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Shadow Banking in China: Institutional Risks¹

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Abstract: In this paper, we examine China's shadow banking institutions for financial risks. We use a bank stress test to analyze solvency risk for the systemically important financial institutions and the banking system as a whole. We find that there is some risk of bankruptcy and potentially a risk of liquidity shortages, for which we lack sufficient data to run a stress test. We conclude with policy recommendations.

Introduction

China's shadow banking system is receiving increasing attention for new products and practices that, while developing the financial system, have increased risk. In this paper, we examine the shadow financial system in China and examine where microeconomic-level financial risks lie. We use a bank stress test to examine solvency risk. We find that bank-related indicators may indicate solvency risk, especially where there are many existing non-performing loans, and that liquidity risk may be an issue for the banking sector as a whole. This paper has a companion piece on China's shadow banking system risks at the systemic level.

While some products appear to contribute positively to financial development, other products, such as credit guarantees and trusts, have proven to be far riskier. China's regulatory bodies are well aware of this. However, due to rapid expansion of the shadow financial system over the past few years, it is impossible to regulate and monitor all aspects of the system. In this paper, we ask, how can we conceive of and assess risks in the system, at the institutional level?

Risk Theory-From the Firm to the Economy

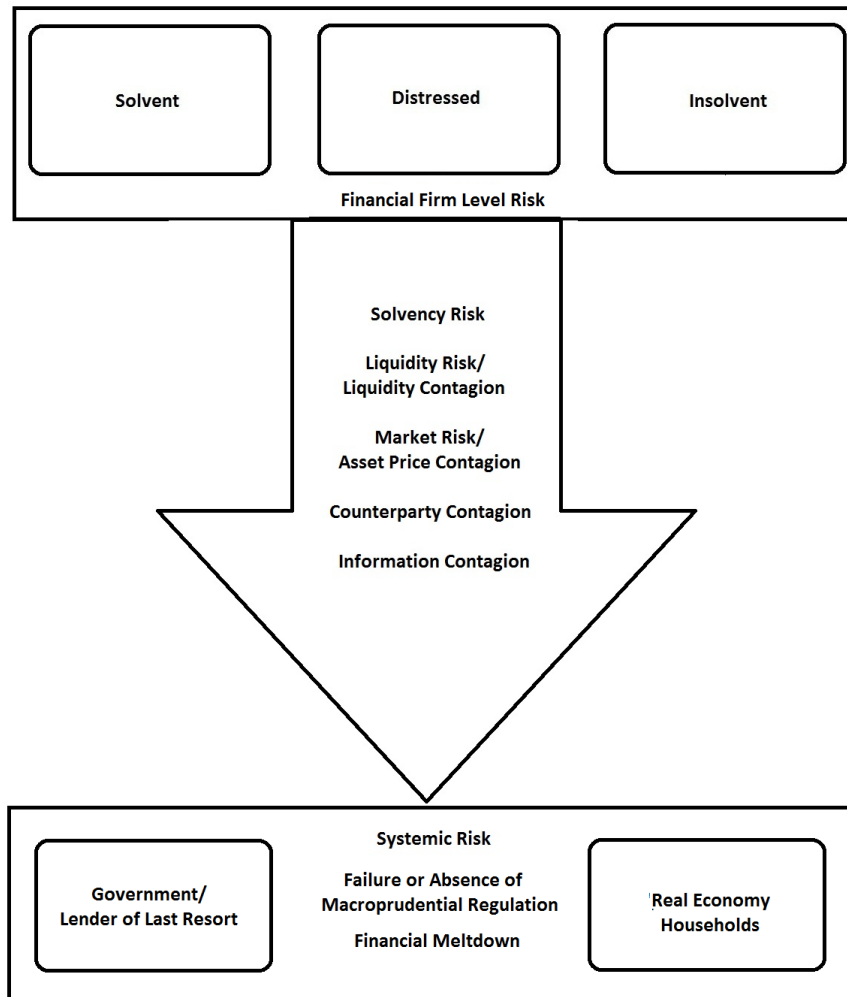
Before laying out the topography of the Chinese shadow banking system, we enter into a discussion of risk by looking at what financial risk entails. Indeed, it is a complex subject that must be analyzed at the firm level, and protected against by using microprudential regulations,

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as well as at the economy-wide level, protected against by using macroprudential regulations. We use the following diagram to explain the different levels of risk.

First, at the level of the firm, we follow Purnanandam (2008), who makes a distinction between financial distress and insolvency in discussing solvency or credit risk. In the state of financial distress, firms lose customers, employees, and suppliers and may miss debt payments. Distress can be quantified by examining leverage, industry-adjusted leverage, and the Altman Z-score. In the state of insolvency, the value of firms' bonds is below the face value of its debt. Firms must control for liquidity and solvency risk, and guard against market risk. These three types of risk can lead to contagion when unchecked. Liquidity contagion can occur when uncertainty prevails. Asset price contagion can arise from increased insolvencies and a rise in market risk. As solvency and liquidity shocks occur, counterparty contagion and information contagion spread financial distress to the rest of the economy, bringing about an upswing in systemic risk and the increased likelihood of a financial meltdown. We explore these types of risks and channels of contagion in this section.

The following diagram illustrates the types of risks emanating from the firm to the rest of the financial system. Financial firm level risk includes solvency or credit risk. Liquidity risk, and market risk, and these in turn pose the threat of liquidity contagion, asset price contagion, counterparty contagion, and information contagion to the rest of the financial system. We next explore risks that we will discuss in this paper, liquidity and solvency or credit risk.



