Non-performing Loans and its Impacts on Systemic Risk
of Commercial Banks in China

by

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Abstract

Although China has undertaken a series of comprehensive reforms to improve the performance of financial institutions and the healthiness of overall banking system, the past five years have witnessed a rising trend of systemic risk at commercial bank level, as well as the worsening of non-performing loan condition. According to the statements provided by China Banking Regulatory Commission, the non-performing loan (NPL) ratio of Chinese commercial banks stood at 1.74% at the end of 2016, with total commercial bank NPLs amounting to RMB 1.51 trillion, a striking increase of RMB 18.3 billion over the previous period.[1] This paper investigates into NPLs and systemic risk, and examines the effects of non-performing loans on the systemic risk of commercial banks in China. The nature of the topic indicates the use of both historical and empirical analyses of bank risk performance in the past decade. The research provides evidence on the significant impact non-performing loans have on systemic risk. The paper also proposes possible suggestions on systemic risk management, such as controlling the bank size, enforcing information transparency and hardening the budget constraints to relevant government units.

Keywords: Chinese banking system, non-performing loans, systemic risk, financial risk management

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[1] Information on Development of the Banking Industry in 2016, January 25, 2017, accessed May 10, 2017, http://www.cbrc.gov.cn/chinese/home/docView/4EB1977DC86C4C1EBB0AF8C7BFF03D10.html.

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Introduction

The 2008 Financial Crisis has proven that failures of financial institutions are easy and fast to spread in global market, bringing enormous damage to the world economy. Firms in general tend to focus on short-term risks rather than long-term risks and the cross-impact between institutions, which serves as one of the main contributors to increasing fluctuation of economic cycle. After the crisis, regulators and policy makers began to pay more attention to assessing the systemic risk of financial institutions and taking preventive actions to minimize economic losses during the downturn.

As the second largest economy in the world, China has a bank-oriented financial structure, so the banking sector has always been the target of major financial reforms in the past two decades. In the late 1980s, deficient financial regulatory system and low efficiency of state-owned enterprises led to a serious non-performing loan (NPL) crisis nationwide. After several transformations, the average NPL ratio of Chinese commercial banks dropped from nearly 25% to less than 2%. However, various sources indicate that NPLs at bank level are rising again, particularly after the Chinese stock market crash in 2015. Meanwhile, China's systemic risk continues its upward tendency along with the expansion of economy size, shown in **Figure-1**. [2]
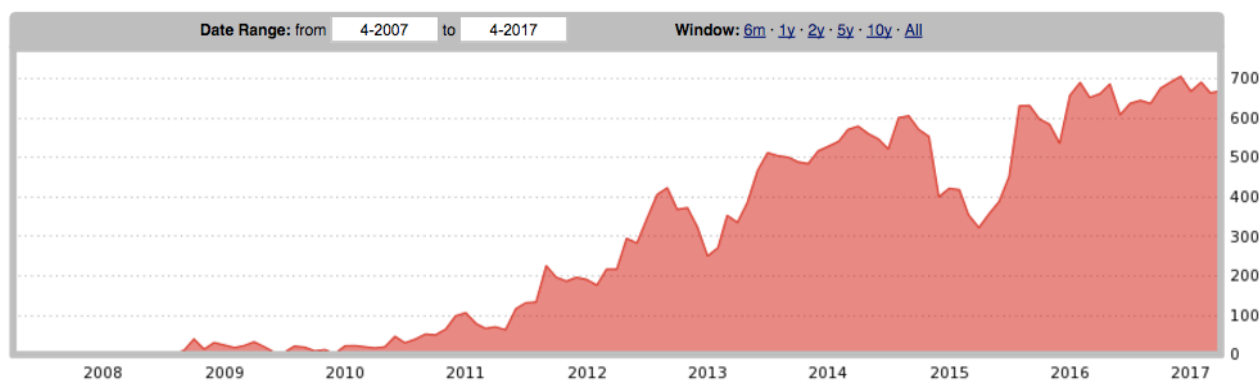
[Figure-1: Risk Analysis Overview – China Financial Total SRISK (US$ billion)]

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[2] NYU Stern | Volatility Institute. Accessed May 10, 2017. https://vlab.stern.nyu.edu/.

