuing wealth management products will pay certain amount of interest fee to the peer institutions when the products come to maturity. Interbank deposits follow the same business logic, the only difference is that they are more regulated in terms of scale, transaction number and holding period, which results in that the interest rate of interbank deposits is much lower than interbank wealth management product. Besides, there is an arbitrage mechanism between the two businesses. (Yanhong et al., 2014) As mentioned above, compared with wealth management products, the interest rate of interbank deposit is relatively low. When one commercial bank is issuing interbank deposit, the funds gathered from peer commercial banks can be invested in other interbank wealth management products. For this amount of money which comes from peer commercial banks, commercial banks are not required to pay cash reserve to central bank, but meanwhile they can also obtain stable returns via interest rate difference. Therefore, since 2005, the interbank business formed by these two has achieved rapid development.

On the other hand, outsourcing investment in Chinese financial market booms in this period as well. Outsourcing investment business refers to the business model in which the principal (mainly refers to the commercial banks) entrusts its own money funds to other financial institutions like asset management company or mutual funds, which have an expertise in asset and wealth management, to help commercial banks build an investment portfolio and achieve considerable returns. (Zhaowei and Jianbo, 2017) Since 2015, banks' outsourcing investment has shown rapid growth. Initially, outsourcing investment emerged because most small and medium-sized commercial banks did not have enough capacity or expertise in asset management and could only entrust money funds to other professional institutions to manage them. However, due to the significant development of the Chinese bond market, commercial banks started to use outsourcing investment more often, to improve their investment portfolio with the purpose of increasing returns on their investments.

Before the interbank business innovation and outsourcing investment development, commercial bank still invested in non-standard assets by means of interbank payment, indirectly issuing loans to those companies which cannot achieve financing through regular channel. (Zhe et al., 2017b) However, due to the decreasing rate of return of interbank payment, after 2014, Chinese commercial banks developed this new business model, by raising fund through interbank wealth management and interbank deposit, at the end investing in standard assets via third-party outsourcing investment.

3.2 Main components of Chinese shadow banking system

For a long time, Chinese shadow banking did not have a clear definition and the Chinese financial industry holds the view that shadow banking includes those kinds of financial entities or institutions which have the function of a commercial bank, but are not within the scope of financial regulation by regulatory agencies. (CGW, 2013) Until December 2013, Chinese financial authorities issued the "Notice Concerning Strengthening Shadow Banking Regulation", defining the scope of shadow banking in China and dividing shadow banking into three categories. The first category refers to credit intermediaries that have not obtained financial licenses and are completely out of the scope of regulation, including third-party wealth management and emerging Internet finance companies; The second category includes credit intermediaries which have no financial licenses and are under weak regulation by financial regulatory authorities, including micro-credit and financing guarantee companies. The third category refers to financial institutions which own financial license, but operate some business with inadequate regulation or regulation evasion, including asset securitization, some wealth management businesses, and money market funds, etc.

The common feature of the above three types of institutions is that they are not subject to strict regulation. From the definition of Chinese financial authorities, the first and second category have a large extent of similarity in their business model and potential risk exposure, since both are operating without the financial licenses issued by the Chinese government. Therefore, in this paper, we classify Chinese shadow banking into two main categories, according to whether financial institutions have financial licenses or not, namely institutions without financial licenses and institutions with financial licenses. The former one includes Internet finance companies, micro-credit companies, financing guarantee companies, consumer financing companies, auto financing companies, etc., while the latter one includes commercial banks, insurance companies, trusts, mutual funds, investment banking and other financial institutions with financial licenses that individually or cooperatively engage in shadow banking services.

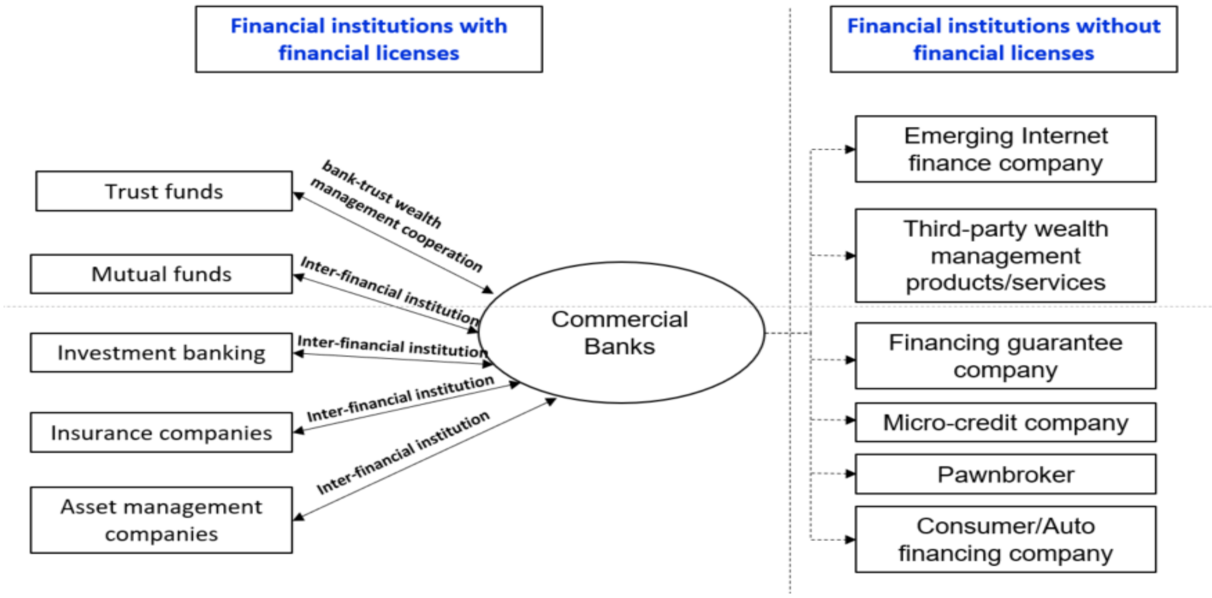

Figure 2: Overview of Chinese shadow banking components

3.2.1 Overview of Chinese shadow banking business in financial institutions without financial licenses

(1) Emerging Internet finance company and its business

A representative example of the emerging internet finance companies is the P2P (peer to peer lending) online lending platform, which refers to a financial service website that integrates P2P and internet lending models. Customers can complete the lending procedures on the internet lending platform. This is an emerging financial model formed following the rapid development of both Internet lending and private lending in Chinese financial market.

P2P lending is to gather small amounts of funds to form a certain size of fund pool, and then lend the funds to people in need of money. This business model represents the future development trend of financial lending services, since it considerably improves the utilization rate of social idle money while meeting personal financing needs and developing a personal credit system. In the Chinese financial system, there are mainly four types of P2P business model available on various P2P lending online platforms:

1) The secured transaction model

The secured transaction model is the most secure P2P transaction model. In this busines model, P2P platform only acts as a transaction intermediary that does not have the function of absorbing deposits and lending credit. It only performed as a matchmaker and provides double guarantees to investors through micro-credit companies and guarantee agencies which have business cooperation with P2P platforms. (M. Zhang, 2015) Most of them adopt a one-to-many transaction model, which means that multiple investors invest in a loan demand. The advantage of this business model is it can ensure that the investor's funds are sufficiently safe. The guarantor is usually one of large domestic guarantee institutions. Once faced with bad debts, the guarantee institution will immediately deposit the principal and interest into the investor's accounts, ensuring the investors' funds are not exposed to default risk.

2) Credit contract transfer model

Under this model, the P2P platform will lend the funds to the borrower as the largest creditor, and then it will transfer the creditor's rights to other investors through creditor's rights transfer, which is basically selling the loan asset to other investors. In this circumstance, the P2P platform could gain benefits from the interest rate difference between borrowers and investors. (Shasha, 2014)

3) internet service platforms of traditional financial institutions

The internet service platforms of large financial companies also operate P2P lending platforms. These platforms generally are backed up by large or giant financial business groups, and they have been developed from the traditional financial industry to the Internet finance area. Therefore, it has a strong financial style in terms of business model, which is quite similar to the traditional offline financial services these financial companies provide.

4) Transaction-based online-to-offline (O2O) model

Comprehensive transaction-based model combined with O2O (online-to-offline/offline-to-online model). Alibaba micro-credit services are a good example. In this business model, Alibaba's credit review system incorporates its e-commerce system, and comprehensively sorts out and analyzes each loan's transaction information, incl. the borrowers' purchasing history, consumption habits, credit reports, credit worthiness, etc. The advantages of this model are obvious: abundant customer resources, large-scale e-commerce transaction data, and a variety of financial product structures. Alibaba has established two offline micro-finance companies to provide financial services mainly for its e-commerce customers. Offline business fully integrates with the online e-commerce, and the Internet acts as the front desk for offline transactions.

In China, there are more than 1000 P2P online lending platforms. (L. Yi and Qingjie, 2015) Compared with other online lending platforms, the P2P platform established by Alibaba has obvious competitive advantages. The platform fully integrates the mature O2O model. Due to its huge capital reserve, it has established two offline micro-finance companies to provide offline financial services to its online e-commerce customers, strengthening the end-to-end customer journey, covering the customers' financial needs both online and offline. Alibaba's micro-lending platform is difficult to imitate, because in terms of its big data resources, customer base, and multi-faceted product designers, most of the online lending platforms in China cannot compare with Alibaba.

While P2P online lending platforms may be exposed to default risks from its participants (mainly borrowers), the risks of online lending platforms themselves are more critical, which are embodied in the following three aspects. First, the credit risk from online lending companies cannot be neglected. Usually, the cash flows of P2P online lending companies are relatively small compared with traditional financial institutions, and hence, P2P online lending companies cannot find custodial services from most commercial banks, which may cause some fund custodians to leverage lax regulation to commit fraud. Secondly, there exists huge operating risks of P2P online lending platforms. The current online lending industry is highly saturated with a large number of big and small participants already playing in this field. Online lending platforms have difficulty to achieve profitability due to the high operating costs until they achieve the required scale effect. In addition, the fierce competition in the industry has caused the payback time for P2P online companies to extend. If the platform cannot be profitable for a long time, it will inevitably face bankruptcy. (J. Zhang, 2013) Hahadai, one of the leading P2P lending platforms established at the beginning of 2010 is a good example. In July 2011, Hahadai declared bankruptcy. In the 18 months of operation, the profit was only around 300,000 RMB. Compared with the operating cost of more than 2 million RMB a year, the profit was insignificant; finally, excessively high guarantee leverage leads to huge risks of online lending companies. The "Interim Measures for the Risk Management of Financing Guarantee Institutions for Small and Medium-sized Enterprises" stipulates that the guarantee liability of guarantee institutions is usually lower than five times of their capital received, and the maximum cannot exceed ten times. However, for P2P online lending companies, their guarantee multiples generally exceed the ten-fold red line. Once the economy is not performing well, large-scale defaults are likely to occur. However, the P2P online lending platforms as the guarantee institutions should cover the bad debts and pay back the investors, which will put the online lending companies into bankruptcy.

(2) Third-party wealth management products/services

Third-party wealth management products/services specifically refer to those independently operated wealth management institutions. Different from financial institutions such as commercial banks and insurance companies, third-party wealth management institutions can independently analyze the actual financial status and financial needs of customers, formulate investment portfolio and provide comprehensive financial advisory services.

Third-party wealth management institutions are not commercial banks, mutual funds, and insurance companies, but these are impartial third-party institutions that analyze the actual financial situation and financial needs of customers strictly based on personal conditions of customers, and adopt scientific and reasonable approaches in private wealth management plans. The operation model of third-party wealth management is relatively simple. Customers choose and hire independent financial advisors, analyze financial status, risk preference, determine expected investment returns, and choose different investment tools and form investment. Third-party wealth management institutions provide primarily financial advisory services related to wealth management. In developed countries with mature financial markets, many third-party wealth management institutions will cooperate with large commercial banks or investment banks to provide their advisory services to their clients.

In China, the third-party wealth management institutions are relatively immature compared with European or American developed countries, (Cantor and Taylor, 2015) thus the third-party wealth management business still faces various types of risks, including legal risks, moral hazard, and investment risks. Firstly, China has not clearly defined third-party wealth management services in law, thus the whole wealth management busines is still unstandardized. (Xiaohong, 2005) The vast majority of third-party wealth management institutions can be specifically divided into two categories based on their operation models: one is to provide financial advisory only, and the other is to provide advisory and act as wealth management agent for clients. Due to the lack of regulations to third-party wealth management institutions in China, many private equity funds absorb investors' money in the name of third-party wealth management institutions. Since the regulation and risk control mechanisms for private equity funds are not yet complete, and usually private equity funds will invest in much riskier projects in order to obtain abnormal returns, thus the risk of default is much higher, compared to traditional wealth management products. Also, the private equity fund managers do not disclose the risk information to the investors, which leaves the investors unprotected and not aware of the considerably high risks of so-called "wealth management products", which is private equity investment in reality. Secondly, there can be moral hazard in third-party wealth management institutions. (Xiaohong, 2005; Wen, 2019) Due to the asymmetry of information between the parties involved in the transaction, third-party wealth management institutions may infringe on the interests of investors based on their own professional knowledge and information advantages. Institutions that provide financial advisory services are likely to make suggestions that are not conducive to investors for the sake of their own interests. The third potential risk is investment risk. (Xiaohong, 2005) The professionalism of the third-party wealth management advisors in China varies greatly. Although some staff may have investing or portfolio management experiences in the financial industry, many third-party wealth management advisors are not qualified or chartered, not as skilled as financial advisors in developed countries like Europe and America. Hence, it is very likely that the financial advisors in China cannot provide clients with trustable and high-quality wealth management advice.

(3) Financing guarantee company and its business

Financing guarantee means the guarantor and guaranteed have reached an agreement with creditors, which can be commercial banks, insurance companies and other financial institutions. If the guaranteed party fails to pay back debt to the creditor, the guarantor shall bear the guarantee responsibility stipulated in the agreement in accordance with the law.

The business provided by financing guarantee companies in China mainly includes loan guarantees, financing guarantees, bill acceptance, project financing and letter of credit guarantees, as well as other types of financing guarantee services. In addition, there are self-owned capital investment services (financing guarantee companies' own capital for investment), financial advisory services related to the guarantee business as well as other intermediary businesses.

Overall speaking, the Chinese financing guarantee industry is relatively small and still in the development stage. Due to the lack of effective regulation, some guarantee institutions also engage in illegal deposits, illegal fund-raising and usury activities, which seriously disrupt the financial market. Since financing guarantee companies use their own funds for investment and will not be subject to regulatory restrictions, they become an emerging channel for shadow banking business in the past few years as well.