Solvency/Credit Risk. Solvency / credit risk, or the possibility of bankruptcy, can be measured in somewhat the same way as financial distress, by looking at leverage, industry-adjusted leverage, and the Altman Z-score. These indicators have been used in the literature to determine the probability of bankruptcy/ insolvency. Methods that incorporate these indicators include the Zipf distribution of R over time (Podobnik et al 2010), the SBM-Super Efficiency Model (Chiu, Chen and Hung 2009), and neural network models (Atiya 2001). Therefore hedging against solvency risk during period of economic expansion is critical. Default probabilities are often assumed to be procyclical since in lean times, credit constricts, asset prices may decline, and other economic factors become unfavorable.

Liquidity Risk/ Liquidity Contagion. Liquidity risk is the risk that a financial firm cannot meet its cash and collateral obligations without losses. The most influential work on liquidity risk is that of Diamond and Dybvig (1983). Diamond and Dybvig view bank runs (liquidity crises) as self-fulfilling prophecies that can be prevented with contracts such as suspension of convertibility

and deposit insurance. Diamond and Rajan (2001) describe a model in which banks create liquidity and in the process experience financial fragility. Other models have shown that there are alternatives to regulation to stop liquidity crises. Cifuentes, Ferrucci, and Shin (2005) find that liquidity requirements on institutions can be as effective as capital requirements in preventing contagion.²

For China, we can compute solvency or credit risk and some aspects of systemic risk. Other data, such as information on liquid assets, specific interbank liabilities (nonaggregated), foreign exchange loans, and details on structure of the bond portfolio, are publicly unavailable. Using this framework above and the data available, we qualitatively analyze the Chinese shadow banking system in the following section, then set up a model to analyze firm risk in terms of solvency or credit risk and, at a less detailed level, in terms of liquidity risk. We examine contagion and systemic risk in a companion paper.

China's Shadow Banking System

China's shadow financial system is comprised of non-bank financial products, including bank-trust cooperation financial products, products issued by trust companies and financial leasing companies, and Q-REITS³ and credit risk assets; and credit creation products often produced by small loan companies, investment companies, credit guarantee companies, insurance brokerage firms, pawn shops, private equity investment funds, and venture capital funds. The shadow financial system is dominated by commercial banks (in off balance sheet transactions), insurance companies, and trusts. Although the Chinese shadow banking system includes informal, or folk, financing, we disregard this sector in this paper because it is highly heterogeneous and relatively low-risk (see Li and Hsu 2009 for more information).

The shadow banking system has grown rapidly in recent years. Supervision currently focuses on commercial banks, while attention is not given to property securities and other non-loan assets. Trust companies and security traders engage in activities that may be high-risk, with high returns as well. Below, we discuss some of the riskier shadow banking institutions, including commercial banks, trusts, Q-REITs, and credit guarantee companies.

² They construct a model accounting for both counterparty contagion and a decline in asset prices, and find that prudential regulation imposing solvency constraints can still create contagion when asset prices are marked to market.

³ Q-REITS is the short for quasi real estate investment trusts. It is a kind of investment funds issued by companies that own and usually manage income-producing real estate property such as apartments, offices, and industrial space.

Commercial Banks. Commercial bank financial products have been viewed as relatively less risky, although many of the products purchased through banks carry more risk than has been perceived by customers. There has been historically a lower rate of default for commercial bank products, although officials have recognized that risk has been building and have recently attempted to deleverage the shadow banking system through monetary policy tightening.

Commercial banks in China have sold the products of trust and investment companies, or have engaged in shadow banking activities themselves by transferring deposits into financial management products and lending the funds to short-term project investors. Commercial banks are better regulated than trust financing or credit guarantee companies, although they face some obstacles to appropriate supervision. The Commercial Banking Law, passed in 1995, is enforced by the People's Bank of China. In addition, the China Banking Regulatory Commission, created in 2003, is charged with regulating banks. The power of regulation does not necessarily translate into the power of enforcement, since the CBRC is both a supervisor and a state agent (supporting changing state policies), playing conflicting roles, and because it lacks a sufficient budget to carry out proper law enforcement (Brehm 2008). The commercial banking system hence appears to closely follow international standards in regulation, but in terms of enforcement it lags behind.

By 2011, there were 23,501 financial products, valued at 16.49 trillion RMB, and the number of issuers increased from 14 in 2004 to 100 in 2011. Financial products are becoming increasingly complex, with both increasing variety of and increasing participation in product investments. The average growth rate of new financial products has been as high as 114.09% over this eight-year period, at its lowest in 2009 due to the global financial crisis, and picking up speed again in 2010^{4,5,6}.

⁴ Currently, the top ten financial fund trading banks, occupying 62.27% of the financial products market, are the Bank of Communications, China Merchants Bank, the Industrial and Commercial Bank of China (ICBC), Bank of China, China Construction Bank, Shenzhen Development Bank, Agriculture Bank of China, Shanghai Pudong Development Bank, China Minsheng Bank, and the Bank of Beijing.

⁵ In 2011, five major state-owned banks and the nationwide joint-stock banks hold the dominant position in the release of RMB financial products. In foreign currency denominated financial products, Bank of China, Bank of Communications, and China Merchants Bank dominate, while for USD denominated financial products specifically, the Shanghai Bank is also prominent.