By 2016, China has the largest systemic risk volume (over US $700 billion) among all countries, more than twice the size of the United States, which is the biggest economy in the world. It ranks the seventh and the only developing country among the top 10 countries with the highest SRISK/GDP ratio worldwide (**Figure-2**).[3]
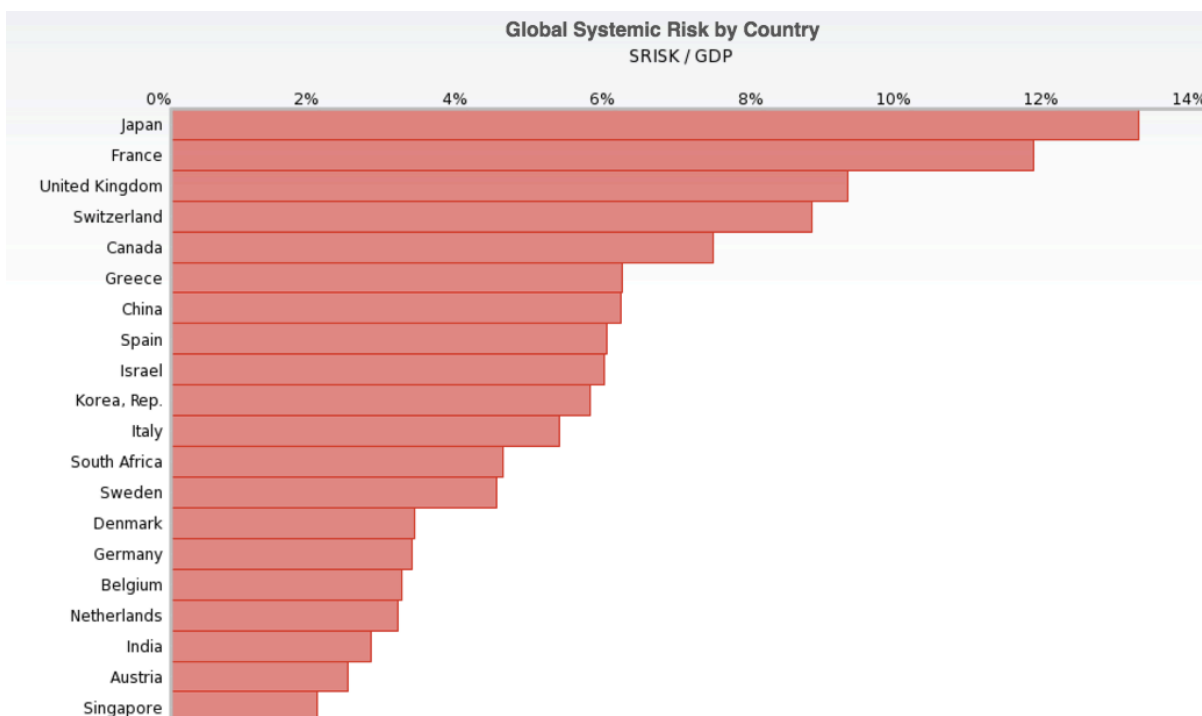
[Figure-2: Global Systemic Risk by Country – SRISK/GDP]

Why is Chinese banking system becoming more and more risky? What are the factors that contribute to the increase of systemic risk? Is NPLs still one of the most crucial problems in Chinese banking sector? How does NPLs impact the banking industry? To address the questions above, this paper takes a closer look at the NPL condition at Chinese Commercial banks and examines its impact on systemic risk. The paper identifies NPLs as a major driving force of rising systemic risk in China based on empirical study results.

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[3] NYU Stern | Volatility Institute. Accessed May 10, 2017. https://vlab.stern.nyu.edu/.

The paper consists of four sections. Section I gives a brief overview of the structure of Chinese banking industry, the history of NPL problem in China and its current performance. Section II introduces what systemic risk is and analyzes the performance of major Chinese commercial banks. Section III explains the negative impact NPLs has on systemic risk through econometric approach. It applies the quantifying method of systemic risk developed by Brownlees & Engle (2012), and then discusses potential components that affect the SRISK performance of individual institutions or industry. [4] Section IV concludes the studies by giving possible suggestions on financial risk management.

Section I: The Non-Performing Loans Issue in China

Definition

Non-performing Loans (NPLs) refers to the amount of money borrowed upon which the debtor has not made scheduled payments for a certain time period, while detailed definitions may vary from countries to countries. China used to categorize NPLs into three separate types of loans: overdue loans, idle loans, and bad loans, which in total are referred as "One Overdue, Two Bad". However, this measurement was not specific enough for regulators to monitor bank performance properly. Starting from 1998, People's Bank of China introduced the five-tier classification of loans to assess the possibilities of loan loss based on borrowers' repayment ability. Under this system, bank loans are classified into the performing (0%), watch-list (5%), substandard (30-50%), doubtful (50-75%) and loss (75-100%) categories, and the last three are

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[4] Brownlees, Christian T., and Robert F. Engle.(2012). "Volatility, Correlation and Tails for Systemic Risk Measurement." SSRN Electronic Journal. doi:10.2139/ssrn.1611229.

considered as NPLs.[5] The amount of NPLs is a strong indicator of financial stability and the risks associated with the financial infrastructure of an economy.