(4) Micro-credit company and its business

A micro-credit company is a limited liability company or joint-stock limited company that is established to carry out micro-credit business but does not conduct deposit business. It's established mainly to meet the financing needs of the vast majority of small and medium-sized enterprises, rural enterprises and individual farmers. As the restrictions to get the small loans are relatively loose and the process is much simpler, it can meet the financial requirements of the above customers to a large extent, and it is quite popular by small and medium-sized enterprises and farmers.

Micro-credit companies mainly obtain funds from three channels: shareholders, donations, and financing from other commercial banks. (Hualan and Qingcheng, 2012) In the scope permitted by the regulations, the balance of financing obtained by micro-credit companies from banking financial institutions should be less than 50% of their net capital. Compared with consumer financing and auto financing companies, micro-credit companies have very narrow sources of funds, which limits their development to a large extent. In order to effectively solve the financial difficulties faced by the development of micro-credit companies, companies can try to carry out bill discounting and credit asset transfer services. Because micro-credit companies have very narrow funding sources and mainly provide loans to small and medium-sized enterprises and individual farmers, they have a relatively high level of liquidity and credit risk. (Q. Yi, 2014)

(5) Pawnbroker and its business

Pawning refers to the behavior of customers who pawn their own property as collateral to the pawnshop, pay corresponding fees, obtain the pawn money, and promise to pay the pawn money and interest within the agreed period and redeem the pawn. Similar to micro-credit companies, pawnbrokers mainly serve small and medium enterprises to meet their financing requirements. At this stage, Chinese small and medium enterprises usually lack enough business strength, and it is difficult to obtain funds from banking institutions. Large commercial banks are more inclined to provide loans to large enterprises due to the safety of funds. Furthermore, small and medium enterprises have to go through very complicated credit procedures in order to obtain loans from commercial banks. Because pawnbrokers can provide more convenient financing services for small and medium-sized enterprises, they have quickly been favored by small and medium-sized enterprises.

(CGW, 2005) From the "Pawn Management Measures" promulgated in 2005 in China, it's legislated that pawnbrokers do not allow conduct deposit-taking business and credit business, over-loan from commercial banks, foreign investment, and other services such as borrowing funds from other pawnbrokers.

In term of profits for pawnbroker, Interest income is the most important source of income. Apart from interest income, usually it also involves some handling fees and management fee. Bank loans and self-owned funds are the main sources of funds for pawnbrokers and the funding channel are very limited. Although the businesses carried out by pawnbrokers display the characteristics of shadow banking, they are relatively simple in terms of business model and the scale in current Chinese financial market is relatively small.

(6) Consumer financing company and its business

Consumer financing companies are non-bank financial institutions approved by the China Banking Regulatory Commission, which do not carry out deposit business for the public but provide small-amount loans to promote the individual consumer consumption in China.

(Seishi, 2010) On January 6, 2010, the China Banking Regulatory Commission approved the first batch of three domestic consumer financing companies to pilot applications in Shanghai, Beijing and Chengdu. The initiators of the three consumer financing companies were Bank of China, Bank of Beijing and Bank of Chengdu. Since then, the consumer financing business has developed quickly in China. By the end of 2020, there are already more than 500 consumer financing companies in China.

From the "Administrative Measures for the Pilot Administration of Consumer financing Companies" promulgated in 2009, (CGW, 2009) consumer financing companies mainly provide personal durable consumer goods loans (excluding automobiles and real estate), which are usually used for personal consumption in daily life. Consumer financing companies mainly raise funding through interbank borrowing, and financial bond issuance. The establishment of consumer financing companies is mainly to promote the households consumption with low spending power and to stimulate domestic consumer demand, as effective complement to commercial banks. Since consumer financing company cannot carry out deposit business but it works as a credit intermediary, it has the characteristics of shadow banking.

(7) Auto financing companies and its businesses

Auto financing companies refer to non-bank financial institutions approved by China Banking Regulatory Commission to provide financial services for domestic auto sales and car purchaser. Its main business is to providing consumers with car loans. Auto financing companies mainly obtain funds through interbank lending, shareholder equity, and issuance of financial bonds. Because the Chinese personal credit management system is not mature enough and credit risk management tools are still lacking, there are relatively high credit risks related to automobile consumer loans. (CBRC, 2008) In the “Regulations on the management of auto financing companies”, published by China Banking Regulatory Commission, it is clearly stated that auto financing companies must meet the minimum capital requirements in order to control credit risks. Similar to consumer financing companies, auto financing companies cannot absorb deposits and they essentially play the role of a credit intermediary. In many cases, auto financing company also conduct asset-based securitization to transfer credit asset in order to raise funding with the ultimate goal of issuing more loans.

3.2.2 Overview of Chinese shadow banking business in financial institutions with financial licenses

(1) Commercial Bank wealth management products

Commercial bank wealth management products are asset management plans designed by commercial banks for target customers who are in demand of higher return on investment than bank deposit. In essence, it is an investment plan or contract that commercial banks provide to their customers. Within this investment contract, both parties determine the investment risks and returns based on agreements. Commercial banks are only authorized by customers to act in the role of wealth or asset management.

Development background and history of Chinese commercial banks' wealth management products

In the historical development of Chinese financial system, wealth management products first appeared in 1996, when CITIC Industrial Commercial Bank launched the "Wealth Management Center", which was also the beginning of Chinese commercial banks' wealth management business. In 2004, Everbright Bank issued wealth management products in Chinese domestic currency, and these wealth management products gradually gained popularity due to higher interest return and began to develop rapidly. However, during the development of Chinese wealth management market, the market did not develop a systematic rule and lacked of regulation from the authorities, thus resulting in chaos in the wealth management market including many defaults of wealth management products , while the commercial bank could not provide the investor with promised expected returns, etc. (Tengfei et al., 2013) As a result, the China Banking Regulatory Commission introduced the "Interim Measures for Commercial Banks' Personal Wealth Management Products" (CBRC, 2005b) and "Commercial Banks' Personal Wealth Management Business Risk Management Guidelines" (CBRC, 2005a) in September 2005 to regulate the development of Chinese bank wealth management products market toward a more regulated and healthier direction. During this period, the main investment direction of bank wealth management products was fixed-income products such as interbank bills, money market funds, treasury bonds, and central bank bills, to obtain stable returns, avoid high risks. Most importantly, the wealth management business in the total Chinese financial market was still quite small in terms of scale. (Lan and Shuang, 2016)

In 2006, the Chinese bond market went up and the stock market rebounded. More and more Chinese commercial banks entered industrial investment through trust funds and enriched the types of wealth management products through the collaboration with trust institutions. At this stage, major commercial banks continued to explore new models. For instance, a large number of domestic commercial banks cooperated with trust institutions to entrust the funds to trust companies, which were gathered from investors through issuing wealth management products. The investing assets for these funds are mainly composed of infrastructure project investment, company bonds, stocks, trust financing, etc. Apart from this business model innovation, large Chinese commercial banks also launched a large number of wealth management products related to interest rates and exchange rates, which enriched the portfolio of wealth management products to a great extent.

In 2008, due to the impact of the financial crisis, bank wealth management products were hit hard and fell into a downturn. When the downturn continued in 2009, the development trend of bank wealth management products was in line with the trend of economic development. Although the US Subprime mortgage crisis did not have a strong impact on the Chinese economy, however, most wealth management products issued by Chinese domestic commercial banks came across no gain or even loss.(Rong, 2009) In order to reduce redemption risks, commercial banks are forced by the Chinese financial authorities to reduce the types and quantities of wealth management products. During this period, investment in wealth management products was relatively conservative, mainly focusing on some low-yield and low-risk products.

When it came to 2011, after several years' of sluggish development, bank wealth management products have resumed growth and entered a stage of rapid development. One of the main reasons is that the Chinese stock market and the real estate market are in a downturn, which results in more and more funds invested in bank wealth management products. (Leqian, 2013) In September 2011, the state introduced the “Measures for the Pilot Asset Management Business of Fund Management Companies for Specific Clients”(CSRC, 2013), which imposed the rule that fund companies officially enter the wealth management product market. Meanwhile, the regulatory authorities have also strengthened the regulation of wealth management products. In November 2011, the China Banking Regulatory Commission proposed to resolutely prohibit the issuance of short-term wealth management products to attract deposits with high interest rates with the purpose of regulatory arbitrage.

On March 25, 2013, the China Banking Regulatory Commission issued the "Notice on Regulating Investment in Commercial Banks' Wealth Management Business" to restrict the investment of wealth management funds in non-standard assets. (CBRC, 2013c) Starting in 2017, Chinese financial regulatory authorities have promulgated and implemented a large number of regulations, focusing on implementing comprehensive governance for interbank, wealth management, and off-balance sheet businesses, and guiding the establishment of a wealth management product information registration system, which realized the nationwide information transparency of wealth management products. Since 2013, due to the continuous strengthening of regulation by the China Banking and Insurance Regulatory Commission, commercial bank wealth management business has been effectively regulated and adjusted, which results in a lower growth rate compared to 2011-2013. (Leqian, 2013)

On July 20, 2018, the China Banking and Insurance Regulatory Commission issued the "Measures for the Regulation and Administration of the Wealth Management Business of Commercial Banks (Draft for Solicitation of Comments)" to continue to restrict the investment direction of wealth management products. (CBIRC, 2018) In the same year, in order to standardize the wealth management business of Chinese financial institutions, the People's Bank of China issued the "Guiding Opinions on Regulating the Wealth management Business of Financial Institutions", which determined a unified standard and rule to classify wealth management products into certain different types based on their features, fund source, investment direction, risk exposure, and financial leverage, etc. This new regulatory standard required all the commercial banks to disclose more complete information related to outstanding and to-be-issued wealth management products in their annual release, with the purpose to reduce information opacity and potential risks in wealth management market.

Current status of Chinese commercial banks' wealth management products

Generally, based on different risks borne by investors, bank wealth management products can be divided into two types: principal-guaranteed and non-principal-guaranteed. Principal-guaranteed wealth management products are mainly invested in the currency market. Commercial banks promise to return the principal to investors after maturity. This type of wealth management products is very similar to traditional bank deposits, though with a slightly higher interest rate. The China Banking Regulatory Commission states that commercial banks should include principal-guaranteed wealth management funds in their financial statements, while for non-principal-guaranteed wealth management products, they are not obligatory to be included in the balance sheet, since the investors will bear all risks themselves. Non-principal-guaranteed wealth management products have occupied a dominant position in wealth management products. In recent years, the number of non-principal-guaranteed wealth management products issued in China has continued to increase, indicating that wealth management products continue to expand from on-balance sheet to off-balance sheet, which enables commercial banks to raise funds through off-balance sheet financing. Based on this intrinsic characteristic of non-principal-guaranteed wealth management products, the China Banking Regulatory Commission has proposed it as one major type of shadow banking business in China. Currently, the Chinese shadow banking business in the form of wealth management products mainly include three types: bank-trust cooperative wealth management, entrusted loan wealth management, and cash pool wealth management. The detailed operational models of these three above-mentioned wealth management services will be explained in Chapter 4.1.

(2) Interbank business

Commercial banks' interbank business refers to a range of businesses with other financial institution as customers, incl. other commercial banks/clearing banks, mutual fund companies, private equity fund companies, trust fund companies, asset management companies, investment banks, etc., with interbank financing as the core business. In recent years, interbank business has developed rapidly in Chinese commercial banking sector. (CBRC, 2014) In the "Administrative Measures on Interbank Financing of Commercial Banks" implemented in February 2014, a detailed explanation of interbank business was carried out, which refers to the business conducted by commercial banks against various financial institutions, mainly including: interbank deposits, interbank lending and borrowing, buy-back resale and sell-back repurchase financial assets, etc. Since commercial banks have the dominant position in Chinese financial system, a huge part of shadow banking business comes from commercial banks' interbank business. Compared with bank wealth management products, the credit creation mechanism for interbank business is more concealed and complicated.

Development background and history of Chinese interbank business

The development of Chinese interbank business began after China joined the World Trade Organization in 2001. However, at that moment it was mainly interbank lending between different commercial banks. With the easing of the restrictions of the Chinese financial system and the continuous growth of the capital market, interbank business has changed enormously, resulting in a situation where bank-trust, bank-fund, bank-financial leasing and bank-financial advisory cooperation coexist with bank-bank cooperation as the leading factor. With non-banking financial institutions joining in, the cooperation between banks and non-bank financial institutions become even closer. (chart) From 2010 to 2012, the interbank business of Chinese commercial banks showed rapid expansion, mainly due to the following two reasons. First, thanks to the rapid development of Chinese capital market and the acceleration of interest rate marketization, interbank business has become an important source of profit growth for commercial banks, especially since other activities of commercial banks are facing a decreasing profitability. On the other hand, due to more and more strict financial regulations put on wealth management business, commercial banks try to avoid regulation by accelerating the innovation of interbank business and thus expanding its scale.

Current status of Chinese interbank business

In recent years, the expansion of Chinese interbank business has been manifested in the rapid growth of interbank assets, interbank liabilities, and interbank business income. This also reflects the three main directions and motivations for commercial banks to develop its interbank business. First, on the asset side, through interbank lending to expand credit creation, which is unregulated by financial authorities. Second, on the liability side, commercial banks try to obtain the liquidity they need as cash reserve through interbank borrowing. Thirdly, in terms of profitability and income, the proportion of commercial banks' interbank business income as % of total income for is increasing year over year, since the income from other businesses decreases, commercial banks have to expand interbank business in order to meet t their profitability targets.

With the rapid development of interbank business, there also come more and more regulations. On February 1, 2014, the "Administrative Measures on Interbank Financing of Commercial Banks" issued by China Banking and Insurance Regulatory Commission set the regulatory standards for interbank business of Chinese commercial banks, (CBIRC, 2014a) which state the balance of commercial banks' financing and borrowing funds from other financial institutions must be less than 100% of its own net capital, which to a great extent restrict the interbank business scale between commercial banks and other non-banking financial institutions. Following this, the China Securities Regulatory Commission also proposed corresponding regulations for non-bank financial institutions, which state the balance of funds raised by non-bank financial institutions through other financial institutions must be less than 25% of its net capital. These regulations on interbank business were set, mainly because a large number of commercial banks realized arbitrage through the business model of "interbank business + outsourcing investment", which triggered the Chinese financial authorities issuing more stringent regulatory policies, requiring commercial banks to meet the requirement on their funding balance and disclose the specific details of their interbank business at more granular level.

In Chapter 4.2, more details regarding the operation model of Chinese interbank shadow banking business will be elaborated.