⁶ Financial products include those denominated in RMB, USD (U.S. Dollars), HKD (Hong Kong Dollars), AUD (Australian Dollars), and EUR (Euros). In 2004, US dollar financial products occupied 62.28% of foreign exchange denominated financial products. However, as Chinese personal wealth increased, the issuance size of RMB financial products exceeded those of the USD in 2007. By the end of 2011, RMB financial products accounted for

China's rising middle class has given way to new financial market investors, individuals who may not have large amounts of wealth to invest and who may not have much knowledge of the market. Specialized funds have been created to meet their needs, some of which are on the esoteric side. For example, the China Construction Bank created an investment product based on the art industry, while Minsheng Bank sold a product based on white liquor. Shenzhen Development Bank also created a financial product based on white wine with an investment period of one year. Personalized financial management products satisfy a wide range of demands.

Both on and off balance sheet transactions can be classified as shadow banking. On balance sheet products include bonds, acceptances, repo, and ABS products. Off balance sheet products include wealth management products, and included trust products until the CBRC banned banks' sales of trust products in 2013. We can obtain a glimpse of both on and off balance sheet transactions in the balance sheet indicator 'Risk Weighted Assets.' Assets and off balance sheet transactions are accorded the proper risk weight category according to international guidelines.

Trusts. China's trust sector is the third largest financial subsector, after the banking and insurance subsectors, and possibly the riskiest. As we discuss below, some trusts have encountered problems since financial trusts are not subject to the same regulations that banks are subject to (Reuters 2012).

Until 2013, trusts could be set up either as cooperation between banks and trusts, or as financial trusts alone. Now banks are forbidden from selling trust products. Trust products may stretch across banking, securities, and many other fields of investment.

Trust companies have skirted regulation that governs activity of commercial banks, and have often engaged in very risky activity. "Wealth management products" or trusts issued by non-bank financial companies have attracted attention for investing in undisclosed or highly risky projects. Poor real investments that the trusts are based on have come to light in recent months—the product called Golden Elephant No. 38 was based on investment in a near-empty housing project in poor, rural Taihe, while another product invested in a coal company, Zhenfu Energy, was at risk of default because the coal company owner was unable to repay loans (Reuters 2012). Additional, possibly questionable, real investments include investment in oil paintings or white liquor.

87% of all financial products in China. RMB financial products are larger in total value than foreign exchange denominated financial products, occupying most of the financial products market

Trusts that invest in local government and municipal bonds are also at risk since these products are based on underlying assets that may not generate an equivalent cash flow. Large amounts of local government debt were issued in 2011, some of which will likely not be repaid. For example, a local government just outside of Beijing that financed a copy of Manhattan on the ground will likely not return the amount of debt it has used to pay for construction of the city, nor will a stadium fronted by Olympic rings in Hunan, central China (Forsythe and Sanderson 2011). Corporate bonds may also face higher levels of risk, with the slowdown of the economy.⁷ In addition, to skirt restrictions on Chinese capital controls, corporate bond issuers have issued bonds through offshore holdings companies and sent the proceeds onshore in the form of foreign direct investment, equity rather than debt, which means that foreign bond holders are subordinated to onshore creditors, reducing likelihood of repayment should the corporation collapse (Cookson 2011).

Both trust financing companies and trust issuing commercial banks are regulated, even though some trust companies have engaged in high risk project investment. The regulatory authority has put forth a series of laws and regulations to bring about the healthy development of trust financial products, but the trust companies continue to engage in speculative investment.

Quasi-Real Estate Investment Trusts. Quasi-Real Estate Investment Trusts, or Q-REITS, carry out investment in real estate management and operations.⁸ Most Q-REIT transactions are associated with government owned real estate. As in the case of the general trust category, Q-REITs have been suffering recently due to a decline in the value of underlying assets—in this case, real estate.

The most common Q-REIT⁹ form is the trust. This began on August 12, 2010, when the CBRC officially issued the notice on “Bank-trust Financial Cooperation”, which ushered in a stage of

⁷ China’s new high-yield bond market (junk bond market) is a sub-sector to watch.

⁸ China does not have REITs that rank at the international standard, but rather has similar REIT products that are denoted as Quasi-Real Estate Investment Trusts, or Q-REITs.

⁹ Q-REITs have several players. First, is the fund holder—the investor who holds the certificate, who enjoys fund rights and interests. Second, is the fund supervisor, who belongs to the fund management company and charges a supervisory fee. Third, is the property supervisor manages the real estate property and charges a management fee, and fourth, the fund trustee is assigned by the commercial bank and is responsible for holding fund assets and settling fund accounts, and collecting trust fees. Fifth is the consultant firm which may be invited by the fund supervisor as needed to provide professional investment advice and is paid the corresponding consultancy fee.

comprehensive standards and innovation. Q-REITs also come in the form of Listed Property Funds (LPFs), which use real estate rental receipts as an income flow¹⁰.