History of Banking reform and loan growth

In 1978, China started its privatization under the policy of "Reform and Opening Up", but its banking sector did not start large-scale reform until the Asian Financial Crisis took place in 1997. The reform process began with the initial institutional restructuring in 1980s, followed by the establishment of four large state-owned commercial banks (SOCBs) from mid 1980s to 1990s. SOCBs experienced further reforms from 1990s till 2003, when the ownership reform and foreign holding were introduced.[6]

In the 1980s, China experienced substantial economic growth led by relatively aggressive political and regulatory shifts. To support the growth of state-owned enterprises (SOEs), the state designated four state-owned banks to make loans to SOEs despite huge risks of loan losses. Thus, when the economy gradually slowed down in the late 1980s, non-performing loans drastically increased. Meanwhile, China did not have mature loan rating and financial monitoring system at all back then. Thus, NPLs in China went out of control, with NPL ratio exceeding 25% by the end of 1998.

With the objective of transforming banks into healthy and market-functioning financial institutions, the State Council approved the establishment of four asset management companies (AMCs) in 1999 to carve out massive bad debts in "Big Four" banks. The four AMCs, namely Changcheng ("Great Wall"), Dongfang ("Orient"), Huarong, and Xinda ("Cinda"), were funded

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[5] Guidelines on Risk-Based Loan Classification 贷款风险分类指导原则. December 19, 2001. Accessed May 10, 2017. http://www.pbc.gov.cn/bangongting/135485/135495/135499/2873461/index.html.
[6] Liang, Qi, Pisun Xu, and Pornsit Jiraporn. "Board Characteristics and Chinese Bank Performance." *Journal of Banking & Finance*, 2013, 2953-968.

by a group of government institutions to purchase NPLs from its banks and manage NPLs

through debt equity swaps, auction and bids, etc.[7] Meanwhile, foreign capital could enter

Chinese banking sector since 1999, mainly through either equity injection or establishment of

shareholdings in commercial banks.[8] Furthermore, the Ministry of Finance founded Central

Huijin Investment Company in 2003 to inject new capitals into four SOCBs. After

reconstructuring and refinancing, four SOCBs went public and shareholding system was built up.

After tremendous efforts, Chinese NPLs have dropped from ¼ of the total loans to 1%, and have

steadily maintained at this low range since 2010 (**Figure-3**).[9]

Bank nonperforming loans to total gross loans (%)
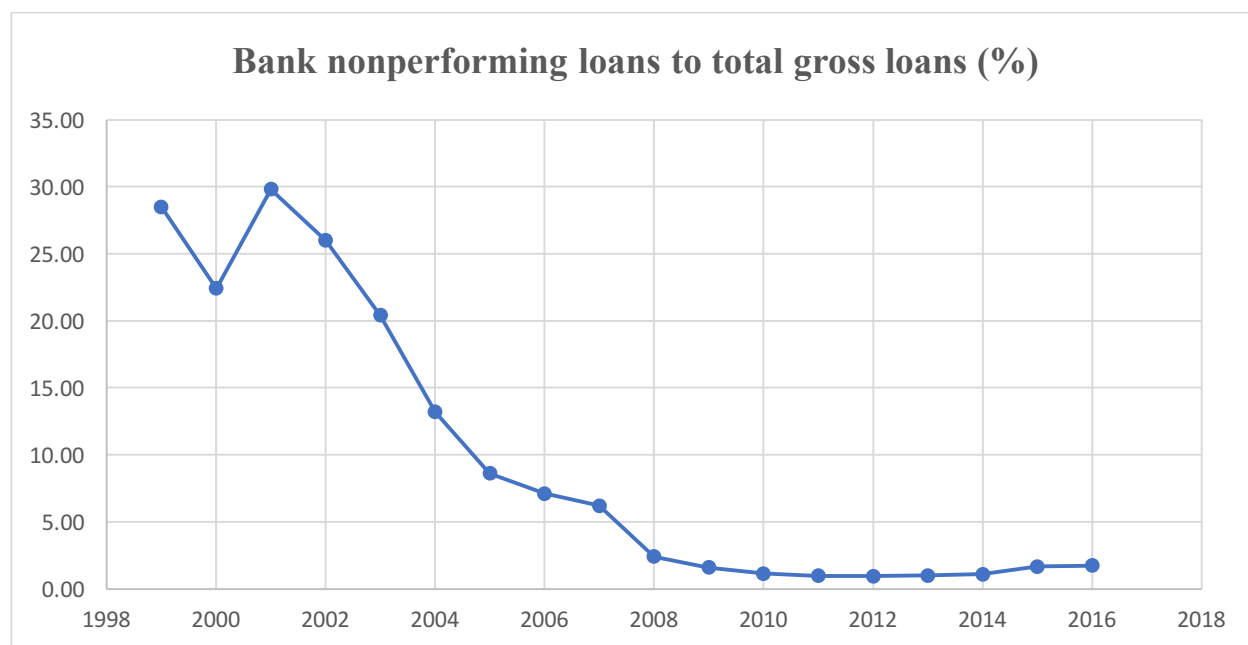
[Figure-3: Bank nonperforming loans to total gross loans (%)]