3.3 Key takeaways

In this chapter, we look into the development trajectory of shadow banking system in China, identifying two key phases related to the rapid growth of Chinese shadow banking activities. The first phase is from 2008 to 2013, which is characterized by commercial banks' wealth management business through various passageways/channels with the final investment in non-standard assets. The second phase is starting from 2013 to 2016, when interbank business takes the dominant position and the funds raised from peer financial institutions end in standard assets via outsourcing investment.

Both phases represent the prominent shadow banking operation model in Chinese financial system, which is commercial bank-centric shadow banking. Considering the dominant positions of commercial banks in Chinese financial system, investigating what role commercial banks take within the shadow banking activities will be crucial for us to understand what risks the shadow banking activities may bring to single commercial bank, or even to a further step the whole Chinese financial system. To answer our research question, these two operation models will be the research focus and thus in the following chapter 4, these two operation models of Chinese shadow banking business will be illustrated with more details.

Besides, in this chapter, an comprehensive introduction to the main components of Chinese shadow banking system is given, displaying an overall picture of what the Chinese shadow banking system consists of and how the banking and non-banking financial institutions operate under shadow banking system, which will be helpful in the later chapters of the thesis, where the cooperation between banking and non-banking financial institutions will be investigated in details.

4 Commercial bank-centric shadow banking and the operation models

As discussed in this thesis before, shadow banking business in China is mainly centered on commercial banks, considering the dominant positions commercial banks are taking in the overall Chinese financial system. This characteristic could be seen as China unique feature, since in Western countries represented by the U.S., where non-banking financial institutions are playing a much more important role in the whole financial system as well as the shadow banking system. [1] From this perspective, the Chinese shadow banking system is quite different from that of the United States. Considering this unique characteristic of Chinese shadow banking system, deep diving into the commercial bank-centric operation model is crucial in order to understand the intrinsic characteristics of Chinese shadow banking system. In chapter three, we have shown an overview of major Chinese shadow banking system components, which consists of two parts, namely institutions without financial licenses and institutions with financial licenses, as can be seen from the picture below. In this chapter, we will only focus on the left side, which is commercial bank-centric shadow banking business. The right side has already been introduced in chapter three and it is not the main focus of this thesis, so here we will not deal with the right side of the picture below. In this chapter, two main types of the commercial bank-centric shadow banking bu sines will be illustrated, namely shadow banking business through commercial banks' wealth management business and interbank business.

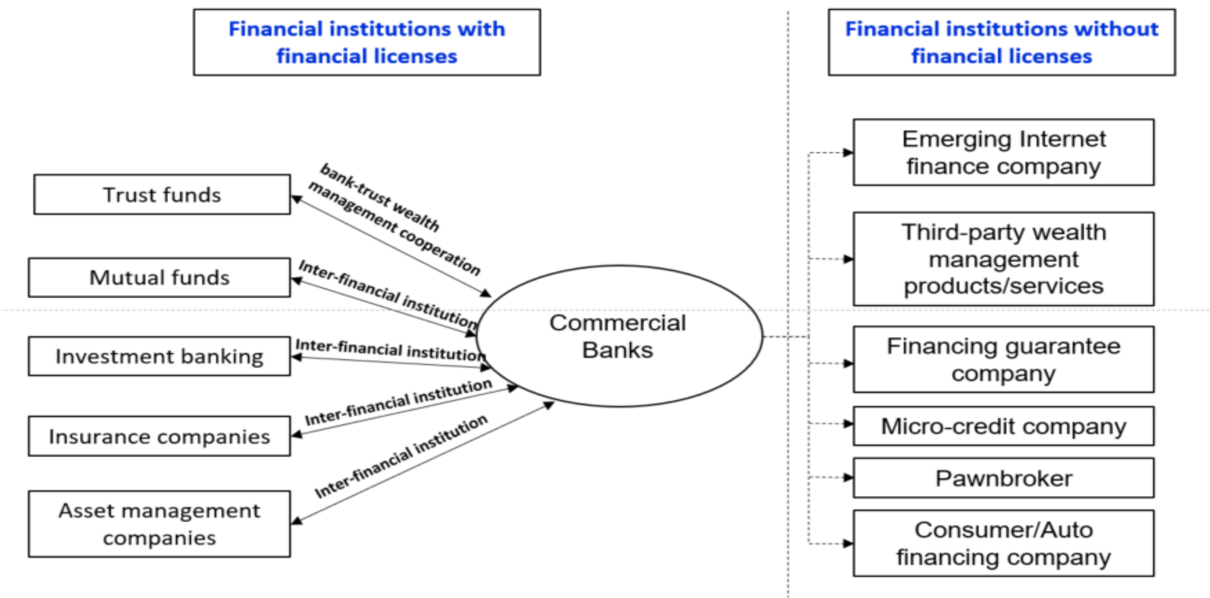

Figure 3: Overview of Chinese shadow banking components

[1]U.S. shadow banking system can be divided into three major categories, namely government-sponsored shadow banking system (represented by Fannie Mae and Freddie Mac), internal shadow banking system (commercial banks' emerging business excluding its traditional deposit and loan business, such as loan securitization, wholesale finance and other businesses with low credit risk concentration and high commission profitability), and external shadow banking system (outside of traditional commercial banks, mostly initiated by brokers as credit intermediation, covering almost all important non-banking financial institutions in the U.S.

4.1 Wealth management shadow banking business

As discussed in Chapter 3, Commercial bank wealth management products are capital investment and asset management plans designed for customers in demand of higher return than bank deposits, while investors bear higher risk meanwhile. Judgment on the shadow banking characteristics of banks' wealth management business needs to be concluded from the comparison between traditional deposit and loan business and wealth management business.

4.1.1 The comparison between wealth management business and deposit and loan business in commercial banks

The intrinsic difference between the wealth management business and deposit and loan business of commercial banks are mainly two aspects. First, as money-creating institutions, commercial banks' deposit and loan business creates the money the whole financial system needs for consuming, investing, etc., which will be circulated within the whole financial system. While in wealth management business, commercial banks acts only as intermediaries, does not function as money-creating institutions. (Guocai, 2011) Second, the traditional deposit and loan business of commercial banks embodies a dual creditor-debtor relationship within the whole process, with banks performing credit intermediary functions in the process of taking deposits and granting loans. In the process of deposit taking, the first level of creditor-debtor relationship is formed between the bank and the depositors. The bank uses the deposited funds to make loans to those in need of funds, forming a second level of creditor-debtor relationship. (Kun, 2012) The dual debt relationship is independent of each other. As long as the bank does not fail, fixed interest is paid to depositors as agreed, regardless of the return on the loan side. In the deposit and loan business, banks aggregate all deposit funds to form a fund pool. The essential feature of the pool is that there is no need for a one-to-one correspondence between deposits and loans. Through a fund pool, commercial banks manage to aggregate single small amounts of money into large amounts and achieve maturity mismatch, which generates profits for commercial banks. The profits of deposit and loan business come from the interest rate spread between the asset side and the liability side, and the bank itself needs to bear the credit risk and liquidity risk.

However, for the wealth management business, the underlying mechanism differs greatly from the traditional deposit and loan business. The inherent property of wealth management business is that investors entrust their funds to an asset manager to conduct investment on their behalf. (Xiaohong, 2005) The asset manager will charge a management fee in a pre-agreed manner and then returns the investment income, net of the management fee, to the investors. The source and investment destination of funds for each wealth management product is independent of each other so that investment returns and risks can be clearly calculated. As a specific category of wealth management products, commercial banks' wealth management products are supposed to meet the above basic attributes and the existing regulations on wealth management products. However, the current operation model of Chinese commercial banks' wealth management business deviates from the abovementioned requirements and inherent attributes of wealth management business. The deviation comes in the following three aspects (J. Du, 2013). Firstly, for wealth management products, due to the existence of the phenomenon of rigid redemption, it is actually the bank that is taking the risk. secondly, the income obtained from the wealth management products is not fully transferred to the investor, which means the investor only receives the expected rate of return; thirdly, the wealth management business does not allow fund pooling, and the source and investment destination of funds for each wealth management product should be independent and not be mixed with other wealth management products. However, in the current Chinese financial market, a large proportion of wealth management products are operating through a fund pool - asset pool model.

Compared with the wealth management business mentioned above, the inherent business logic in commercial bank's deposit and loan business is to use a pool of funds to absorb liquidity risk and credit risk, meanwhile earning an interest rate spread due to risk taking. On the contrary, in wealth management business, commercial banks as the asset manager do not have to bear either of these two types of risk, so there is no need to set up a pool of funds. Ideally, commercial banks' wealth management business is supposed to be a type of asset management business, but in reality, in the current Chinese financial market, wealth management products have become more like "deposit and loan" business, since the commercial banks are taking risk due to rigid redemption, maturity mismatch and creating fund pool, which are the basic characteristics of traditional deposit and loan business. However, these wealth management businesses are not subject to regulatory restrictions such as capital adequacy ratio, deposit-to-loan ratio, leverage ratio, liquidity requirement, etc., while commercial banks have to meet these regulations for its deposit and loan business. (Guocai, 2011) In this case, commercial banks conduct wealth management business, which is essentially the same as its traditional deposit and loan business, but do not need to meet the regulatory requirement imposed by central bank, which means wealth management business provide room for commercial banks to avoid regulation. Based on the analysis above, it is quite appropriate to define commercial banks' wealth management business as shadow banking business.

4.1.2 Different types of wealth management business/products issued by commercial banks in Chinese financial market

Since commercial banks' wealth management products are a key element of Chinese shadow banking system, in the next section 3 major types of wealth management products issued by commercial banks and its business model will be reviewed , in order to further understand the operating mechanism of this shadow banking business. These 3 types of wealth management business are bank-trust wealth management cooperation, entrusted loan wealth management business and fund pool wealth management business.

Bank-trust wealth management cooperation

Introduction to trust funds

A trust is a form of asset management as well as a financial and physical property management system. Together with commercial banks, securities and insurance, it constitutes a modern financial system. Trust business is a legal act based on credit, usually involving three parties: the principal, the trustee and the beneficiary. It generally refers to the act in which the principal, based on trust in the trustee, delegates his property rights to the trustee, and the trustees conduct asset management and gain returns through various investment activities, in order to ensure the interests or of the beneficiaries. In terms of investment preference, period, portfolio constitutions and all the other details of trust plan, they are all composed in an agreement or contract before the trust comes into operation.

Trusts began to emerge in China in late 1970s, and the establishment of China International Trust and Investment Corporation (CITIC) marked the beginning of the trust business in China, which has developed for more than 40 years so far. At the early stage of development, Chinese trust companies were not real trust companies, and the vast majority of them were platforms for large state-owned companies or local governments to provide financing and raise money. Although they were called trusts, they were not trust companies in the true sense of the word. Meanwhile, because of the irregular management and operation, trusts companies at that moment generated large-scale non-performing assets, which could not redeem when the trust contracts came to maturity. (Fei, 2013) Since the beginning of 1980, China has implemented six times of all-round rectification of the trust industry. It was not until March 2007, when the "Trust Company Management Measures" and the "Trust Company Pooled Trust Fund Plan Management Measures" were introduced and the trust companies were strictly required to carry out interbank borrowing and lending only, and no other liability business was allowed, that Chinese trust industry was gradually operating on the right track.

At present, trust companies in China are mainly engaged in three types of trust business: investment trusts, financing trusts and service management trusts. The first type of trust includes financial securities investment and private equity investment trusts, etc. The second type of trust mainly includes trust loans, credit asset transferring and guarantee-based equity financing trusts, etc. with the main purpose to provide trust financing services for companies in need of funds. The third type of trust mainly undertakes trustee management business, managing accounts on behalf of the trustee, and performing management and investment duties based on the agreement of the trust contract and the wishes of the principal. Under the pattern of separate operation in Chinese financial industry, trust companies are regarded as the “Department Store” of Chinese financial industry (Qiaorong, 2004) because they can get involved in money market and capital market as well as industry. Commercial banks and trust companies cooperation can break the limitations of separate operation, and commercial banks can indirectly enter the stock and real estate markets or even derivatives markets.

Introduction of bank-trust wealth management cooperation

Before we dive into bank-trust wealth management cooperation, let us look at the general bank-trust cooperation first. In the "Guidelines on Business Cooperation between Banks and Trust Companies" issued in 2008, (PBOC, 2008) the cooperation between commercial banks and trust companies was divided into two types: bank-trust wealth management cooperation and other cooperation.

Bank-trust wealth management cooperation refers to a model in which commercial banks hand over the funds received by their wealth management products to trust companies for management. Another major type of cooperation between commercial banks and trusts is the credit asset-based securitization business, in which trust companies act as SPVs to securitize commercial banks' credit assets and sell ABS to investors. ABS will be introduced in later chapters so here we focus on the wealth management cooperation between commercial banks and trusts.

In China, bank-trust wealth management cooperation mainly consists of trust loan wealth management products. (Y.-H. Zhu, 2008) The specific business model of trust loan wealth management products is that banks sell wealth management products to a wide range of customers, pool their financial funds together and invest them in trust fund plans launched by trust companies within the agreed period, and the investment destination is mainly to issue trust loans to enterprises with capital needs, and the enterprises receiving the loans use their credit or collateral to ensure timely repayment, thus realizing financing. (C. Zhang, 2011)

Reasons for the development of bank-trust wealth management cooperation

The bank-trust wealth management cooperation business is a joint venture between Chinese commercial banks and trust companies to further expand their business scope and enhance their competitive advantage in the global market. The rapid growth of the bank-trust wealth management cooperation in China is driven by the following factors.

First, Chinese commercial banks have been in a fiercely competitive domestic and global market. Since China's accession to the WTO in 2001, a series of restrictions for foreign banks in China have been slowly relaxed, and domestic commercial banks have started to directly face competition from foreign banks. In addition, funds, securities, insurance and trust companies and various types of financial institutions have launched a series of wealth management business, which also includes shadow banking business. They are gradually taking over traditional commercial banks' customers. In such a competition landscape, the operating pressure faced by Chinese commercial banks is rising rapidly, and there is an urgent need to break the limitations of traditional deposit and loan business and vigorously develop off-balance sheet business to explore new profit growth points.

Second, the transformation of commercial banks in China requires the development of bank-trust cooperation business. Since the late 1980s, the financial industry in the United States and other developed countries has moved into the stage of mixed operation. This has greatly enhanced the activity and global competitiveness of U.S. financial institutions. (Hong-bo, 2004) In contrast, while the Chinese financial system is still greatly restricted by separate operation, Chinese commercial banks are too dependent on the traditional deposit and loan business, and this business model is too homogeneous and is difficult to adapt to the mixed operation model in world financial industry. In China's Commercial Bank Law, it is clearly stipulated that "commercial banks cannot carry out securities and trust investment business in China, and cannot invest funds into non-bank financial institutions and enterprises". Under the constraints given by the law, there is an urgent need for cooperation between commercial banks and trust companies in China. Through bank-trust cooperation, commercial banks will be able to break the limitation of separate operation imposed by the law, and carry out business such as wealth management and asset-based securitization, which can further optimize the commercial banks' asset-liability structure and reduce capital occupation to a large extent.