Q-REITs incorporate risk based in large part on the underlying real estate assets. As the Chinese real estate market experiences a boom and corresponding bust, Q-REITs are at risk as well. As of 2011, the real estate trust average yearly returns ratio was as high as 10.09%. Figure Two shows the average annualized returns of funds raised by REITs. However, products related to real estate have already been in trouble. According to public statistics, in the first half of this year, more than 30 early redemptions of real estate trust products have already been completed (Xinhua 2012). Statistics reported by Yongyi Trust, a well-known trust web portal in China, showed that mature REITs may reach a peak both in third quarter of 2012 and second quarter of 2013, when the total repayment scale will be 43.959 billion RMB and 50.570 billion RMB respectively (Xu 2012). A far more aggressive report is given by China Investment Corporation Limited (CICC), which said that in the next three years a 700-billion RMB repayment of REITs will be due. The estimation of repayment scale in this year and next year are 223.4 billion and 250.0 billion RMB respectively.

Tightening housing policy serves as a main reason for the REITs trouble. Influenced by restrictive home-buying policies, housing prices witnessed a continuous decline during recent months. Thus, numbers of real estate agents have faced financial strain. Consequently, concerns about the housing industry and devaluation of REITs have increased.

China's real estate trust products are in their initial stages of development and growing rapidly. Because of their rapid growth and corresponding poor risk management, Q-REIT business carried out by four major trust companies was ordered to be temporarily suspended at the end of 2011. The China Banking Regulatory Commission (CBRC) required Bohai International Trust, Founder BEA Trust, Minmetals International Trust and Sichuan Trust to suspend business due to a lack of prudence in selecting investment programs (China Business News 2011).¹¹

¹⁰ LPFs realize gains through four methods: gaining higher rent through existing real estate, developing new real estate projects, carrying out real estate development to enhance income, and reducing operating costs. The major part of the income is assigned to the investors of Q-REITs.

¹¹ Most of the investors of REITs are individual investors. Devaluation of the financial product will cause significant losses for them, which would likely lead to a wider range of early redemptions. Still, the current situation is unlikely to act as a systemic shock on the domestic financial system. First of all, commercial banks, the most important part of the financial system, would not be strongly impacted. Bank-trust products, on the other hand, have been kept under rigid supervision. Secondly, the trust industry has ways to overcome this specter. Solutions for insolvent real estate agents include debt restructuring and rollover, both of which have already taken place. Assumption of REIT-related debt by asset management companies has prevented default. Regardless of restructuring, most of the

Credit Guarantee Companies. Credit guarantee companies guarantee credit risk, thereby taking responsibility for the risk.¹² While as a concept these types of companies seem like a good idea, they are particularly subject to the riskiness of the transactions they guarantee. Recently, a rash of problems stemming from credit guarantee companies has affected China's financial sector, which we turn to in a moment.

Credit guarantee companies have undergone four stages of development¹³. In the first stages, 1993 to 2000, development of the credit guarantee industry was slow, and capital stocks were used mainly for government investment. In the second stage, 2001 to 2007, China joined the World Trade Organization and the economy boomed. Credit guarantee companies were no exception, and developed rapidly under increased private capital injections. The third stage, 2008 to 2010, witnessed the impact of the financial crisis, and survival of the industry has been exceptionally difficult. The government, in response, has guaranteed the industry, causing some inflows of finance. The fourth stage has occurred since 2011. In this stage, several regional credit guarantee companies have arisen, as have local credit guarantee associations.

In addition, starting in this period, some of the guarantee companies have experienced difficulties. Tight monetary policies and tightened real estate market supervision occurred. Informal finance increased as bank lending declined. Some credit guarantee companies lent money to informal financial markets. This increased the riskiness of credit guarantee companies. For example, the Henan Province credit guarantee industry based in Zhengzhou

REITs were issued based on qualified collateral. This collateral provides that if investment cannot be recovered by the returns from REITs, trust companies have the ability to make up losses from these projects (Xu 2012).

¹² Credit guarantee companies may be divided into financial bonding companies and non-financial bonding companies. The former provides a guarantee for the fund holder and the latter is not directly engaged with the loan itself, but guarantees advanced payments and commercial contracts for example. We examine here financial bonding companies.

¹³ Most guarantee companies with low registered capital collect money from institutions and banks have been based on special relationships (guanxi loans), absorbing public deposits at high interest rates (average 10-25%). They then lent the funds to folk lending brokers or institutions (such as investment companies) at a higher rate or invested in real estate projects or purchased REITs. They also lent out the money as bridge loans, including short term construction loans or loans for business working capital, Some of the guarantee companies invested money in private equity funds or directly traded stocks on securities markets. This method of operating reveals that guarantee companies have pursued high-risk-industry investment or high-risk markets. In China, most guarantee companies are lending and borrowing for business purposes, which is the main factor creating high risk in credit companies.

contains companies that are densely interwoven with informal finance. A crisis among four large-scale credit guarantee companies erupted in 2011, involving an amount of 2,450 million RMB. These companies went out of business.

In another case of guarantee company difficulties, Zhongdan Investment Credit Guarantee Co. Ltd. faced a liquidity shortage due to its investment in a US consultancy that failed (Yang and Ma 2012). In another case, a complex web of 23 companies in Hangzhou, Zhejiang Province was linked together and threatened with failure due to the bankruptcy of Tianyu Construction, a company at the center of the web (Zhang, Zhang, Shen, Wen and Zheng 2012). After Tianyu's bankruptcy, the company's creditors started to call in loans to other firms guaranteed by Tianyu. According to Zhang Hanhua, the Vice President of Guangzhou Intermediate People's Court, increasing numbers of small-loan companies and guarantee companies are involved in informal finance credit disputes which have already been accepted by the court. In Wenzhou, one third of credit disputes accepted by the local court are related to guarantee companies (Wang 2012).