Comparing to two decades ago, the NPL condition has improved, due to strong banking

reforms and policy interventions. However, it does not necessarily mean the goal of financial

stability and low systemic risk has been achieved. Considering China's massive economy size,

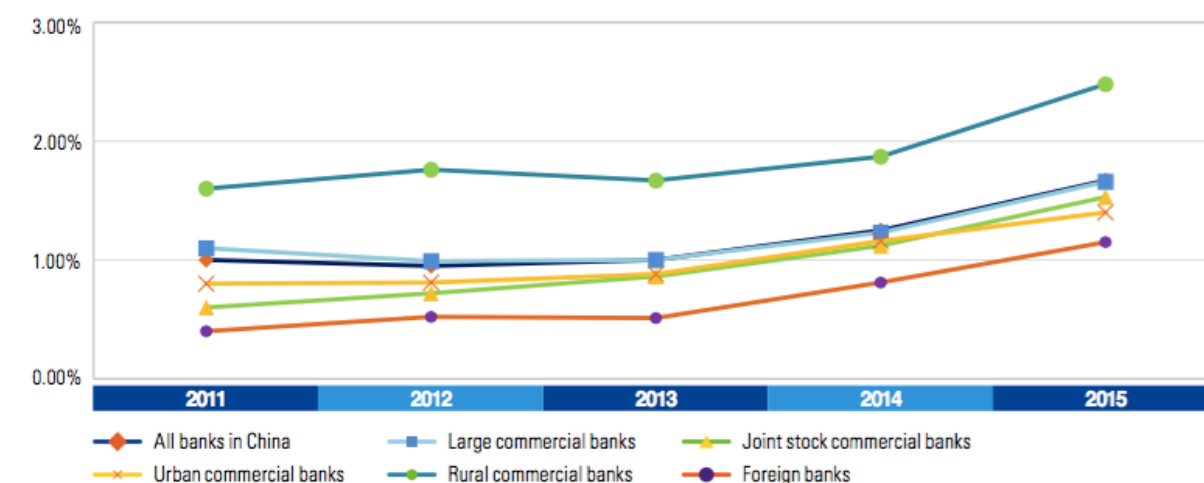[7] Kossof, Paul. "China's Non-Performing Loans: History, Current Infrastructure, and the Future of Bad Debt in China*." International Journal of Law and Legal Jurisprudence Studies*, 2014.
[8] Chen, Chien-Hsun, Chao-Cheng Mai, Yu-Lin Liu, and Shin-Ying Mai. "Privatization and Optimal Share Release in the Chinese Banking Industry." *Economic Modelling*, 2009, 1161-171.
[9] Wind Terminal. Accessed May 10, 2017.

one percent of total NPLs equals approximately 100 billion USD. As the global economy

weakened again and that the Chinese artificial bull market began to crash in June 2015, financial

risk exposure enlarged. The NPL ratios at Chinese commercial banks all climbed up, surpassing

the 1% red line in late 2015 (**Figure-4**).[10] The total volume of NPLs at Chinese commercial

lenders hit RMB 1.44 trillion (US $217 billion) at the end of the second quarter in 2016, the

highest since 2005, based on CBRC data.[11]

[Figure-4: Commercial banks' non-performing loan ratio]

Section II: Systemic Risk of Commercial Banks and its Determinants

Definition

   Banks face a variety of risks such as credit risk, market risk, and interest rate risk. Those

risk performances, closed linked to bank's overall strategy and policies at macro level, have

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[10] Mainland China Banking Survey 2016. Report. September 19, 2016. Accessed May 10, 2017.
https://home.kpmg.com/cn/en/home/insights/2016/09/mainland-china-banking-survey-2016.html.
[11] The CBRC Released Supervisory Statistics of Q2 2016. August 10, 2016. Accessed May 10, 2017,
http://www.cbrc.gov.cn/EngdocView.do?docID=3571A52E75C0447ABDDF05E1DECFF3FB

profound impacts on future growth and stability of the financial sector. The increase of risk

measurement at individual bank levels would lead to the rise of systemic risk at the industry level.

Sometimes, the risk of individual institutions can also be viewed as systemic risk if they are "too

big to fail".