Third, bank-trust cooperation is also necessary for the survival and development of trust companies in China. In China, the only financial institution that can operate in the capital market, industry and money markets simultaneously is the trust company. Under the system of separation operation, the trust company has great advantages compared to other financial institutions which can only operate single type of business, but meanwhile it is also threatened by financial mixed operation from other parts of the world and an increasing number of financial innovations. Bank-trust cooperation enables commercial banks to fully combine their product sales channels with trust companies' investment channels, bringing the synergies between both sides and achieving a win-win situation. (C. Zhang, 2011) For example, the banking industry has sufficient funds and abundant customer resources, but is greatly restricted in the use of funds; the trust industry is more flexible in the use of funds, but has greater limitations in the fund-raising channels. In this case, the cooperation between these two parties will complement each other and achieve reciprocity.

Fourth, the wealth accumulation of the Chinese public, coupled with the growing awareness of asset management, has become the driving force for the development of bank-trust wealth management business. Recently, the per capita disposable income in China has shown an increasing trend year by year (CHART), which results in more and more saving and deposits. However, Chinese people are not satisfied with depositing their saving in banks anymore, and more and more people are willing to choose wealth management products to realize the preservation and appreciation of their money. In the case, bank-trust wealth management cooperation perfectly meets the asset management need of Chinese public, through providing wealth management products which can generate much higher interest returns than commercial bank deposits.

Risks of bank-trust wealth management cooperation

In recent years, the development of bank-trust wealth management cooperation has grown in scale and become one major element of Chinese shadow banking system. Bank-trust wealth management cooperation has gradually become a method for commercial banks to avoid regulation, which poses a great challenge to China's financial regulation. It is mainly manifested in the following aspects.

First of all, commercial banks appear to be conducting wealth management business, but in fact they are using high interest rates to absorb deposits in disguise. In order to attract more middle and high-end customers, commercial banks will deliberately raise the expected returns of wealth management products to make their products more attractive to investors. However, when it comes to maturity, the actual return of such wealth management products often differs a lot from the expected return claimed by the commercial banks, in most cases much lower than promised return. (Hu et al., 2019) However, commercial banks usually have to guarantee the expected return of wealth management products to their customers when they sell these products, resulting in such high-interest wealth management products becoming invisible liabilities of commercial banks, aiming at absorbing investors' funds and then issuing loans. In such case, the bank-trust wealth management cooperation becomes a shadow banking business, away from its original purpose.

Secondly, the bank-trust wealth management cooperation enables commercial banks to use the wealth management products they cooperatively issue, to regulate the scale of credit asset within their balance sheet and realize off-sheet financing. (Shi et al., 2013) Different from traditional deposit business, the money or funds which commercial banks raise by issuing wealth management products, do not enter the banks' balance sheet. Commercial banks use these funds to issue loans to enterprises (usually with very low credit rating) that would otherwise be unable to obtain loans, avoiding regulatory restrictions. This "off-balance sheet" financing poses a huge challenge to financial regulation, because commercial banks are exposed to very high risk of default for enterprises financing through this method, and it is extremely difficult for the authorities to identify and take control under this operation model.

Third, commercial banks are able to enter the capital market through wealth management products launched by bank-trust cooperation. The Commercial Bank Law clearly stipulates that banks are not allowed to carry out investment in stocks, funds, real estate and derivatives, but through wealth management cooperation, banks can hand over their funds through trust companies as the channel, and then invest in the capital market, breaking the regulatory restrictions. As is known widely, the investment risk in capital market can be relatively high, especially when the investors engage in the stock and derivatives investment. In the worst case, the funds raised by wealth management products, which essentially are the investor's money, may come across big losses. Thus, the investment risk for both investors and commercial banks can be quite high, even sometimes beyond their acceptable range, depending on which kind of investment tools the funds are targeting at.

Entrusted loan wealth management

The operation model of entrusted loan wealth management products is that commercial banks issue wealth management products to fund principals (including government departments, enterprises, institutions and individuals, etc.) to obtain funds, and then commercial banks will issue loans to the loan recipients predetermined by the fund principals. After the loan comes to maturity, the commercial bank will take back the loan and redeem the wealth management products as well.

Entrusted loan wealth management products are essentially intercompany credit, (Kilichuo, 2011) where the commercial bank is the trustee and does not take risk, but merely receives a commission. This type of business enables commercial banks to avoid regulation and issue loans to companies which otherwise cannot obtain the loans due to their low credit ratings, while not being restricted by regulations that prohibit lending between companies, and is therefore typical of shadow banking. For companies that invest in entrusted loan wealth management products, they are able to earn much higher interest than deposits, and at the same time save small and medium-sized enterprises (SMEs) that would not otherwise be able to obtain loans from commercial banks from their financing difficulties. Although the bank only has the responsibility of supervising and helping to take back the loan while obtaining the corresponding handling fee, it seems that the commercial banks do not have to bear any default risk, but in fact, due to the poor credit rating of the financed SMEs, there is a high probability that they cannot repay the loan, and commercial banks still face a considerable risk of default.

Fund pool wealth management

Fund pooling refers to the issuing of a variety of wealth management products by commercial banks to bring in funds, and then pool the raised funds together to form a larger pool of funds, in which the bank manages and invests the funds in a unified manner. With fund pool, there usually exists an asset pool as well, which together forms the "fund pool-asset pool" business model in the shadow banking world. The asset pool is usually composed of bonds, repo, trust financing plan, deposits and other diversified financial products. (Lei et al., 2018) The income from the asset pool is the source of interest for corresponding wealth management products. Commercial banks often raise funds through short-term wealth management products and invest them in long-term projects or assets to obtain spreads. However, due to this maturity mismatch, commercial banks must issue wealth management products on a revolving basis, in order to ensure the size stability of funds in the pool. The business model of fund pool wealth management products are illustrated in the figure below.

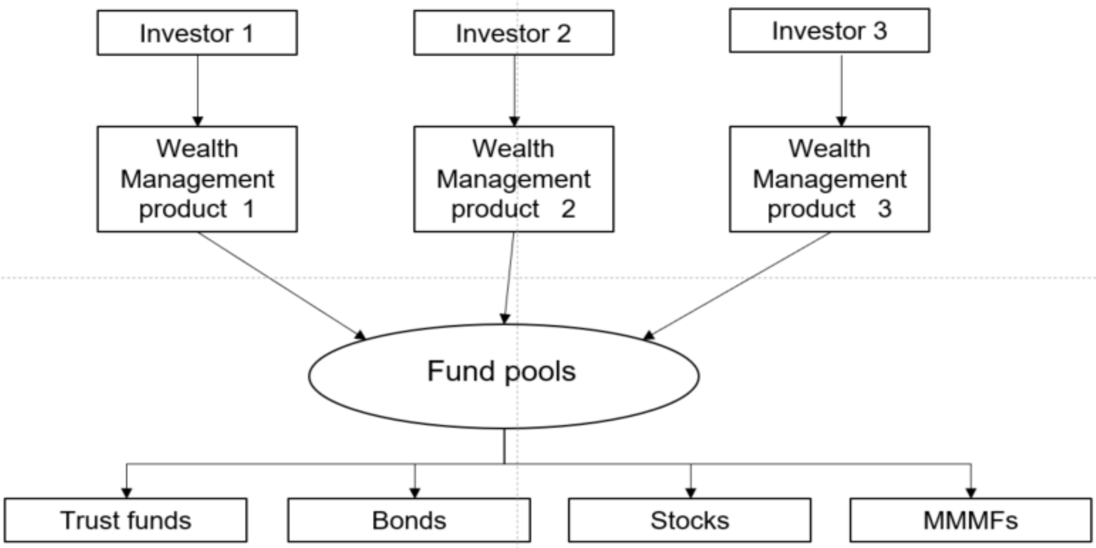

Figure 4: Fund pool wealth management

The fund pool business model has intrinsic great risks due to its pooling characteristic. For commercial banks, if they cannot obtain stable cash flow by repeatedly issuing wealth management products and the capital chain of the pool suddenly breaks, there will be huge liquidity risk and a large number of investors' wealth management products cannot be redeemed, which will lead to big credit crisis. Moreover, the funds in the pool model cannot be matched with the underlying assets on one-to-one base, making it difficult for commercial banks and investors to predict the investment risk. In March 2013, the China Banking Regulatory Commission promulgated the "Notice of the China Banking Regulatory Commission on Issues Related to the Regulation of Investment Operations of Commercial Banks' Wealth

Management Business", (CBRC, 2013a) which set out clear requirements on the investment destination of commercial banks' wealth management funds, emphasizing the "one-to-one principle between the source of funds and the destination of funds". All wealth management products issued in China have to follow the one-to-one principle, and commercial banks are required to resolutely stop carrying out fund pool business to prevent potential financial risks.

4.2 Interbank shadow banking business

Interbank business is a general term for various businesses in which commercial banks have other financial institutions as their counterparties to realize capital financing as ultimate goal. In a broad sense, interbank business may be reflected both on and off the balance sheet. Off-balance-sheet interbank shadow banking business mainly relies on off-balance sheet wealth management business, for example, bank-trust wealth management cooperation is a typical representative of this kind of business, which have been illustrated in previous section. Thus, in the section, we will mainly focus on on-balance sheet interbank business, which refers to interbank asset business and interbank liability business. The interbank asset business mainly includes interbank deposits (commercial banks as depositor), interbank lending and buy-back resale financial assets. The interbank liability business includes interbank deposits (other financial institutions as depositor), interbank borrowing and sell-back repurchase financial assets.

4.2.1 Risks of interbank shadow banking business

Since 2006, the scale of Chinese interbank business has grown rapidly, especially after 2010, with a significant increase in the scale of both asset side and liability side. In term of the reason why interbank business stepped since then, it maybe that after 2010, the direction of the national macroeconomics policy changed, from the previous loose monetary policy to a more stable monetary policy. (Chen et al., 2018) This change led to the fact that financial authorities, like China Banking and Insurance Regulatory Commission and China Securities Regulatory Commission, began to take credit line management, deposit-to-loan ratio restriction and other means to strengthen the management of commercial banks' credit risk. In this context, interbank business has become a major tool for commercial banks to avoid regulations and seek arbitrage, in order to keep their original profit margin before the regulatory measures being taken.

The main motivation of interbank business innovation is "to reduce credit scale, reduce capital occupancy, increase financial leverage and avoid regulation", and its business models are also in the process of dynamic adjustment along with the changes of regulatory environment. There are two main reasons why innovative interbank business is defined as shadow banking business. On the one hand, interbank assets are not included in the credit asset, so they are not subject to the regulatory restrictions of banks' capital adequacy ratio. However, some commercial banks leverage this channel to issue loans to low credit-rating enterprises which would otherwise not be able to get financing, through interbank lending and other interbank business, completely avoiding the regulatory requirements, which brings great potential risks to the operation of commercial banks. On the other hand, there exist opportunities for regulatory arbitrage in interbank business. Many commercial banks, in order to obtain higher profits, lend the funds originally intended for loans to enterprises to other financial institutions through interbank business, which aggravates the difficulties of financing for small and medium-sized enterprises and completely defeats the purpose that commercial banks should serve the real economy. In view of the two reasons mentioned above, interbank business is considered by Chinese financial regulatory authorities and many scholars as an important component of Chinese shadow banking system.

4.3 Key Takeaways

In this chapter, we discussed two main pillars within Chinese commercial bank-centric shadow banking system, namely commercial banks' wealth management business and interbank business. For commercial banks' wealth management business, it's key to understand how this business differentiated with the traditional deposit and loan business in terms of their operating model and whether the funds are reported on balance sheet or off balance sheet. Though there are several different types of wealth management products which can be issued by commercial banks, however, the underlying reason why these wealth management products are risky is the same. Either through bank-trust cooperation, entrusted loan or fund pooling, the essence is leveraging maturity mismatch to raise funds with low interest and then invest in higher-return products/activities to obtain interest rate spreads.

For interbank business, it emerged post the strong regulation by Chinese financial regulators on commercial banks' wealth management business. It is intrinsically different from wealth management business, since interbank business are on-balance sheet business and the transactions are reported on commercial banks' balance sheet. Though the interbank business is reported on balance sheet, the commercial banks are using it as the best solution to reduce credit asset scale on balance sheet, and then consequently reduce capital occupancy rate with the final purpose to avoid regulation. Understanding these two main patterns of how Chinese shadow banking system operates, we could know what kind of risks shadow banking business might bring, not only to commercial banks but also to other financial institutions engaged in the shadow banking business chain, in worst case even the whole financial system. Thus, it becomes more obvious why financial regulations specifically related to shadow banking are necessary.

To formulate appropriate regulation policies, not only different kinds of risks which shadow banking business might bring should be understood, but also the underlying mechanism why these risks are generated, transferred and amplified. In the following chapter, these questions will be addressed.

5 Main risks of Chinese shadow banking activities to Chinese financial system

After deeply investigating the commercial banks' centric shadow banking system and understanding its operation model, in this chapter, we will discuss how the risks are generated within commercial banks, how they are transferred across financial institutions as well as the reasons behind why they can be amplified along with the transmission process. Besides, after identifying the underlying mechanisms related to the risks of Chinese shadow banking system, three major types of risks which could be brought by shadow banking activities to the financial system are illustrated.

Thus this chapter will be structured as follow:

1) Risk generation mechanisms of Chinese shadow banking system
2) Risk transmission mechanisms of Chinese shadow banking system
3) Risk amplification mechanism of Chinese shadow banking system
4) Main risks of shadow banking in China

5.1 Risk generation mechanisms

The motivation of shadow banking is regulatory arbitrage. Shadow banks make extra profits through maturity mismatches; then, they use different wealth management products to avoid regulation and achieve the purpose of regulatory arbitrage. Therefore, it is the maturity mismatch and regulatory arbitrage that lead to the emergence of risks related to shadow banking. (Cai et al., 2019)

One of the key features of shadow banking is maturity mismatch. Through complex accounting treatment, commercial banks are constantly mismatching the maturity of their assets and liabilities, which results in creating and even exacerbating risks. The maturity mismatch of shadow banking is caused by the long- and short-term switching between liabilities and assets, which can also increase the liquidity risk of shadow banks. From the liability side, wealth management products and interbank business are both important sources of funds for shadow banks. From the asset side, non-standardized debt assets with long maturity and high liquidity risks are the main destinations of investment. From large number of practical examples in Chinese financial market, it can be observed that shadow banks make long-term investments through short-term fund raising, marking the most distinctive feature of shadow banking activities.