Credit guarantee companies have engaged in riskier activity, and have aroused supervisory organizations to examine them more carefully. Additional policies and measures were implemented in 2011 to strengthen credit guarantee company supervision. The China Banking Regulatory Commission has increased attention to credit guarantee companies' risks. Most provinces and cities have also acted to adopt supervisory measures since 2010. For example, in August 2010, Jiangsu Province began external audits and spot checks on credit guarantee companies' business. Guangdong Province and Zhejiang Province, in November 2010 and January 2011 respectively, issued policies to strengthen regulations on credit guarantee companies.

One source of credit guarantee companies' capital is via institutional investor funds. Enterprises are partial to credit guarantee companies because the rate of return is high. The populace itself invested in credit guarantee companies, with individuals getting family and friends to put their funds into the companies. Credit guarantee companies have been able to obtain funds at a low interest rate from banks and extend loans to individuals at a higher interest rate, earning a big profit. Some banks, however, including the Bank of China and the Agricultural Bank of China have declared that they will not cooperate with private guarantee companies. According to a guarantee company employee, without issuing any public announcement yet, the Industrial and Commercial Bank of China is not willing to support private guarantee companies, either (Qin 2012). Acting as an intermediary, the credit guarantee company takes a big risk because they cannot gain re-financing from the Central Bank.

Credit guarantee companies engaging in the real estate market seek high returns at a very high risk. Credit guarantee companies have also provided bridge loans to companies that could not

repay their bank debts. Some credit guarantee companies have absorbed funds for investment in the stock market or for venture capital institutions. This activity has moved credit guarantee companies away from traditional guarantee services. In Henan, some real estate businesses even register through credit guarantee companies in order to obtain financing. Credit guarantee companies have lost competitiveness due to increased perceived risky behavior.

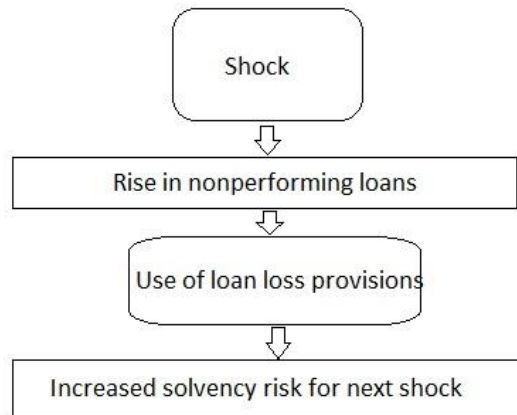
Two additional notable problems with credit guarantee companies include opaqueness of company control structure and inside trading. For example, the identity of Chen Yibiao, the person in control of Huangding Financial Guarantee Corporation, once the biggest guarantee company in Guangdong province, was concealed from the shareholder lists of these two firms. This allowed the firms under Chen's control to appear that they had no relation to each other. A wide range of inside trading within Huangding had developed. The complicated shareholder structure and prodigious transaction scale resulted in a loss of financing, and afterward all insider trading committed by Huangding employees was released. Influenced by Huangding's collapse, the guarantee industry in Guangdong province has been severely impacted (Qin 2012).

We next turn to modeling firm risk.

Modeling Firm Risk

In this section, we analyze firm level credit risk indicators for public banks in the Chinese financial sector, and then look at liquidity ratios of banks and trusts. While we realize that not all banks are shadow banks per se, they are systemically important for both the non-shadow and shadow banking sectors. It is difficult to impossible to separate out banks' shadow banking transactions from regular transactions. Trusts, on the other hand, can be considered mostly within the shadow banking sector due to the nature of their transactions, as noted above.

First, we run a bank stress test on the banking sector as a whole and on the top five significant financial institutions (SIFIs), including the Agricultural Bank of China, the Bank of China, the Bank of Communications, the China Construction Bank, and the Industrial and Commercial Bank of China. In this stress test, we assume that an external shock impacts China's banking sector. Since we lack detailed data on foreign exchange loans and interbank lending, we focus on the impact of a rise in credit risk to the Chinese banking system. The stress test process is as in the chart below. We base our stress tests on the stress test model presented in Čihák (2007). This is a balance sheet type of stress test that examines scenarios in which particular balance sheet items are negatively impacted, and how they affect other balance sheet indicators.



In the solvency stress test, we assume that some individuals and firms are suddenly unable to repay their loans. The loans therefore become nonperforming loans. If we assume that the shock produces a proportional rise in non-performing loans (NPLs) of about 25%, the result is that provisions to NPL ratios decline across SIFIs by about 7%. Loan loss provisions start to become depleted. This is particularly of concern where there are a relatively large number of existing NPLs relative to the capital base, as in the Agricultural Bank of China.

We also test for what might happen if entities in particular industries are unable to repay their loans. If this solvency shock occurs in larger sectors, such as the manufacturing sector, and to a somewhat lesser degree the construction and trade sectors, the rise in NPLs can become quite large. Assuming a distribution of loans across industries proportionate to industrial contribution to GDP, we find that a 10% increase in NPLs in the manufacturing sector would lead to the creation of almost 3 trillion yuan in nonperforming loans. Capital would thus be affected, as would risk weighted assets and the capital to asset ratios. This could present a real threat to solvency. Results are shown in the Appendix.