In general, systemic risk refers to an event that could trigger the collapse of an industry or

economy. Adrian and Brunnemeier (2011) identifies how systemic risk builds up in the credit

boom period when the market is over-optimistic about the risk level, and how it amplifies the

damage to the economy during crisis, namely the spillover effect.[12] Danielsson, Shin and Zigrand

(2013) defines systemic risk as the aggregation of the risk of market volatility from major market

participants, while Patro, Qi, and Sun (2013) views systemic risk as the probability of a large-

scale breakdown of the financial system caused by some systemic event such as the bankruptcy

of large financial institutions.[13]

Systemic risk does not equal the sum of individual risks, because the latter does not take

into account risks associated with portfolio activities between financial institutions, which may

cause destructive pro-cyclicality and high correlation of asset returns that aggrandizes economic

shocks and disturbs macroeconomic policies (BCBS, 2011).[14] The domino effect of financial

institutions failing down in the 2008 Financial Crisis is a classic example. We should also be

aware that systemic risk is completely different from systematic risk, because the latter is about

the overall market risk, which cannot be reduced through diversification.

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[12] Adrian, T. & Brunnermeier, M. (2011). CoVaR (No. 348). Federal Reserve Bank of New York.
[13] Danielsson, J., Shin, H., Zigrand, J. (2013). Endogenous and Systemic risk. In J. Haubrich & Lo (Eds.), Quantifying systemic risk. *Chicago, IL: University of Chicago Press.*
 Patro, D. K., Qi, M., Sun, X. (2013). A Simple Indicator of Systemic Risk. *Journal of Financial Stability.*
[14] Messages from the Academic Literature on Risk Measurement for the Trading Book (Working Paper No. 19). Bank for International Settlement. 31 January 2011. Accessed May 10, 2017, http://www.bis.org/publ/bcbs_wp19.pdf

Calculation method

In my research, I adopted the "capital shortfall" approach by Acharya, Engle, and Richardson (2012).[15] This method emphasizes the bank's contribution to the overall financial failure rather than their individual failures. SRISK is defined as "the capital that a firm is expected to need if we have another financial crisis", its symbolic form shown below as:

$$SRISK_{i,t} = E_{t-1}(Capital\ Shortfall_i|\ Crisis)$$

SRISK seeks to measure how much capital a bank will need to avoid insolvency in a financial crisis scenario. It uses accounting data on liabilities, market data on equities and the volatility of equity. The way to calculate it is:

$$SRISK_{i,t} = E((k(Debt + Equity) - Equity)|Crisis) = kDebt_{i,t} - (1-k)(1-LRMES_{i,t}) \times Equity_{i,t}$$

- *k* represents capital ratio of a firm, which is by default 8% for China.

- *debt* refers to the book value of a firm's debt

- *equity* refers to the market value of a firm's equity on a daily basis

- *LRMES* refers to Long Run Marginal Expected Shortfall, i.e., the expected loss/ average return of the firm's equity value in a crisis. It used to be approximated as $1 - e^{-18 \times MES}$, where MES is the daily expected loss if the market returns are below -2%. But later it was refined as $1 - e^{log(1-d) \times \beta}$, where d is the crisis definition, i.e. the market index

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[15] Acharya, V., Engle, R., & Richardson, M. (2012). Capital Shortfall: A New Approach to Ranking and Regulating Systemic Risks. *American Economic Review*, 102 (3), 59–64.

drops by 40% in 6 months; beta value is obtained through Professor Robert Engle's

Dynamic Conditional Beta model.[16]

The percentage of SRISK of the firm to aggregate amount can better illustrate its significance

level of impact on the entire industry sector:

$$SRISK\%_{i,t} = SRISK_{i,t} \div \sum_{j \in J} SRISK_{j,t} \, , \, J = \{\text{firms with positive SRISK}\}$$