However, maturity mismatches are quite common in financial systems. Given adequate regulations, the liquidity risk caused by maturity mismatch can be under good control. However, in the current Chinese financial system, there is a regulatory deficiency or lack of regulations, which exacerbates the potential risks. The regulatory deficiencies are reflected in the following aspects: First, the restrictions on the commercial ratios, e.g. deposit-to-loan ratio, deposit reserve ratio, and capital adequacy ratio, are usually imposed on commercial banks' traditional credit business, namely deposit and loan business, but not any restrictions on banks' on-balance sheet shadow business are proposed, i.e., the regulatory effectiveness of the above ratios to control risks of shadow banking needs to be doubted.

For example, many commercial banks conduct shadow banking business through wealth management and interbank business. However, none of the above-mentioned ratios are directly regulating these two businesses, which exactly reflects the loopholes of current Chinese commercial bank regulations system. Second, a product disclosure mechanism for the shadow banking system has not yet been established, which may lead to shadow banking-related speculative behaviors of financial entities and information asymmetry. Both two factors mentioned above may make it difficult to measure and control the risks of shadow banking activities, which ultimately are due to the lack of adequate regulations on shadow banking.

5.2 Risk transmission mechanisms

5.2.1 Risk transmission between credit loan markets and capital markets

Within the shadow banking system, there exists a mechanism of mutual transmission of economic and financial risks. In the spreading process of the U.S. financial crisis in 2008, one of the important channels was the transmission of risks between credit loans and capital markets. The key to the transmission from credit markets to capital markets was the role of asset securitization, as a catalyst. Through securitization process, there are a large number of securitized financial assets in the capital market, such as asset-backed securities (ABS), mortgage-backed securities (MBS) and Collateralized Debt Obligation (CDO). (Stein, 2010) According to historical data, the market size of the U.S. home mortgage market was about $10 trillion in 2007, and the market size of securitized assets based on mortgages was over $6 trillion, which is more than half of the total mortgage size. The major risk of ABS is the risk of the underlying assets, because changes in the value of the underlying assets (the collateral) will have a strong impact on the value of asset-backed securities. For example, after the bad debt ratio of subprime mortgages increased, the market value of mortgage-backed securities held by investors decreased significantly, so credit loan market losses were directly transmitted to the capital markets. The impact of the credit loan markets on the capital markets was not only due to the large amount of default of credit assets, but also the value of many high-quality asset-based securities will also be strongly impacted since investors distrust the securities and all want to sell the securities in bulk as fast as possible.

In contrast, In China, the asset-based securitization business is still not as mature as developed countries such as the US and Europe, which results in the transmission of downside risks from the real economy to the capital market is relatively simple, mainly through various asset management products represented by commercial banks' wealth management products. When the real economy is at upturn and fixed asset prices are rising, the scale of banks' wealth management products grows rapidly. However, when the economic growth rate decreases and the asset price bubble bursts, the asset and liability positions of enterprises and individuals will deteriorate, resulting in that many enterprises and individuals cannot pay back the loans to the commercial banks. Since most commercial banks invest the funds raised by wealth management products into these credit assets, using the income paid by these borrowers to cover the investment returns requested by the investors, when the loans default, the investment returns of wealth management products will drop significantly or even incur losses. (Liu, 2019) In Chinese financial market where rigid redemption is common for all types of wealth management products, once the expected returns promised by commercial banks to investors are not realized, there are bound to be massive redemptions, due to the psychological effect of panic. In this case, Although the development of asset securitization business in China is limited, through wealth management business, it still realizes the risk transmission between credit loan market and capital market, which is quite in line with the asset securitization issue in the US. Wealth management products create market liquidity to a certain extent, but at the same time, also creates a potential crisis of liquidity risk.

5.2.2 Risk transmission among financial institutions

In China's commercial bank-centric financial system, there are extensive linkages between different types of financial institutions, especially the linkage between one commercial bank and other commercial banks, and commercials and other non-banking institutions. These linkages provide a channel for risk transmission among financial institutions when potential default issues happen. According to the different credit relationships, we can classify the credit relationships among commercial banks into four categories.

The first type is the debt relationship. Debt relationships are quite common among commercial banks due to the prevalence of interbank business such as interbank borrowing and lending, interbank deposits, etc. The bankruptcy of one commercial bank first affects other commercial banks which are the creditors of this bankrupt bank. In normal cases, it will just generate bad debts and the creditor bank will suffer from capital losses. However, in worse cases, bankruptcy if the creditor bank's capital is not sufficient to cover all the bad debt losses, it will go bankruptcy as well.

Second is the equity relationship. If there is an equity relationship between different financial institutions, which happens quite common in China between commercial banks and their asset management subsidiaries, the shareholder will come across losses due to the bankruptcy of their subsidiaries, thus becoming a channel for risk transmission.

The third type is indirect credit relationship. Indirect credit relationships are mainly claims based on financial contracts, such as financial guarantee. Therefore, if there is a problem with the solvency of one commercial bank, it will not only affect its creditors and shareholders, but also the risk will be transmitted to other financial institutions who undertake financial guarantee for this bank.

Fourth, there are complex financial contractual relationships. Accompanied by financial innovation, complex financial contracts have been emerging in China in the past decades, most of which are based on innovative instruments, such as trust beneficiary rights, asset-backed securities, derivatives, etc. A large number of studies of the subprime mortgage crisis in the US financial crisis suggest that the asset-liability linkages among financial institutions, formed primarily by complex financial contracts, spread risks quickly to each other when the crisis breaks out, which leads to systemic risk in the worst case.

5.3 Risk amplification mechanism

High leverage has always been one significant feature of shadow banking business, in China especially for the bank-trust corporation and fund pool wealth management business. According to the data published by China Banking and Insurance Regulatory Commission and the commercial banks' financial statements, overall, the financial leverage of commercial banks of Chinese commercial banks is significantly higher than its peers around the world, which magnifies the potential risks of shadow banking activities. Besides, considering the risk transmission mechanism between different financial markets and among financial institutions, the high leverage may jeopardize the healthy and smooth operation of the whole financial system, even resulting in systemic risk.

Leverage has long been the operating principle of commercial banks, not only in China but all the countries in the world. However, why is the Chinese commercial banks' leverage much higher than those of other countries? The reason lies in the scale of shadow banking business. Due to the huge scale of shadow banking business (mainly consisting of wealth management business and interbank business) in Chinese commercial banks' total business portfolio, the financial leverage increases dramatically, also thanks to the inefficient regulation by the financial regulators. Because of their highly leveraged nature, commercial banks prefer to invest in credit assets with high returns and simultaneously high risks, which means that when the economy is doing well, banks may reap high profits due to their high leverage characteristics; on the contrary, when market conditions are bad and the economy is in downturn, the unstable flow of funds may cause great liquidity risk and default risk, resulting in the Chinese financial system more vulnerable. So Many scholars emphasize that financial crises are often caused by overleveraging and commercial banks should do a good job of controlling risks while chasing profits, especially paying attention to their high-leverage shadow banking business. (Lee, 2015)

5.4 Main risks of shadow banking in China

The emergence of shadow banking activities in China is essentially an act of financial innovation undertaken by commercial banks to change their disadvantages in an unfavorable financial environment. In a certain aspect, shadow banking activities promote the development of Chinese financial system, injecting new vitality, but it is definitely necessary to pay attention to the potential risks of shadow banking in China, which is crucial to avoid systemic risk and remain long-term financial stability for the overall financial system. In the following section, three types of main risks related to Chinese shadow banking business will be discussed in detail.

5.4.1 Liquidity risk due to maturity mismatch

The maturity mismatch between assets and liabilities is a significant risk in China's shadow banking system. From the liability side, shadow banking products are becoming more and more short-term because of the fierce competition among commercial banks for deposits and the quarterly assessment of banks' deposit-to-loan ratios by regulators. From the asset side, shadow banking funds are more often invested in medium- and long-term projects in order to maximize yields. For example, one of the key investment products of shadow banking for regional commercial banks is municipal bonds. (Hsu et al., 2015) The municipal bonds issued by China's local government have an average maturity of five to eight years. This means that commercial banks must rely on the continued issuance of short-term wealth management products to alleviate the liquidity pressure caused by maturity mismatch between wealth management products and municipal bonds. If the maturity of old wealth management products comes and new products have not been issued, these commercial banks will be forced to immediately sell other credit assets in order to obtain cash and redeem the wealth management products at maturity. Once the liquidity shortage is too huge to cover, then the wealth management products are very likely to default.

The once-popular fund pool wealth management business among commercial banks in China will further worsen the maturity mismatch situation in the shadow banking system. As discussed before, fund pooling refers to the pooling of funds drawn from a large variety of different wealth management products, which are then invested in various types of financial assets with different risks and maturities, such as bonds, trust plans and equity. The fund pool development is entirely dependent on funds drawn through wealth management products, which are essentially short-term but most often used to invest in higher-risk, long-term financial assets. While this can generate high returns in good times, it is subject to the risk of maturity mismatch. In addition, such centralized operations create a lot of uncertainty in the pooling business and problems in information disclosure. Investors who purchase wealth management products do not know the exact investment destination of their funds, thus not knowing how much the risks they will bear. If the funds in the pool are invested in projects with significant risks, and losses are incurred as a result, investors will be concerned about the safety of the their funds, and may even collectively redeem their wealth management products in advance, which may cause even bigger liquidity shortage in this case.

5.4.2 Credit default risk

As mentioned before, a large proportion of the wealth management products issued by China's commercial banks are invested in investment tools with high risk and high returns, e.g. corporate bonds, stock, in order to obtain high yields with the ultimate purpose to increase commercial banks' overall profitability. However, if the investment assets become problematic and high returns cannot be achieved, credit default may occur. Today, China's shadow banking funds are mainly invested in three areas: infrastructure, real estate industry, and small and medium-sized enterprises. (T. Li, 2014) Expect for infrastructure projects which will be guaranteed by the Chinese government, the other two domains have varying degrees of considerable risk of default, as demonstrated in the past decade. If defaults continue to occur, investors' trust in the overall financial system will significantly drop and newly issued wealth management products will be unlikely to absorb investors' fund in the future, which in turn will worsen the maturity mismatch and lead to more serious consequences.

5.4.3 Risk on monetary policy formulation and implementation

The rapid growth of shadow banking has directly affected the central bank's long-standing practice of using M2 as an intermediate target for monetary policy. (Chen et al., 2018) Because both the central bank and the China Banking and Insurance Regulatory Commission impose quarterly assessments on the deposit-to-loan ratio of commercial banks, commercial banks are more inclined to maintain sufficient RMB deposits at the end of each quarter.

In order to avoid regulation, commercial banks issue wealth management products with a maturity of less than three months at the beginning of each quarter, at which time the deposits are withdrawn by the public or enterprises for the purchase of wealth management products, so the RMB deposits of commercial banks decreases significantly in the first month of each quarter, while the deposits increases significantly in the third month when the wealth management products come to maturity and the funds become deposits again. The growth of bank deposits directly affects the growth of M2, and thus the central bank's measurement of the effectiveness of monetary policy is affected. In this case, shadow banking business affects the central bank's monetary policy formulation and effective implementation in the long run.

6 Current regulatory policy on Chinese shadow banking business

From the historical data shown in chapter six, we can see that the scale of on-balance sheet shadow banking business for most Chinese commercial banks has shown a significant upward trend during the period 2010-2020. Therefore, for China's financial regulators (mainly PBOC, CBRC, SFC), taking necessary regulatory measures and increasing the regulation intensity on commercial banks' shadow banking business are crucial to reduce the default risk of commercial banks and thus avoid the potential systemic risk of the financial system which could be brought by this. In fact, this is exactly what Chinese financial regulators are continuously promoting. Since 2010, the Chinese government, in conjunction with financial regulators (PBOC, CBIRC, CSRC), has introduced a number of measures in response to the expansion of shadow banking activities in Chinese financial system. (T. Li, 2014) These include three main areas of regulation: regulation of the source of shadow banking funds, regulation of shadow banking passageways/business channels, and regulation of the investment destinations of shadow banking funds.

6.1 Regulation of the sources of shadow banking funds

Release Date	Publishing Department	Documents	Sources of funds	Main purpose
August 2012	Former CBRC	Notice on regulating the management of interbank payment business	Interbank business	Inclusion of interbank payments in on-balance sheet accounting
March 2013	Former CBRC	Notice on issues related to regulating the investment operation of commercial banks' wealth management business	Wealth management business	Regulations on investment of wealth management funds in non-standardized debt assets and prohibition of fund pooling wealth management
April 2014	PBOC, former CBRC, former CIRC, CSRC	Notice on the regulation of interbank business of financial institutions	Interbank business	Define and regulate interbank business and standardize the information disclosure and risk management mechanism
2017	PBOC	Inclusion of off-balance sheet wealth management of commercial banks into "broad credit activities"	Wealth management business	Further regulate the development of banks' off-balance sheet wealth management business
2018	CBIRC	Regulation measures of commercial banks' wealth management business	Wealth management business	Clear regulations on commercial banks' wealth management business, commercial banks' wealth management subsidiaries' operation

Figure 5: Regulatory policies on the sources of shadow banking funds

In terms of the regulatory policies on the sources of shadow banking funds, from the above table, we can see that the funding sources of shadow banks mainly originate from wealth management products and interbank business. Since shadow banks make use of maturity mismatch to carry out regulatory arbitrage through wealth management and interbank business, the regulatory authorities have continuously issued laws to regulate these two funding sources. For wealth management products, policies such as the "Notice on Issues Related to the Regulation of Investment Operations of Commercial Banks' Wealth Management Business" were issued by CBRC (2013a) to regulate the funding amount, operation mechanism and risk segregation of commercial banks' wealth management business; for interbank business, policies such as the "Notice on Regulating the Management of Interbank Payment Business and the Notice on Regulating Interbank Business of Financial Institutions" (CBIRC, 2014b) were issued to further clarify the definition of interbank business and standardize the information disclosure and risk management of interbank business. In 2017, the People's Bank of China included off-balance sheet wealth management of commercial banks into "broad credit activities" and required commercial banks to disclose the scale of off-balance sheet wealth management in their annual business performance release and set the scale of off-balance sheet wealth management as commercial banks' performance indicators. (PBOC, 2017) To summarize, Chinese financial regulators have introduced a series of measures to push the sources of shadow banking funds more transparent and limit the increasing scale of shadow banking funds.