China's central bank runs its own stress tests and does not allow any foreign access to data. The Financial Sector Assessment Program, run by the People's Bank of China, confirms our findings that the aggregate solvency position of insurers could be improved. FSAP does, however, find that China's financial sector has sufficient liquidity (World Bank 2011). Overall, four domestic financial risks are pinpointed by FSAP: potentially negative impact of recent credit expansion on bank asset quality, risks created by the rise of off balance sheet interlinkages, especially to the informal financial sector, possible market risk created by high real estate and commodity asset prices, and potential for exacerbation of imbalances in the current system.

Second, although we lack balance sheet data to run micro level liquidity tests, we can look at indicators for the bank and trust sectors, as a whole and for the largest public corporations.

Liquidity indicators for banks and trusts

	2007	2008	2009	2010
Major Commercial Banks				
Agricultural Bank of China	N/A	9.41	10.07	11.59
Bank of China	13.34	13.43	11.14	12.58
Bank of Communications	14.44	13.47	12	12.36
China Construction Bank	12.58	12.16	11.7	12.68
Industrial and Commercial Bank of China	13.09	13.06	12.36	12.27
Liquidity in Chinese banks (capital/asset)	5.4	5.9	5.3	6
Liquidity in US banks (capital/asset)	10.3	9.3	10.9	11.1
Trust Companies				
China Pingan Trust Company	N/A	50.85	37.25	39.29
Huarun SZITIC Trust	N/A	N/A	N/A	85
Shanghai International Trust Company	N/A	97.17	93.87	94.22
Liquidity in Chinese trusts (equity/asset)	N/A	N/A	N/A	48

Source: China Trust Association, Bankscope, World Bank (2011).

We can see that the liquidity ratios for the systemically important financial institutions—banks in particular—are good, although liquidity in Chinese banks overall diverge from this level of capital adequacy. We use different data sources for these measures—data inconsistencies may affect these numbers, since the overall liquidity in Chinese and US banks is obtained from the World Bank, while liquidity ratios in individual banks is obtained from the Bankscope database.

Banks in the US are required to hold current minimum capital adequacy ratios consisting of a minimum of 4% for Tier 1 capital to total risk weighted credit and 8% for total capital to total risk weighted credit exposures. We can see from the table that US banks comply with this, while Chinese banks in aggregate diverge. This contradicts results of the FSAP stress tests, which state that liquidity is sufficient and therefore we believe it is important to gain access to micro level statistics to run stress tests independently, since the aggregated capital-asset ratios do not reveal where the problems lie.

Liquidity measures for trust companies are highly variable. While the aggregate trust industry ratio is at 48, the equity to asset measures for trusts diverges greatly, measuring at between 37 and 97. The relatively lower levels of liquidity for China Pingan Trust Company, a very large financial institution, should be of concern, particularly since many of the trust transactions are risky. Levels below 30% are considered particularly weak.

Policy Recommendations

From our stress tests, we can conclude that the solvency position of SIFIs should be improved. This is something that is widely recognized; non-performing loans have presented a problem to the banking sector since the 1980s, and the tight connection between the banking sector and the state has perpetuated the problem. Clearly, non-performing loans present solvency and credit risks, particularly if government backing becomes an issue. As it has in the past, the Agricultural Bank of China continues to require special attention in this area.

Liquidity appears to be adequate for the SIFIs but inadequate for the banking sector as a whole. Although the central government may stand by ready to inject funds into the banking sector where needed, it would be more efficient to ensure that banks are liquid before a credit crunch ensues, particularly since it may be more difficult to identify flagging banks in a crisis if they are spread throughout the system and not concentrated in the SIFIs. Access to more detailed data on the liquidity composition of asset holdings would allow those external to the banking system to run stress tests on banks that go beyond examination of indicators.

In terms of more general policy recommendations, since we write at the nascent stages of growth in China's shadow banking system, we can say that the shadow banking system, excluding informal finance, is small relative to the rest of China's financial system according to the size of total assets, but its credit scale (net financing) is larger than that of commercial bank loans. In the aggregate, bank loans occupied 48.8% of China's financing of the economy at the end of Quarter 3 of 2012, down from 53% in 2010 (People's Bank of China 2012). Looking at the scale of financing, the size of the shadow banking system has exceeded that of the commercial banking system. That means shadow banking system is impacting the monetary policy transfer mechanism and regulatory performance.

China's regulatory bodies are attempting to respond to the explosion in shadow banking products over the past decade. A continuing expansion in shadow financing can quickly foment risk, and this is of great concern. Because of this, ongoing monitoring of the shadow banking system must be carried out. China's financial economy is innovative and fast-paced, and monitoring will require close connection to the shadow financial sector.¹⁴

¹⁴ A small but growing market to watch is the hedge funds market. China has also recently allowed hedge funds to raise funds in China and invest domestically (only for domestic hedge funds) or overseas. The first hedge fund in China was Junxiang lianghua, issued by Guotai Junan Securities Assets Management CO.,Ltd and set up on March 7, 2011 (Zhou 2011). Issuers of hedge funds include security traders, private equity funds, and public funds. Product design and market regulation have been developing slowly, mainly due to regulatory and financial restrictions. There are a limited number of derivatives to invest in, as well as restrictions on speculative activity (Money 163 2012).