SRISK Distribution in Chinese Banking Sector
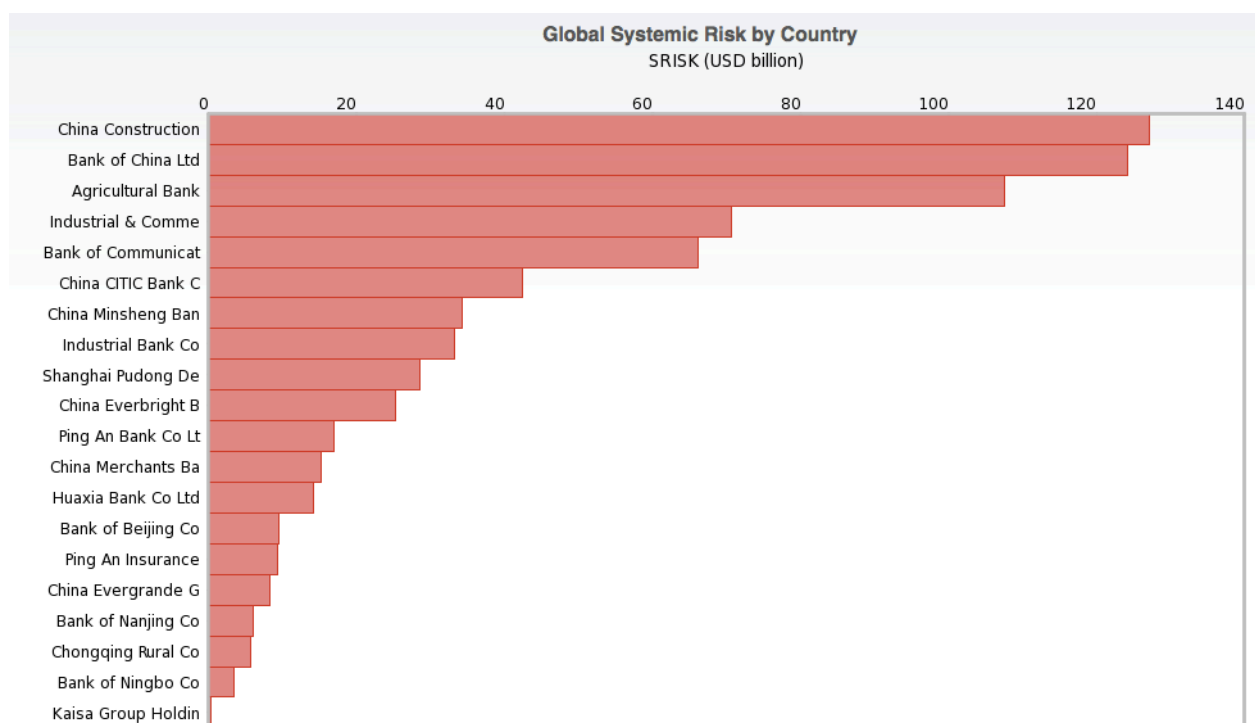
[Figure-5: Global Systemic Risk by Country SRISK - China]

If we look at the SRISK distribution at individual financial institutions in China (**Figure-5**),

adjusted by market capitalization, SOCBs have significantly higher systemic risk than other

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[16] Engle, Robert F. "Dynamic Conditional Beta." SSRN Electronic Journal, February 27, 2014. Accessed May 10, 2017. doi:10.2139/ssrn.2084872.

commercial banks, with over US $490 billion aggregate systemic risk amount, which takes up more than two-thirds of the systemic risk of the entire banking industry.[17]

Section III: Empirical Study

Data Collection

I used the quarterly financial data of 16 listed Chinese commercial banks from Q1 2007 to Q4 2016, including 1) 5 state-owned commercial banks: Bank of China Ltd, China Construction Bank Ltd, Industrial & Commercial Bank of China Ltd, Bank of Communications Ltd, and Agricultural Bank of China Ltd; 2) 8 joint-stock commercial banks: China CITIC Bank Ltd, China Everbright Bank Ltd, Huaxia Bank Ltd, China Minsheng Banking Corp Ltd, China Merchants Bank Ltd, Industrial Bank Ltd, Ping An Bank Ltd, Shanghai Pudong Development Bank Ltd; 3) 3 city commercial banks: Bank of Beijing Ltd, Bank of Ningbo Ltd, and Bank of Nanjing Ltd.[18]

BANK NO.	NAME(ENG)	NAME	TICKER
1	China CITIC Bank Corp Ltd	中信银行	601998.SH
2	Bank of China Ltd	中国银行	601988.SH
3	China Construction Bank Corp	建设银行	601939.SH
4	China Everbright Bank Co Ltd	光大银行	601818.SH
5	Industrial & Commercial Bank of China Ltd	工商银行	601398.SH

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[17] NYU Stern | Volatility Institute. Accessed May 10, 2017. https://vlab.stern.nyu.edu/.
[18] Structure of Chinese Financial Institutions. China Banking Regulatory Commission. Accessed May 10, 2017. http://www.cbrc.gov.cn/chinese/jrjg/index.html

6	Bank of Communications Co Ltd	交通银行	601328.SH
7	Agricultural Bank of China Ltd	农业银行	601288.SH
8	Bank of Beijing Co Ltd	北京银行	601169.SH
9	Industrial Bank Co Ltd	兴业银行	601166.SH
10	Bank of Nanjing Co Ltd	南京银行	601009.SH
11	China Merchants Bank Co Ltd	招商银行	600036.SH
12	China Minsheng Banking Corp Ltd	民生银行	600016.SH
13	Huaxia Bank Co Ltd	华夏银行	600015.SH
14	Shanghai Pudong Development Bank Co Ltd	浦发银行	600000.SH
15	Bank of Ningbo Co Ltd	宁波银行	002142.SZ
16	Ping An Bank Co Ltd	平安银行	000001.SZ

[Figure-6: Bank Summary]

Data is collected from various sources including Wind Terminal, the World Bank, and the GMES database of NYU Stern Volatility Lab.