6.2 Regulation of shadow banking passageways/business channels

Release Date	Publishing Department	Documents	Passageways/business channels	Main purpose
December 2009	Former CBRC	Notice on issues related to further standardization of banking-trust cooperation	Trust funds	Clarify the asset management function of trust companies and restrict the investment destinations
March 2013	CSRC	Notice on strengthening the regulations of asset management business of securities companies	Securities	Strengthen the risk management of securities companies' asset management business
April 2014	CSRC	Notice on Strengthening Risk Management of Fund Companies and Their Subsidiaries Engaged in Asset Management Business	Mutual funds	Regulating the passageway business and fund pool business of mutual funds companies and their subsidiaries
June 2016	Former CIRC	Notice on the Regulation of passageway Business of Insurance Companies	Insurance	Inspection and regulation of passageway business of insurance asset management companies
2017	Former CBRC	Special rectification action for the banking industry on passageway business	All passageways	Rectifying passageway businesses that violate regulatory rules and engage in regulatory arbitrage and inappropriate innovation
April 2018	PBOC, CBIRC, CSRC	Guidance on regulating the asset management business of financial institutions	All passageways	Comprehensively regulate asset management business, clarify product classification, eliminate multi-layer nesting, and limit non-standard asset business
May 2019	CBIRC	Notice on the promotion of compliance behavior of financial institutions	All passageways	Continuously promote risk management of passageway business and strengthen regulation of shadow banking business

Figure 6: Regulatory policies on the sources of shadow banking funds

From the perspective of the regulatory policies on shadow banking passageways/business channels, the Chinese regulatory authorities have gradually realized the importance of regulating commercial banks' passageway business, and the scope of regulation has been gradually expanded. According to the above table, it can be seen that 2009 was the time when commercial banks' passageway business emerged and has been developing and growing since then. (C. Zhu et al., 2017) Before 2017, as China adopted a model of sectoral regulation, financial institutions such as commercial banks, trust companies, securities companies, fund companies and insurance companies were regulated separately, which was prone to regulatory gaps under sectoral regulation, resulting in information asymmetry among financial institutions and easily leading to regulatory arbitrage. Although Chinese financial regulators introduced several policies to regulate a certain type of passageway business, such as bank-trust cooperation, funds can be transferred from trusts to other channels such as securities and mutual funds, which means the risks of shadow banking still are not under control. For the above reasons, after 2017, Chinese regulatory authorities began to reform the regulation of commercial banks' passageway business from the regulation of single channel to the regulation of full channels, reflecting the trend of tightening regulation.

6.3 Regulation of the investment destinations of shadow banking funds

Release Date	Publishing Department	Documents	Investment destinations	Main purpose
December 2009	Ministry of Finance, Ministry of Land and Resources, PBOC	Notice on further strengthening the management of land transactions	Real estate	Restrictions on the financing of land transactions to prevent excessive flow of funds from the financial sector into the real estate sector
2010 - 2013	Former CBRC	Documents on risk monitoring of local government financing platforms	Local government debt	Regulate and limit the loan amount of local government financing platforms
April 2017	Former CBRC	Guiding Opinions on Risk Prevention and Control in the Banking Sector	Real estate	Strengthen the regulation of financing activities of real estate enterprises and eliminate excessive lending behaviors
April 2017	Ministry of Finance, National Development and Reform Commission, PBOC	Notice on further regulation of local government debt financing behavior	Local government debt	Strengthen the financing management of local government financing platforms and clarify the policy boundaries for debt raising behaviors
August 2019	CBIRC	Notice on the special inspection of real estate business of banking institutions in 2019	Real estate	Inspection of illegal financing for real estate enterprises and flow of funds into the real estate industry through shadow banking activities

Figure 7: Regulatory policies on the sources of shadow banking funds

From the perspective of regulatory policies on the investment destinations of shadow banking funds, the main targets are real estate and local government debt, and as you can see from the table above, the regulation intensity is gradually tightening. For the shadow banking business flowing to real estate industry, the regulatory authorities have focused on the financing methods and financing amount for real estate enterprises, which to a certain extent has regulated the capital inflow to real estate enterprises and curbed excessive financing behaviors. The "Guiding Opinions on Risk Prevention and Control in the Banking Sector" issued by CBRC (2017) also reflects the strict regulatory requirements for real estate credit business. The regulatory authorities are also continuing to promote policies on shadow banking that flow into local government debt, while the governance of local government financing platforms is becoming increasingly strict. The "Notice on Further Regulating Local Government Debt Financing" issued by Ministry of Finance (2017) directly points out the gray area of local government financing, effectively preventing local governments from illegally raising debts and over-raising debts in the name of local economic development.

From the above three aspects, it can be seen that the Chinese government has introduced a series of regulatory measures for the three different parts of the whole operating process of Chinese commercial bank-centric shadow banking system, namely funding sources, passageway/business channels, and investment destinations. By comparing historical data, we can also clearly see that the intensity of shadow banking regulation in China has increased significantly over the past 10 years, which is in line with our understanding for the Chinese financial regulators that they are more and more concerned about the shadow banking activities in current Chinese financial system, especially after the US Sub-prime mortgage crisis broke out in 2007.

7 Empirical analysis

In this chapter, an empirical analysis based on panel data regression will be conducted to investigate the correlation between the default risk of commercial banks and the scale and regulatory intensity of shadow banking in China. In section 7.1, the variables, which will be used in empirical analysis will be selected based on research of previous scholars, including: explained variables (default risk of one single commercial bank), explanatory variables(scale of on-balance sheet shadow banking business and regulation intensity) as well as control variables. In section 7.2, after the variables are determined, raw empirical data of Chinese listed commercial banks will be collected from annual reports and financial statements and descriptive statistics will be conducted using Stata. After that, the risk of commercial banks will be taken as the explained variable while the explanatory variables are the scale of shadow banking and the regulation intensity. In section 7.3, a panel data regression model will be built, and the empirical analysis will be conducted with Stata. In this paper, both fixed effect model and random effect model will be used and based on the results of Hausman test, the most appropriate method will be selected. Then the regression results will be interpreted, and our initial hypothesis will be reflected.

7.1 Variables selection and explanation

7.1.1 Explained Variables

In this empirical analysis, the explained variable selected is the default risk of one single commercial bank, which is different from the systematic risk of whole financial system. Considering the systematic risk is difficult to measure and our empirical analysis focuses on commercial banks' on-balance sheet shadow banking business scale, thus we decide to use the default risk of one single commercial bank to represent the potential risk that could be brought by shadow banking business of commercial banks. In previous scholars' research, one common method to measure the default risk of commercial banks is Z-Score. (Bertay et al., 2013) Z-score is constructed as the sum of the average return on assets (ROA) and the average equity-to-assets ratio (EA), divided by the standard deviation of the return on assets. In a large number of scientific research conducted by previous researchers in econometric field, such as Lepetit and Strobel (2013), Chiaramonte et al. (2015), and X. Li et al. (2017), the logarithm of Z-Score LnZ is taken as the indicator to measure the default risk of commercial banks, which are widely accepted by different scholars across the globe, like the scholars in the World Bank. (Bertay et al., 2013) The specific formula of Z-Score is as follows:

$$Z = \frac{AROA + AEA}{sd(ROA)}$$

Where AROA is the average return on total assets of the bank for the last three years, AEA is the average equity-to-assets ratio of the bank for the last three years, and sd (ROA) is the standard deviation of return on total assets. In this thesis, we use 3 years of rolling data to calculate the moving average of ROA and EA and the standard deviation of ROA. Considering Z values are usually biased, it's good to take its logarithm. Thus, in this paper, we use LnZ to measure the magnitude of commercial bank default risk, defined as the explained variable in our empirical analysis. Something we need to pay attention to is that **the larger the LnZ, the lower the default risk of commercial bank.**

7.1.2 Explanatory variables

1) Scale of commercial banks' shadow banking business

As mentioned in Chapter 2, the current literature measures the size of shadow banking business mainly from two perspectives. The first one is from a macro perspective, aggregating the size of all shadow banking activities across different types of financial institutions in the whole financial system, including both banks and other non-banking institutions. For example, Grillet-Aubert et al. (2016) selected some non-bank financial institutions as shadow banking entities to measure the scale of shadow banking business in Eurozone area. The second one measures the size of shadow banking from a micro perspective, starting from the balance sheets of financial institutions.

As we have discussed in Chapter 4, due to the dominant position of commercial banks in the Chinese financial system and the commercial bank-centric shadow banking system in China, in this empirical analysis part, we will focus mainly on the shadow banking business conducted by commercial banks, thus measuring the size of shadow banking business from micro perspective, namely from the balance sheets of commercial banks as the starting point. As discussed in the previous chapter, many scholars have researched on commercial banks' on-balance sheet shadow banking business. The basic logic is to aggregate several financial accounts from the commercial banks' balance sheet as the on-balance sheet shadow banking scale. Different researchers have different choices regarding which financial accounts should be put into the shadow banking scope. In this paper, we select four accounting items in commercial banks' balance sheet that have the most characteristics of shadow banking to represent the scale of shadow banking activities. The following accounts are included in the calculation: interbank payment + assets purchased under resale agreements + available-for-sale financial assets + investment in receivables. The sum of these five accounting items is used as the explanatory variable to measure the on-balance sheet shadow banking scale, defined as SHASCA.

2) Regulatory intensity

From the existing literature, there is very limited research done on how to measure the regulatory intensity of shadow banking activities in China. Based on the research paper available, the methods can be mainly divided into two categories. The first is to use the frequency of official documents issued by regulatory authorities as an indicator of shadow banking regulatory intensity, as done by Min and Wei (2015) . However, it is difficult to reflect the difference of regulatory intensity between different years only based on the number of documents issued each year, which can cause bias in later regression analysis. Another method is to measure regulatory intensity based on specific contents in the official documents. In the research of Sha and Jingjiang (2020), they have collected the policy documents and annual reports published by main Chinese financial regulators (PBOC, CBIRC, CSRC) from 2010 to 2020 and extracted shadow banking-related contents to conduct content analysis. They analyzed the content of these official documents and calculated the frequency of negative words related to shadow banking regulation. In this thesis, we use the number of negative words divided by total number of words in official documents issued by Chinese financial regulators as the indicator to represent regulation intensity of shadow banking, defined as RI. Please see the below figure for the value of RI across different years.

Year	Total number of words (K units)	Total number of negative words (units)	Negative words as % of total words	RI
2010	15.558	380	2.44%	2.44
2011	29.273	925	3.16%	3.16
2012	23.585	953	4.04%	4.04
2013	1.008	32	3.17%	3.17
2014	61.521	2227	3.62%	3.62
2015	8.732	140	1.60%	1.60
2016	24.114	1471	6.10%	6.10
2017	34.766	1189	3.42%	3.42
2018	37.567	1059	2.82%	2.82
2019	36.184	1411	3.90%	3.90
2020	28.563	1314	4.60%	4.60

Figure 8: Value of Regulatory Intensity from 2010 to 2020

7.1.3 Control Variables

In order to effectively identify the relationship between commercial banks' default risk and the scale and regulatory intensity of shadow banking, control variables need to reflect the characteristics of commercial banks. With reference to the relevant studies of previous scholars, we determine to take the following 4 indicators as the control variables in our empirical analysis, including EA (equity-to-asset ratio of commercial banks), NPLR (non-performing loan ratio of commercial banks), ROA (return on assets of commercial banks), and gTA (growth rate of total assets of commercial banks).

Below is an brief introduction to each of the control variables and an initial hypothesis of whether each control variable will be positively or negatively correlated to explained variable, which is the commercial bank's default risk in this case.

EA (equity-to-asset ratio): The ratio of shareholders' equity to total assets, which reflects the proportion of commercial banks' total assets that belong to its shareholders. It can hardly be determined whether EA will be positively or negatively correlated to the default risk of commercial bank. The sign needs to be tested during the regression analysis.

NPLR (non-performing loan ratio of commercial banks): NPLR refers to the proportion of non-performing loans to the total loan balance of financial institutions. Non-performing loans refer to the assessment of a bank's loan quality by classifying loans on a risk basis into five categories: normal, concern, subordinated, suspicious and loss, the latter three of which are collectively referred to as non-performing loans. It is assumed that the higher the NPLR is, the more bad loans one commercial bank will be exposed to, thus the higher default risk there could be. We assume that NPLR will be negatively correlated with our explained variable LnZ. (Since the higher commercial banks' default risk, the lower LnZ)

ROA (return on assets): Return on assets equals to Net profit divided by total assets. It is a measure of how much net profit is generated per unit of assets. Return on assets is one of the most widely used indicators of bank profitability in the industry, and the higher the indicator, the better the commercial bank's assets are utilized. Since shadow banking business is usually risky but also high profitable, we can assume that the higher ROA one commercial bank has, the more shadow banking business it may be engaged in, thus the higher default risk it may be exposed to. Following this logic, our initial hypothesis is ROA will be negatively correlated to LnZ.

gTA (growth rate of total assets): The ratio of total assets absolute growth to total assets at the beginning of the year, reflecting the growth of the bank's assets within that specific year. Similar to EA, it can hardly be determined whether gTA will be positively or negatively correlated to the default risk of commercial bank, which needs to be tested during the regression analysis.

7.2 Data collection and descriptive statistics

7.2.1 Data collection

In this thesis, we use the annual data of Chinese domestic commercial banks listed in China's A-share market (either in Shanghai Stock Exchange or Shenzhen Stock Exchange) from 2010 to 2020 as sample. Most of the financial accounts data used in empirical analysis are obtained from the official disclosed annual reports and financial statements of commercial banks. For a few banks that do not disclose the relevant financial performance in some years and thus we cannot obtain the relevant accounts data through financial statements, the following data sources are also used as supplement in order to build complete and accurate panel dataset.

It is worth pointing out that constructing the panel regression data set is a very time-consuming task. Currently there is no commercial bank data set available on any open-source platforms that can be directly used for regression analysis in this thesis. Therefore, at the early stage of writing this thesis, I set out to construct the sample data set needed for the regression analysis. At first, I intended to construct a data set consisting of 38 large Chinese commercial banks (based on the market value), but later found that the sample size of 38 commercial banks was too small and the final regression results were unrobust. Especially a small variance in control variable would have a huge impact on the final regression results. Therefore, after discussion with my thesis supervisors, we decided to include all 154 listed Chinese commercial banks in the sample, among which 8 banks were excluded in the construction of the data set due to the lack of relevant historical data. At the end there are 146 banks included in our sample data set for regression analysis.

For each bank's historical data of the past 10 years, the only approach to obtain the data is to look through the official website of the corresponding bank. Some large banks have already organized and summarized the historical data of the past 10 years on their official websites, which can be obtained directly through interactive dashboard, but some banks are poorly digitized and thus the data can only be found by going to the historical annual reports and financial reports year by year. After intensive data searching, I successfully built the sample data set we need for our empirical analysis. The whole process from the beginning to the final construction of the data set took nearly two months, and it can be said that the construction of the sample data set was the most time-consuming and labor intense task during the master thesis project.