With the rapid development of the shadow banking system in China, financial disintermediation has rapidly increased, potentially causing financial fragility and financial instability. Shadow banking institutions innovate many new products every day, but these products are not necessarily monitored by regulatory sectors effectively. The risks of shadow banking system are increasing under the background of the global economic downturn. Government guarantees to some public bonds and publicly owned banks and other financial institutions may intensify moral hazard which would cause systematic risk. So it is necessary to build up a new financial regulatory system to adapt to the development of the shadow banking system. The financial regulatory system must change the model of supervision from institutional regulation to business monitoring in order to create a unified financial supervision framework. Business risk control is at the core of the regulatory system.

It is also important to push forward reform of interest rate marketization of the banking system and to develop the monetary market and build a multi-level capital market. This would allow investors more opportunity to receive returns on their money, so that they refrain from seeking out shadowy investments. The bond market is the best channel for risk pricing in loan rate marketization, but China's corporate bond market and middle and long term national bond markets are still relatively small. Interest rate pricing that reflects market risk would help investors in the shadow banking system to monitor their own risk levels

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Appendix. Credit Risk Stress (based on end-2012 data; all numbers are in CNY millions, ratios are in percent)

	All Banks	SIFIs	SB1 (ABC)	SB2 (BOC)	SB3 (BOCO)	SB4 (CCB)	SB5 (ICBC)
Table C1. Asset Quality							
Total loans (gross)	69,530,030	31,636,247	6,153,411	6,710,040	2,879,628	7,309,879	8,583,289
Performing loans	51,536,694	32,233,914	6,347,551	6,799,248	2,920,304	7,437,694	8,729,117
Pass loans	49,995,599	31,230,646	6,052,100	6,591,713	2,851,980	7,233,287	8,501,566
Special mention loans	1,541,095	1,003,268	295,451	207,535	68,324	204,407	227,551
Non performing loans (NPLs)	526,129	327,484	85,848	65,448	26,995	74,618	74,575
Substandard loans	215,578	133,564	29,489	28,643	13,269	32,745	29,418
Doubtful loans	243,658	151,260	46,996	24,276	9,793	33,713	36,482
Loss loans	66,893	42,660	9,363	12,529	3,933	8,160	8,675
Reported data on collateral							
Substandard loans	21,558	13,356	2,949	2,864	1,327	3,275	2,942
Doubtful loans	24,366	15,126	4,700	2,428	979	3,371	3,648
Loss loans	6,689	4,266	936	1,253	393	816	868
Provisions held	66,112,438	159,153	54,628	19,086	14,537	38,330	32,572
Regulatory capital	109,155,216	4,588,530	751,354	988,658	456,075	1,093,429	1,299,014
Risk-weighted assets (RWA)	3,156,868	34,765,099	7,215,518	7,253,230	3,147,441	7,637,705	9,511,205
Capital adequacy ratio (CAR) pre-shock	3,457.7	13.2	10.4	13.6	14.5	14.3	13.7
NPLs (gross)/total loans (gross)	0.8	1.0	1.4	1.0	0.9	1.0	0.9
(NPLs-provisions)/capital	-60.1	3.7	4.2	4.7	2.7	3.3	3.2
Provisions/NPLs	125.6582283	0.485987102	0.636333986	0.291620829	0.538507131	0.513683026	0.436768354
Table C2. Credit Risk Stress Test							
<i>Shock 1. "Underprovisioning"</i>							
Assumed provisioning rates (%)							
Pass loans	1						
Special mention loans	3						

Substandard loans	20						
Doubtful loans	50						
Loss loans	100						
Assumed haircut on collateral (%)	75						
Collateral value after the haircut:							
Substandard loans	5,389	3,339	737	716	332	819	735
Doubtful loans	6,091	3,782	1,175	607	245	843	912
Loss loans	1,672	1,067	234	313	98	204	217
Provisions needed	772,231	483,782	107,174	101,779	41,766	109,241	123,822
Provisions held	66,112,438	159,153	54,628	19,086	14,537	38,330	32,572
Provisions to be made	0	324,629	52,546	82,693	27,229	70,911	91,250
Capital post-shock	109,155,216	4,263,901	698,808	905,965	428,846	1,022,518	1,207,764
Impact on RWA/impact on capital (%)	100						
RWA post-shock	3,156,868	34,440,470	7,162,972	7,170,537	3,120,212	7,566,794	9,419,955
Capital adequacy post-shock	3,457.7	12.4	9.8	12.6	13.7	13.5	12.8
Capital adequacy change	0.0	-0.8	-0.7	-1.0	-0.7	-0.8	-0.8
<i>Shock 2. "Proportional increase in NPLs"</i>							
Assumed increase in NPLs (%)	25						
The increase is proportional to:							
existing NPLs (1=yes, 0=no)	1						
existing performing loans (1=yes, 0=no)	0						
Additional NPLs	44,573	44,573	21,462	16,362	6,749	18,655	18,644
Assumed provisioning of the additional NPLs (%)	25						
Additional provisions	11,143	11,143	5,366	4,091	1,687	4,664	4,661
Capital post-shock	109,144,073	2,022,476	693,442	901,875	427,159	1,017,854	1,203,103
Impact on RWA/impact on capital (%)	100						