Hypothesis

My hypothesis is that NPLs is the driving force of increasing systemic risks at commercial banks. This hypothesis holds intuitively because I assume that NPLs would rise dramatically during a crisis scenario. Increasing NPLs not only leads to the jump of LRMES and leverage level, but also deteriorates equity value, which aggregately drive SRISK to go up.

Firstly, slower economic growth has led to an accumulation of bad debts, especially from local governments and SOEs due to soft budget constraint, as we see from the historical evidence

given in Section I. Since 1990s, the state has restricted the local governments' access to credit to harden budget constraints, but local governments could still get funding easily through other methods, such as the use of local government financing vehicles loans, chengtou bonds and infrastructure trusts.[19] Hence, SOE managers do not have the motivation of fully utilizing the fund because they can still so easily get funded, and they believe that the state would never let them fall. Hence, the amount of bad debts would keep climbing up that it certainly deteriorates the commercial bank's balance sheets and might potentially trigger a systemic crisis.

Secondly, the climbing NPL ratios pushed state-owned banks to restrict their lending. This made the demand of loanable fund higher than supply, which contributes to the rapid growth of shadow banking sector in China. PBOC data shows that shadow-banking loans already took up 30.1% of China's nominal GDP in 2010, and it increased to 42.5% in 2013. Not only is shadow banking in China indirectly supported by the formal banking sector, capital flows are also much harder to regulate, so by transferring lending risk from commercial banks to institutions at the shadow banking sector, the systemic risk of the overall financial industry increases.

Thirdly, while the detailed asset and composition data is not available from public sources, some researches indicate that the current asset growth in Chinese banking system is backed by wholesale funds rather than deposit growth, which implies an increasing interconnectedness in the system and weaker ability to withstand unexpected market shocks.[20]

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[19] García-Herrero, Alicia, Sergio Gavila, and Daniel Santabárbara. "What Explains the Low Profitability of Chinese Banks?" Research in International Business and Finance 26, no. 2 (May 2012): 221-39. doi:10.1016/j.ribaf.2011.12.005.

[20] "Moody's: China's banking system faces systemic risk from significantly higher dependence on wholesale funds." Moodys.com. August 28, 2016. Accessed May 10, 2017. https://www.moodys.com/research/Moodys-Chinas-banking-system-faces-systemic-risk-from-significantly-higher--PR_354245.

Measures

$$(SRISK/MKT\_CAP)_{i,t} \quad = \alpha_i + \beta1{\times}NPL\%_{i,t} + \beta2{\times}NIM\%_{i,t} + \beta3{\times}NII\%_{i,t} + \beta4{\times}LDR\%_{i,t}$$

$$+\beta5{\times}\ln(PU)_t + \beta6{\times}\ln(GDP)_t + \lambda_{i,t}$$

Systemic risk is the dependent variable. As we see in the SRISK calculation formula from the previous section, SRISK value is very much associated with bank size, so on the left-hand side of the model, I normalized SRISK by Market Capitalization to eliminate the size effect on the regression result. Both SRISK and MKT CAP data are collected from the GMES database at NYU Stern Volatility Lab.

NPL ratio is the test independent variable. To make my results on NPLs robust, I added two types of control variables:

Type A: Other bank characteristics that might also explain the SRISK performance.

- NIM (%): Net interest margin is calculated as dividing the interest returns on funds by the average earning assets. While interest rate is strictly controlled by the central government in China, I included this variable because it measures the efficiency of a bank's fund investment. I assume that NIM is positively correlated with bank performance and may act as SRISK buffer.

- NII (%): Non-interest income reflects the bank's participation in market activities, ranging from consultancy services, investment and other intermediary services. Different from commercial banks in other countries, most bank earnings come from interest income in China. But non-interest income has been playing a more and more important role, with relatively higher profitability and earning stability.

- LDR (%): loan-to-deposit ratio assesses a bank's liquidity condition. If the ratio is too high, the bank may face the risk of not having enough money to pay back loans if

customers initiate withdrawal requests. If the ratio is too low, the bank may not generate optimal earnings. Hence, lower LDR may indicate safer liquidity and thus lower SRISK level.

Type B: Macro indicators that makes clear whether the change of SRISK comes from banks taking on NPLs at individual level or from shifts of the nation's economic condition.

- Log (PU): economic policy uncertainty raises stock market volatility and discourages investment activities in policy-sensitive sectors such as banking. Scott R. Baker, Nicholas Bloom, and Steven J. Davis (2015) measures the economic uncertainty based on newspaper coverage frequency. [21] Larger policy uncertainty may intensify market panic and increase the capital needed to be raised in a crisis scenario.

- Log (GDP): This variable tests whether the economy size has noticeable contribution to the SRISK. I used the quarterly real GDP data in US $ million.