Datasources:

1. China Banking and Insurance Regulatory Commission (CBIRC) bank database
2. Financial industry data from the National Bureau of Statistics of China
3. Wind public database
4. Straight flush database
5. CCER Sino finance database

Based on the above-mentioned database and the data accessibility for each single bank, 146 commercial banks are selected and could be divided into the following three categories.

Bank types in Sample dataset:

1. 6 national state-owned banks, e.g. Bank of China, Industrial and Commercial Bank of China, China Construction Bank, Bank of Communications of China, etc.
2. 12 large joint-stock banks, e.g. China Merchants Bank, Ping An Bank, Minsheng Bank, Pudong Development Bank, CITIC Bank, etc.
3. 128 large regional banks, e.g. Bank of Shanghai, Bank of Ningbo, Bank of Chengdu, Zheshang Bank, etc.

Note: Policy banks and rural credit cooperative banks are not included, since they do not offer wealth management business and are only engaged in interbank business at very limited scale. Including them into our regression analysis will cause bias so these two types of banks are not included in sample dataset.

7.2.2 Descriptive statistics

The table below shows the descriptive statistics for all the variables of the 146 listed Chinese commercial banks sample data.

Notes:

1) LnZ: the logarithm of Z-Score for one single commercial bank, measuring the default risk of that commercial bank
2) SHASCA: the scale of commercial banks' on-balance sheet shadow banking business
3) RI: regulatory intensity on shadow banking activities imposed by Chinese financial regulators
4) EA: equity-to-asset ratio of commercial banks
5) Gta: growth rate of total assets of commercial banks
6) NPLR: nonperforming loan ratio of commercial banks

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
LnZ	1,515	4.474	0.996	1.634	10.94
SHASCA	1,326	0.272	0.156	0	0.783
RI	1,705	3.534	1.122	1.600	6.100
EA	1,705	6.686	3.748	-1.377	46.34
Gta	1,705	20.18	30.72	-40.98	876.5
NPLR	1,705	1.231	1.225	0	28.44
ROA	1,705	0.865	0.548	-2.018	5.665
Number of Bank	146	146	146	146	146

Figure 9: Descriptive statistics

7) ROA: return on assets of commercial banks

The minimum value of LnZ is 1.634 and the maximum value is 10.94, with a standard deviation of 0.996. This is because the 146 selected banks are of different types, and each bank has a large variability in its operating scale, profitability, and asset and liability position, which results in considerable deviation for the default risk. In terms of the scale of commercial banks' on-balance sheet shadow banking business, the mean value is 27.2%, indicating that the average scale of the selected 146 banks' on-balance sheet shadow banking business is considerable. The standard deviation is 15.6%, which means there is a huge difference between different banks' on-balance sheet shadow banking assets, which may be due to the different risk preference and operating strategy of different types of banks. The minimum value of the regulatory intensity is 1.600 and the maximum value is 6.1, with a mean value of 3.534. The maximum value of equity-to-asset ratio is 46.34%, while the minimum value is -1.377%. For NPLR, the biggest is 28.44% and lowest 0%, which seems reasonable considering the CBIRC's strict regulation on commercial banks' non-performing loans, however, there still demonstrates huge difference across different banks. For the growth rate of total assets, the number differed greatly from each other with a mean value of 20.18%, a maximum value of 876.5% and a minimum value of -40.98%. Some banks even experienced negative growth, which indicates the insufficient performance of that single bank. For return on total assets, the highest value 5.665% and lowest value even shows negative ROA result, -2.018%, which means several banks have gone through profit loss in certain years. It happens only in regional banks, large state-owned banks and joint-stock banks generally maintained profitable performance throughout different years.

7.3 Panel data regression model and regression results

7.3.1 Panel regression model

In general, linear regression models based on cross-sectional data are quite suitable for common influencing factor analysis concerning individual difference. However, this approach ignores the special effects among individuals at different times, which can be complemented by time series data. Combining the advantages of time series and cross-sectional data and compensating for the shortcomings, panel data are widely used in quantitative economics research. Since panel data contain both cross-sectional and time-series information, using panel data to build econometric models will make the models more accurate and comprehensive. Therefore, this thesis uses panel data to build the regression model, with the purpose to investigate the correlation between default risk of commercial banks and the scale and regulatory intensity of shadow banking.

In this paper, we use classical static panel model with default risk of commercial banks as the explained variable on the left side of the equation and the explanatory and control variables are placed on the right side of the equation. Based on Hausman test result, we will determine whether using the fixed-effects or random-effects model.

The model is set as follows:

$$LnZ_{it} = \alpha_i + \beta_1 \mathrm{SHASCA}_{\mathrm{it}} + \beta_2 \mathrm{RI}_{it} + \beta_3 \mathrm{EA}_{it} + \beta_4 \mathrm{NPLR}_{it} + \beta_5 \mathrm{ROA}_{it} + \beta_6 \mathrm{gTA}_{it} + \varepsilon_{it}$$

Within the equation, α is defined as individual drift term, which reflects the influence of individual special effects on the regression model. β is set as parameters of explanatory variables. LnZ refers to the default risk of single commercial bank, as measured by Z-Score. SHASCA refers to the on-balance sheet shadow banking business scale of that single commercial bank. EA represents commercial banks' Equity-to-Asset ratio. NPLR is defined as non-performing loan rate, which is a good indicator for commercial banks' credit asset quality. ROA refers to return on assets, as indicator for banks' profitability. gTA refers to year-over-year growth rate of total asset for commercial bank. The notation of variables' subscripts is the value of the ith individual at time t. ϵ is set as the stochastic error term, which follows zero mean valued and homoscedasticity normal distribution.

7.3.2 Stata operation

In Stata, both fixed effect model and random effect model are implemented. Based on Hausman test result, we should choose fixed effect model instead of random effect model. The regression results of fixed effect model are shown in the figure below. For the results of random effect model and hausman test, please refer to the appendix.

Fixed effect model

	(1)
VARIABLES	LnZ
SHASCA	-0.867***
	(-2.89)
RI	0.030**
	(2.18)
EA	0.012
	(0.48)
Gta	-0.003***
	(-5.10)
NPLR	-0.074***
	(-3.16)
ROA	-0.009
	(-0.08)
Constant	4.708***
	(16.01)
Observations	1,281
Number of Bank	146
R-squared	0.042
Bank FE	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 10: Fixed effect model

Besides, a multi-collinearity test has been done to examine whether there exists potential multi-collinearity between explanatory variables and control variables. The correlation matrix is shown below, which indicates there is **no multi-collinearity** in the regression model.

Correlation Matrix

	LnZ	SHASCA	RI	EA	Gta	NPLR	ROA
LnZ	**1.0000**						
	0.0000						
SHASCA	**-0.1350**	**1.0000**					
	0.0000	0.0000					
RI	**0.0387**	**0.0407**	**1.0000**				
	0.0004	0.1454	0.0000				
EA	**0.0398**	**-0.0299**	**-0.0285**	**1.0000**			
	0.1541	0.2851	0.3076	0.0000			
Gta	**-0.1409**	**0.2516**	**-0.0132**	**-0.0192**	**1.0000**		
	0.0000	0.0000	0.6369	0.4922	0.0000		
NPLR	**-0.0672**	**-0.1036**	**0.0145**	**-0.0530**	**-0.1906**	**1.0000**	
	0.0162	0.0002	0.6048	0.0579	0.0000	0.0000	
ROA	**-0.0189**	**-0.0461**	**-0.0983**	**0.2156**	**0.0529**	**-0.3673**	**1.0000**
	0.4997	0.0988	0.0004	0.0000	0.0585	0.0000	0.0000

Figure 11: Correlation Matrix

7.3.3 Analysis of regression results

As mentioned in the previous chapters, our initial hypothesis that the default risk of commercial banks is positively correlated with the scale of shadow banking activities while negatively correlated with the regulatory intensity of shadow banking activities imposed by government. Now based on regression results, we could testify the hypothesis we made and decide to accept or reject it.

From the regression results, the regression coefficient of SHASCA is -0.867 and significant at the 1% level, indicating that the bigger the shadow banking size, the smaller the Z-value of commercial banks and the greater the default risk of commercial banks. Thus the default risks of commercial bank is positively correlated with the shadow banking scale. Next, the regression coefficient of RI is 0.030 and significant at the 5% level, which means that as the regulation intensity increases, the larger the Z-value of commercial banks and the default risk of commercial banks will decrease. So the default risks of commercial banks is negatively correlated with the regulation intensity of shadow banking business.

In terms of control variables, NPLR needs to draw our attention, since non-performing loans, as the core indicator of financial regulation for commercial banks, should have a significant impact on the default risk of commercial banks. According to the regression results, the regression coefficient of NLPR is -0.07 and significant at the 1% level, implying that an increase in the NPLR leads to a decrease in the Z-value of commercial banks and thus an increase in the default risk, so the regression results remain in line with the actual situation.

Based on the analysis above, we could accept our initial hypothesis that the default risk of commercial banks is positively correlated with the scale of shadow banking activities while negatively correlated with the regulatory intensity of shadow banking activities imposed by government.

8 Conclusions and reflections

8.1 Research Conclusion

Answer to main research question:

What is the relationship between the risk of commercial banks and the scale and regulatory intensity of shadow banking in China?

Through the qualitative deep dive on Chinese shadow banking system in chapters three to five, we can know that the main form of Chinese shadow banking system is commercial bank-centric shadow banking business, which entails conducting investment and financing activities through commercial banks' wealth management business and interbank business. The main purpose of Chinese shadow banking system is still to avoid regulation and realize regulatory arbitrage. The uncertainty of shadow banking business itself and the risks it will bring may cause volatility in the Chinese financial system, and in the worst case, may lead to systemic risk in Chinese financial system. Thus, from 2008 to the present, Chinese financial regulators have introduced a number of laws and regulatory measures to address the risks brought by shadow banking activities. In order to investigate the relationship between commercial banks' default risk and shadow banking scale and regulatory intensity, apart from qualitative analysis on the potential impact of shadow banking activities on commercial banks, this thesis also quantitatively analyzes the correlation between the above three factors by econometric methods. This thesis takes the data of 146 Chinese commercial banks as a sample, using the panel data from 2010 to 2020 to measure the scale of on-balance sheet shadow banking activities carried out by commercial banks. Besides, a new measure of regulatory intensity is applied in the empirical analysis. At the end, a quantitative panel regression analysis on the correlation between the default risk of commercial banks and the scale and regulatory intensity of Chinese shadow banking business is conducted. Now we can answer our main research question with the following conclusions:

1) The larger the scale of commercial banks' on-balance sheet shadow banking business, the greater the default risk of commercial banks.

2) The stronger the regulation intensity, the lower the default risk of commercial banks.

Answer to sub-questions:

1. How has the shadow banking business been developing in China?

So far, the Chinese shadow banking system has been developing into such a status that commercial banks play a central role in the whole shadow banking system with other important non-banking financial institutions involved in. In chapter three, a comprehensive introduction to the main components of Chinese shadow banking system is given, displaying an overall picture of what the Chinese shadow banking system consists of and how the banking and non-banking financial institutions operate under shadow banking system. Among the development trajectory, two key phases related to the rapid growth of Chinese shadow banking activities are identified in this thesis. The first phase is from 2008 to

2013, which is characterized by commercial banks' wealth management business through various passageways/channels with the final investment in non-standard assets. The second phase is starting from 2013 to present, when interbank business takes the dominant position and the funds raised from peer financial institutions end in standard assets via outsourcing investment. Both phases represent the prominent shadow banking operation model in Chinese financial system, which is commercial bank-centric shadow banking. The concrete operation model of Chinese commercial bank-centric shadow banking system will be explained in the second sub-question with more details.

2. How does the "commercial banking-centric" Chinese shadow banking system work? What's the mechanism?

In chapter 4, after investigating how Chinese shadow banking system operates around commercial banks and its underlying operation mechanism, we identified two main types of the commercial bank-centric shadow banking busines, namely commercial banks' wealth management business and interbank business, which is in line with the two different phases identified in chapter 3.

For commercial banks' wealth management business, it includes 3 major types of wealth management products, namely bank-trust wealth management cooperation, entrusted loan wealth management business and fund pool wealth management business. Within these 3 different types, commercial banks all take a centralized role while other non-banking institutions cooperate with commercial banks to facilitate the shadow banking business development. Either through bank-trust cooperation, entrusted loan or fund pooling, the essence is leveraging maturity mismatch to raise funds with low interest and then invest in higher-return products/activities so that commercial banks can obtain interest rate spreads and make profits during the process.

For interbank business, the reason why it developed so rapidly is that Chinese financial regulators imposed strong regulation on commercial banks' wealth management business after 2013.Different from wealth management business, interbank business, including interbank deposits, interbank borrowing and lending, etc., are reflected on commercial banks' balance sheet. However, the interbank business mentioned above is not counted as the credit asset (or loans issued by commercial banks). Thus, the commercial banks are using it as the best solution to reduce credit asset scale on balance sheet, and then consequently reduce capital occupancy rate with the final purpose to avoid regulation while generating profits through interbank business.

3. What is the correlation between the risk of default of commercial banks and the scale and regulatory intensity of shadow banking in China from a quantitative perspective?

As demonstrated by the regression results in chapter 7.3.2, the risk of default of commercial banks is **positively** correlated to the scale of commercial banks' on-balance sheet shadow banking business, while **negatively** correlated to the regulatory intensity imposed by Chinese financial regulators.

8.2 Recommendation for Chinese shadow banking regulations

Based on the previous analysis in Chapter 6, we can see that the regulation of shadow banking in China is still mainly focused on specific types of shadow banking business itself (e.g. commercial banks' wealth management business, interbank business, etc.), and there are not many measures in place to address the information disclosure mechanism of the shadow banking system as a whole and potential innovations of financial instruments in the future. However, from a holistic perspective, these two items are key to the regulation of shadow banking. Based on the analysis in the previous sections, we know that a very distinctive characteristic of shadow banking is information asymmetry/information opacity. For example, many commercial banks transfer funds from traditional credit loan business to off-balance sheet through various operations (wealth management business or interbank business), and this information opacity poses great challenges to financial regulators.