RWA post-shock	3,145,725	17,442,578	7,157,606	7,166,447	3,118,525	7,562,130	9,415,294
Capital adequacy post-shock	3469.6	11.6	9.7	12.6	13.7	13.5	12.8
Capital adequacy change	11.9	-0.8	-0.1	0.0	0.0	-0.1	0.0
Capital adequacy overall change (provisioning and increase in NPLs)	11.9	-1.6	-0.7	-1.0	-0.8	-0.9	-0.9
Memo items:							
Post-shock NPLs	570,702	409,355	107,310	81,810	33,744	93,273	93,219
Post-shock NPL/total loan ratio	0.8	1.3	1.7	1.2	1.2	1.3	1.1
Post-shock provisions/NPLs	11,586	42	56	28	48	46	40
change in provisions to npls ratio	9.7945899 21	0.0699760 9	0.0772667 97	0.0083241 66	0.0577014 26	0.0527366 05	0.0373536 71
<i>Shock 3. "Sectoral shocks to NPLs"</i>							
<i>Structure of lending (in B\$ million)</i>							
<i>Total loans</i>	69,530,030	32,561,398	6,433,399	6,864,696	2,947,299	7,512,312	8,803,692
<i>Agriculture</i>	3,476,502	1,628,070	321,670	343,235	147,365	375,616	440,185
<i>Manufacturing</i>	27,812,012	13,024,559	2,573,360	2,745,878	1,178,920	3,004,925	3,521,477
<i>Construction</i>	6,953,003	3,256,140	643,340	686,470	294,730	751,231	880,369
<i>Trade</i>	6,953,003	3,256,140	643,340	686,470	294,730	751,231	880,369
<i>Tourism</i>	3,476,502	1,628,070	321,670	343,235	147,365	375,616	440,185
<i>Non-bank financial institutions</i>	3,476,502	1,628,070	321,670	343,235	147,365	375,616	440,185
<i>Other</i>	17,382,508	8,140,350	1,608,350	1,716,174	736,825	1,878,078	2,200,923
<i>Nonperforming loans (in B\$ million)</i>	526,129	327,484	85,848	65,448	26,995	74,618	74,575
<i>Agriculture</i>	26,306	16,374	4,292	3,272	1,350	3,731	3,729
<i>Manufacturing</i>	210,452	130,994	34,339	26,179	10,798	29,847	29,830
<i>Construction</i>	52,613	32,748	8,585	6,545	2,700	7,462	7,458
<i>Trade</i>	52,613	32,748	8,585	6,545	2,700	7,462	7,458
<i>Tourism</i>	26,306	16,374	4,292	3,272	1,350	3,731	3,729
<i>Non-bank financial institutions</i>	26,306	16,374	4,292	3,272	1,350	3,731	3,729
<i>Other</i>	131,532	81,871	21,462	16,362	6,749	18,655	18,644
<i>Performing loans (in B\$ million)</i>	69,003,901	32,233,914	6,347,551	6,799,248	2,920,304	7,437,694	8,729,117

Agriculture	3,450,195	1,611,696	317,378	339,962	146,015	371,885	436,456
Manufacturing	27,601,560	12,893,566	2,539,020	2,719,699	1,168,122	2,975,078	3,491,647
Construction	6,900,390	3,223,391	634,755	679,925	292,030	743,769	872,912
Trade	6,900,390	3,223,391	634,755	679,925	292,030	743,769	872,912
Tourism	3,450,195	1,611,696	317,378	339,962	146,015	371,885	436,456
Non-bank financial institutions	3,450,195	1,611,696	317,378	339,962	146,015	371,885	436,456
Other	17,250,975	8,058,479	1,586,888	1,699,812	730,076	1,859,424	2,182,279
<i>Structure of lending (in percent of total loans)</i>							
	100	103	105	102	102	103	103
Agriculture	5	5	5	5	5	5	5
Manufacturing	40	41	42	41	41	41	41
Construction	10	10	10	10	10	10	10
Trade	10	10	10	10	10	10	10
Tourism	5	5	5	5	5	5	5
Non-bank financial institutions	5	5	5	5	5	5	5
Other	25	26	26	26	26	26	26
<i>Structure of nonperformance (NPLs to total loans by sectors)</i>							
	1	1	1	1	1	1	1
Agriculture	1	1	1	1	1	1	1
Manufacturing	1	1	1	1	1	1	1
Construction	1	1	1	1	1	1	1
Trade	1	1	1	1	1	1	1
Tourism	1	1	1	1	1	1	1
Non-bank financial institutions	1	1	1	1	1	1	1
Other	1	1	1	1	1	1	1
<i>Assumed shocks (% of performing loans in the sector becoming NPLs)</i>							
Agriculture	0						
Manufacturing	10						
Construction	0						
Trade	0						
Tourism	0						
Non-bank financial institutions	0						
Other	0						

New NPLs (from the affected sectors)	2,760,156	1,289,357	253,902	271,970	116,812	297,508	349,165
Assumed provisioning rate (%)	25						
Impact on capital		-322,339	-63,476	-67,992	-29,203	-74,377	-87,291
Capital (post-shock)	6,762,650	3,941,562	635,332	837,973	399,643	948,141	1,120,473
Change in RWA/change in capital	100						
RWA (post-shock)	58,903,597	34,118,131	7,099,496	7,102,545	3,091,009	7,492,417	9,332,664
CAR (post-shock)	11.5	11.6	8.9	11.8	12.9	12.7	12.0
CAR (change)	-3,446.2	-0.8	-0.8	-0.8	-0.8	-0.9	-0.8
CAR (overall change, including the underprovisioning)	-3,446.2	-1.6	-1.5	-1.8	-1.6	-1.7	-1.7