I obtained bank characteristics data from Wind Terminal, and the time-series macro data from the World Bank and the Economic Policy Uncertainty Index. [22]

Regression Results

Because my data contains a variety of variables of 16 bank objects at nearly 40 time points, I conducted a random-effect cross-sectional regression analysis based on the Hausman test result. More than 500 observations have been studied, key variables SRISK and NPL normalized by market capitalization. **Figure-7** is a descriptive summary of the empirical data. The simple time-series regression analysis, shown in **Figure-8**, tells us that macro variables have minor impacts

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[21] Baker, Scott, Nicholas Bloom, and Steven Davis. "Measuring Economic Policy Uncertainty." October 2015. Accessed May 10, 2017. doi:10.3386/w21633.
[22] Economic Policy Uncertainty Index – China Monthly Index. Accessed May 10, 2017. http://www.policyuncertainty.com/china_monthly.html.

on the increase of systemic risk.

Variable	Obs	Mean	Std. Dev.	Min	Max
SRISK	538	0.3024493	0.3702894	-0.8115821	1.162384
NPL	534	0.067251	0.0465367	0	0.3097473
NIM	610	2.552887	0.4194296	1.2783	4.9768
NII	605	20.1212	8.341596	-3.6527	42.5967
LDR	571	69.46383	7.527951	42.68	92.0317
PU	640	4.981074	0.6148459	3.678577	6.472208
GDP	40	10.53197	0.7059363	8.904762	11.59862

[Figure-7: Descriptive Statistics]

SRISK	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
NPL	3.834916	1.2041090	3.18	0.004	1.349757	6.320076
NIM	-0.0473533	0.0943776	-0.50	0.620	-0.242139	0.1474324
NII	0.0183424	0.0082638	2.22	0.036	0.0012867	0.0353981
LDR	-0.0336798	0.0099493	-3.39	0.002	-0.0542141	-0.131454
PU	0.0904887	0.0623382	1.45	0.160	-0.038171	0.2191484
GDP	0.1022543	0.0634611	1.61	0.120	-0.028723	0.2332315
_cons	-139.9104	69.6120700	-2.01	0.056	-283.5826	3.761871
sigma_u	.					
sigma_e	0.17636219					
rho	.	(fraction of variance due to u_i)				

[Figure-8: Time-series Linear Regression]

Source	SS	df	MS	Number of obs	=	507
				F(6,27)	=	30.16
Model	12.832311	4	3.20807775	Prob > F	=	0.0000
Residual	53.4019357	502	0.106378358	R-squared	=	0.1937
				Adj R-squared	=	0.1873
Total	66.2342466	506	0.130897721	Root MSE	=	0.3262

SRISK	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
NPL	2.524611	0.3447179	7.32	0.000	1.8473430	3.201878
NIM	-0.1795722	0.038154	-4.71	0.000	-0.2545335	-0.1046109

NII	0.004262	0.0021238	2.01	0.045	0.0000893	0.0084347
LDR	0.0029773	0.0020831	1.43	0.154	-0.0011152	0.0070699
_cons	0.2943789	0.1696249	1.74	0.083	0.0070699	0.6276411

[Figure-9: Panel Data]

For the panel data, the result meets my hypothesis, with p-value below 0.05 and positive coefficient (**Figure-9**). Loan-to-deposit ratio and net interest margin seems irrelevant. However, the non-interest income ratio is different from my expectation. Nevertheless, based on the result, my explanation would be: when the ratio increases, it means more market activities and more service fees charged from credit card bill overdue, indicating higher systemic risk.

Section IV: Conclusion

Now that NPLs is at the core of increasing systemic risk, what should regulators do to tackle this long-existing challenge? Here are some possible solutions.

Firstly, if a commercial bank operates at a size that is too large to fail, it would create a vicious circle of soft budgets. Banks may get more vulnerable to corporate governance shortcomings. Hence, it is important for the state to control the size of the five largest commercial banks and give more support to small-and-median size commercial banks.

Secondly, the government should harden budget constraints to SOEs, allow the risk to be exposed to and absorbed by the market. Nevertheless, this may be a gradual and long-term process. A quick privatization of financial sector, like what East European countries have experienced after the collapse of the Soviet Union, is not likely to fit China's national condition, since it may cause huge market panic, liquidity stress, as well as chaos in both the real business and banking system.

Thirdly, since banks with more engagement in market activities or more sophisticated organizational structure tend to generate more systemic risk, it is necessary to add a macro-prudential framework besides the existing micro-prudential regulations at individual bank level.

Finally, regulators should enforce information transparency from SOEs, at the same time, enhance its own information openness and encourage more external supervisions, such as the media and research agencies.

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Acharya, V., Engle, R., & Richardson, M. (2012). Capital Shortfall: A New Approach to

Ranking and Regulating Systemic Risks. *American Economic Review*, 102 (3), 59–64.

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