At the same time, the main business forms of Chinese shadow banking activities are commercial banks' wealth management business and interbank business, but as regulators continue to tighten the constraints on these two businesses, commercial banks are bound to develop new types of shadow banking business in the future in order to obtain higher profits. It is reasonable to assume that, with the maturity and rapid development of Chinese financial industry, commercial banks are very likely to follow the trajectory of the United States shadow banking system and innovate in asset securitization and financial derivatives in the near future as new forms of shadow banking activities. Therefore, the awareness of prevention of new types of shadow banking business is also crucial for its regulation. Based on the above reasons, combining the analysis conducted in the previous chapters, this thesis would propose the following recommendations to Chinese financial regulators:

8.2.1 Strengthen the information disclosure mechanism of Chinese shadow banking system

Commercial banks have moved their business to off-balance sheet by releasing credit assets on their balance sheets, which makes the risks of commercial banks more hidden and the regulators do not have enough information about the existing risks. When compiling the sample data, the author found that there are problems of vague and incomplete information on on-balance sheet shadow business, which are not disclosed by commercial banks. E.g. some banks did not disclose their available-for-sale financial assets financial accounts in their balance sheet while others did not disclose investment in receivables financial accounts. By checking the annual report data of commercial banks, there are few data about shadow banking, which is not conducive to accurate regulation and makes it difficult for regulators to effectively prevent systemic risks in advance. According to the above-mentioned problems, regulatory authorities should urge commercial banks to make public and disclose information about their shadow banking activities.

In order to strengthen the information disclosure of the shadow banking system, a kind of information disclosure and monitoring mechanism could be established. Specifically, each financial institution (especially banking institutions) should promote the disclosure and transparency of shadow banking assets under a standardized information disclosure process as requested by the financial regulators. Meanwhile, a digital real-time information disclosure platform related to shadow banking should be gradually established based on the current data and statistics of the financial industry, covering all financial institutions' shadow banking business in an all-round manner. Besides, the regulators could also establish a risk prevention mechanism based on this real-time information disclosure and monitoring platform, once the data on the platforms signals potential risk of default, the regulators could respond in time and interfere into the unregulated shadow banking activities, so that the risks can be under control as soon as possible and be prevented from transferring across financial institutions.

8.2.2 Improve capabilities to deal with new types of shadow banking innovation

One of the motives for shadow banking business is regulatory arbitrage. With the increasing regulation of shadow banking by regulatory authorities, the space for regulatory arbitrage of traditional shadow banking business has been continuously compressed, and it is difficult for financial institutions to use the previous operating model to make extra profits. Along with the stronger regulation intensity, there will absolutely be new types of shadow banking business emerging, replacing the previous business type and operation model. One good example is the emergence of interbank business after the strong regulation on wealth management products after 2013. (Zhe et al., 2017a) Now since Chinese regulators already imposed many regulatory measures on interbank business, it is reasonable to assume that in the future new types of shadow banking will occur, for example, asset securitization business, or even more risky financial derivatives with higher complexity and more nested structures. Thus in order to deal with the changing shadow banking business model innovation, Chinese financial regulators should keep up with the major trends in financial market and develop corresponding agile capabilities to address this kind of risky shadow banking innovation.

8.2.3 Strengthening financial regulation should be accompanied by prudent assessment of possible risks

In the process of issuing and implementing regulatory policies, banks may be under certain operating pressure, especially for small and medium-sized banks, where regulatory policies are too strong and will be even more likely to exacerbate the operating risks of these small and medium-sized banks. Based on this fact, financial regulation should be carried out step by step and divided into different stages, which will enable banks' own adjustment to these new regulatory policies and effectively prevent them from falling into operational difficulties. At the same time, because different types of banks have their own unique development characteristics, appropriate regulatory policies should be formulated according to their different characteristics, so that regulatory policies are both effectively targeted and differentiated. As the scale of shadow banking business in China expands year by year, regulations are being introduced in an orderly manner. In 2018, new regulations on asset management and wealth management were introduced one after another, indicating the continuous tightening of financial regulation by government. (Haiyan et al., 2018) However, after the introduction of these regulations, the growth rate of social finance in 2018 has experienced downturn, which has triggered concerns from all sectors of Chinese society. (Gui and Hui, 2018) Therefore, when regulatory authorities formulate and implement new regulatory policies, they should not only take into account the effects expected to be brought by regulatory policies, but also the affordability of commercial banks and the possible (negative) impacts on macro economy. The possible risks should be prudently assessed while strengthening financial regulation.

8.3 Reflections

8.3.1 Strong points in the research method of this thesis

Multi-variable consideration

This paper investigates the correlation between shadow banking business scale, regulation intensity and the risk of default of commercial banks, taking both the impacts of the shadow banking business scale and regulatory intensity on the default risks of commercial banks into consideration simultaneously. While most of the existing research only investigates either the correlation between shadow banking business scale and default risks of commercial banks or the correlation between the regulatory intensity and the default risks of commercial banks. The research conducted in this thesis provide a more comprehensive view to the intrinsic impacts caused by shadow banking business and the corresponding regulation.

Qualitative analysis combined with quantitative empirical analysis

In the thesis, first a qualitative analysis on the whole picture of Chinese shadow banking system is conducted, which helps understand how the Chinese shadow banking system works, the potential risks it may bring to the whole financial system as well as the mechanism how these risks can be created and transmitted. Then based on qualitative analysis, we formulate an initial hypothesis on the correlation between the default risk of commercial banks and the scale and regulatory intensity of shadow banking. Through econometric method, we could testify our initial hypothesis with empirical data, drawing the final conclusion based on the quantitative analysis results. Therefore, in this thesis, a close loop of whole research process is formed and thus the final conclusion is concluded with robustness and validity.

8.3.2 Weak points in the research method of this thesis

Only taking on-balance sheet shadow banking business into consideration

During the empirical analysis, a micro-perspective approach is selected to estimate the scale of Chinese commercial banks' shadow banking business, namely using the balance sheets of commercial banks as starting point, taking on-balance sheet financial accounts into consideration. In the thesis, though referring to the previous work conducted by different scholars, we have included five accounting items in commercial banks' balance sheet to represent the scale of shadow banking activities (while most of the current work only includes three to four items). However, the off-balance sheet shadow banking business conducted by commercial banks are not included when measuring the shadow banking business scale. One outstanding item is commercial banks' off-balance sheet wealth management products. In the fourth chapter we have already discussed the Commercial bank-centric shadow banking business and its operation model. One of the key pillars is wealth management products/services conducted by commercial banks. However, due to the low information transparency related to the closure of commercial banks' off-balance sheet wealth management products business scale, it is extremely difficult to estimate this part of shadow banking business. Thus in the empirical analysis part, the off-balance sheet wealth management products are excluded from the calculation of shadow banking business scale, which is supposed to be an important part of commercial banks' shadow banking business.

Data credibility

Though in the thesis, the data used in Chapter Six empirical analysis come from the annual reports of Chinese domestic commercial banks listed in China's A-share market as well as the following official data sources owned by either Chinese government or authority organization, including China Banking and Insurance Regulatory Commission (CBIRC) bank database, Financial industry data from the National Bureau of Statistics of China, Wind public database, Straight flush database and CCER Sino finance database. The data are regarded as creditable since all the data should be audited by accountancy before publishing. However, due to the intrinsic characteristics of Chinese society and financial system, Chinese commercial banks tend to have the propensity to fake the data in their annual reports, in order to meet the regulation requirements posed by Chinese financial regulators and also satisfy their shareholders. It's already not latest news that Chinese commercial banks will forge their business performance, especially the amount of outstanding loans and non-performing loans.

A good example for this fraud behaviors is the bankruptcy of Baoshang Bank.[2], from which it is clearly shown that Chinese commercial banks will whitewash their financial state-

[2]On May 24, 2019, Baoshang Bank was jointly taken over by the People's Bank of China and the China Banking and Insurance Regulatory Commission due to serious credit risks. It was the first time in the history of Chinese financial system that a commercial bank went bankrupt and thus was taken over by the central bank. As for the reasons for the bankruptcy of Baoshang Bank, according to the report issued by its auditors, it was mainly due to the existence of a large number of non-performing loans that could not be recovered and eventually it became seriously insolvent. However, before this matter was exposed by the media, Baoshang Bank's annual reports had always shown adequate performance, and the information disclosed in the annual reports was also in line with the requirements of financial regulation. However, after a third-party auditor entered the investigation, it was found that Baoshang Bank had deliberately concealed the amount of non-performing loans and disguised the actual number of non-performing loans through other means such as interbank borrowing and shareholders' contributions, which eventually led to the exposure of its fraudulent practice due to the breakage of its capital chain. As one of the many commercial banks in China, Baoshang Bank was once in the top tier of Chinese commercial banks with a total asset size of more than RMB 430 billion.

ments, especially their balance sheets, when disclosing their financial performance disclosures with the purpose of avoid regulation. Given this fact, even though the sources of the data used in the empirical analysis part of this thesis is not in question, we still need to be skeptical about the data credibility.

8.3.3 Reflections on selection and operationlization of variables

Explained variables

1) Default risk of single commercial bank

In this thesis, we use Z-Score to measure the default risk of single commercial bank. Z-score is constructed as the sum of the average return on assets (ROA) and the average equity-to-assets ratio (EA), divided by the standard deviation of the return on assets. In our regression analysis, we choose the most common used three-year rolling number to calculate the Z-Score, and then take the logarithm LnZ as the explained variable. However, this approach may cause bias. As demonstrated in many previous research, the effectiveness of Z-score in measuring risk can be highly sensitive to how many years are taken into consideration when calculating the Z-Score, which means when taking different number of years to calculate the Z-Score, the final results (the default risk of one single commercial bank in different years) can show a different trend along with the time. (Chiaramonte et al., 2015; Laura et al., 2016) For example, here in our regression analysis we calculate the Z-score based on data of 3-year backward looking. When we calculate it with 5-year backward looking data, then the year when default risk is maximum or minimum could be different from previous results. Therefore, although currently in the academic world Z-Score is quite popular to be used as the measurement of commercial bank's default risk, there is still limitation when constructing z-score as the indicator.

Explanatory variables

1) The scale of shadow banking business conducted by commercial banks

As mentioned above, off-balance sheet shadow banking business conducted by commercial banks, represented by wealth management business that has been discussed in chapter 4, plays an important role in the total shadow banking business scale of commercial banks. However, when calculating the scale of shadow banking business conducted by commercial banks, off-balance sheet shadow banking business is not taken into consideration, given the fact that most commercial banks do not disclose their off-balance sheet business in their annual reports or financial statements, which greatly increases the difficulty to access the data. Thus in our regression analysis, only on-balance sheet shadow banking business scale are counted, which can be directly calculated from commercial banks' balance sheet.

2) Regulatory intensity

As stated in chapter 2 and chapter 7, there is very limited existing research done on how to measure the regulatory intensity of shadow banking activities in China. In this master thesis, we followed the approach of Sun Sha and Chang Jingjiang (2020), taking the number of negative words divided by total number of words in official documents issued by Chinese financial regulators as the indicator for regulation intensity of shadow banking. To a certain degree, this variable can represent how strong the government regulate shadow banking activities. However, this approach of operationlizing the regulator intensity can cause bias, since it only depends on the percentage of negative words as total number of words in government document, not considering the concrete measures the government is taking or the regulation level initiated by regulators. For example, in some government documents, it says "This type of business is not recommended" while in other documents there are much stronger words such as "prohibited or banned". In the approach taken in this thesis, we did not distinguish different levels of regulatory intensity conveyed in the documents. Thus the "Regulatory intensity" used in this thesis is accurate only at a certain level.

Control variables

In this thesis, four control variables are taken into consideration when building the regression model, that is EA (equity-to-asset ratio of commercial banks), NPLR (nonperforming loan ratio of commercial banks), ROA (return on assets of commercial banks), and gTA (growth rate of total assets of commercial banks). When looking into other scholars' empirical analysis, some other variables are also included in the regression analysis, e.g. the real GDP growth to represent the macro economy status, capital adequacy ratio to represent the commercial bank's capital structure, and loan-to-deposit ratio to represent the credit asset scale of commercial banks. Given more time, these control variables could be also considered in regression model for further exploration.

8.4 Possible future research directions

8.4.1 Expanding the scope into off-balance sheet shadow banking business

As mentioned above, off-balance sheet shadow banking business conducted by commercial banks could play an important role in the total shadow banking business scale of commercial banks, thus could impact the empirical analysis results if taking it into consideration. Given more time, the author should further research into the off-balance sheet shadow banking business, especially the wealth management business conducted by commercial banks, so that a more comprehensive empirical analysis could be done.

8.4.2 More accurate measurement of regulatory intensity using Delphi Method

As discussed in the section above, our current indicators for regulatory intensity is calculated as the number of negative words divided by total number of words in official documents issued by Chinese financial regulators. Since this method only considers the number of negative words, not taking into account the concrete measures or context conveyed in the office documents, it can cause bias. In academic world, when dealing with this kind of variable which is hard to quantitatively measure, Delphi method is quite commonly used to form an efficient and valid estimation.

The Delphi method, also known as the expert survey method, is a process of asking a panel of experts to reach a consensus opinion or decision. Experts respond to several rounds of questionnaires, and after each round, the experts' opinions are collected, summarized, tallied, and then anonymously fed back to the experts, who are again asked for their opinions, and so on and so forth, until a consensus is reached. (Okoli and Pawlowski, 2004)

Through Delphi method, the regulatory intensity of different years could be compared more fairly, not purely determined by the amount of negative words, but taking expert's view towards the regulation, specific context and key messages conveyed in the regulation documents into consideration. Therefore, it would be a better approach to form the indicator for regulatory intensity. However, considering the time constraints of this master thesis project, 22-23 weeks is not enough to conduct the Delphi method. As the next step for this thesis project, if given more time, Delphi method should be implemented in order to obtain a better estimate of the regulatory intensity.

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A Appendix

Random effect model

	(1)
VARIABLES	LnZ
SHASCA	-0.825***
	(-3.23)
RI	0.029**
	(2.13)
EA	0.016
	(0.76)
Gta	-0.003***
	(-4.84)
NPLR	-0.082***
	(-3.95)
ROA	-0.060
	(-0.63)
Constant	4.724***
	(18.31)
Observations	1,281
Number of Bank	146
Bank RE	YES

Robust z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 12: Random effect model

Hausman Test

	(1)	(2)
VARIABLES	RE	FE
SHASCA	-0.825***	-0.867***
	(0.200)	(0.220)
RI	0.029	0.030
	(0.021)	(0.021)
EA	0.016	0.012
	(0.010)	(0.011)
Gta	-0.003***	-0.003***
	(0.001)	(0.001)
NPLR	-0.082***	-0.074***
	(0.024)	(0.025)
ROA	-0.060	-0.009
	(0.067)	(0.072)
Constant	4.724***	4.708***
	(0.157)	(0.161)
Observations	1,281	1,281
R-squared		0.042
Number of Bank	146	146
Hausman		8.726
p-value		0.190

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 13: Hausman test