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Chinese Shadow Banking: Bank-Centric Misperceptions*

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Abstract

In this paper, we provide a qualitative and theoretical framework to analyze the rapid growth of shadow banking in China. An important characteristic of the system is its close connection with traditional banks, making it very bank-centric. Our theoretical model employs the concept of "information sensitivity" – a measure of tail risks – by Dang, Gorton and Holmstrom (2013) and suggests that Chinese shadow banking is built on the asymmetric perception of information sensitivity among shadow banking entities, banks and investors. Compared to the US, we show that shadow banking in China is built on different mechanisms (implicit guarantees in China versus financial engineering in the US) and operates on different platforms (banks versus capital markets).

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1. Introduction

The rapid emergence of the Chinese economy over the past three decades has been one of the most significant economic developments since the Industrial Revolution (Eichengreen et. al, 2011). Over this period, the Chinese economy has grown at an annual average rate of around 10 percent, enabling it to surpass Japan as the world's second largest economy. Today, China is also the world's largest trading nation and a major force in the global financial markets, commanding foreign exchange reserves of almost USD$4 trillion. Domestically, this rapid economic expansion has brought profound changes to the society, lifting more than 500 million people out of poverty.

Despite this remarkable economic achievement, development in China's financial system has lagged behind. Not only does the system lack diversity – as resources are concentrated in a small number of state-owned banks, heavy-handed regulation has created distortions in the economy, and political influence on state-owned banks has led to a bias in credit allocation towards state-owned enterprises and official projects (Song, et al., 2011). Although such a command system worked well in the early stages of economic development, a heavily regulated financial system has constrained economic transformation in recent years, and created imbalances both domestically and internationally. This has forced the Chinese authorities to speed up the pace of financial reforms.

Our paper focuses on one of the key aspects of financial transformation – the rise of shadow banking. Loosely defined as credit intermediation outside the formal banking system, shadow banking activities have experienced rapid growth since the global financial crisis. The share of non-bank credit intermediation, such as trust loans and entrusted loans, surged from less than 10% of the system in 2008 to almost 40% in 2013. The rapid growth of wealth management products (WMPs), including those provided by online platforms like Yu'E Bao,[1] and non-bank credit lending, have reduced the binding effect of interest rate and credit regulations, liberalizing a large part of the financial system to market forces.

Despite widespread media focus, deep and thorough research on China's shadow banking sector is limited.[2] Our paper contributes to the literature by providing a qualitative and theoretical discussion of the system, its key features and structural flaws. In essence, our analysis focuses on three main questions: 1) why did shadow banking emerge in China and what enabled its fast growth? 2) Why do state-owned banks play such a prominent role in shadow banking activities? 3) How is risk distributed within the system?

[1] Yu'E Bao, for example, was established as online platform for deposit accounts in June 2013 by one of the world's largest internet companies, Alibaba. It corporates with Tian Hong, a money market fund (MMF), and sell the MMF products to retail investors at an interest rate premium over bank deposits. Yu'E Bao gained huge popularity since it was launched last year, with total AUM blooming to RMB500 billion by the end of February 2014.

[2] There are only some descriptive reports, such as Li and Hsu (2013) and Schwarcz (2013).

Our analysis identifies a number of structural and cyclical factors driving the rapid growth of shadow banking. Structurally, interest rate controls on bank deposits has created financial repression in the economy, transferring wealth from savers to borrowers. The desire for higher-return investment has created strong demand for products like WMPs, whose yields are unconstrained by the deposit ceiling (Zhang, 2013).[3] On the lending side, credit and macro-prudential regulation limits banks' lending capacity and biases their credit allocation towards state-owned enterprises. To fulfil the financing needs of private businesses, banks cooperate with shadow-banking entities to conduct credit intermediation off-balance sheet. Overall, our analysis suggests that circumventing regulation has played a critical role in propelling the rise of shadow banking in China.

Cyclically, rapid growth in shadow banking has been closely associated with the government's massive economic stimulus following the global financial crisis. Under strong political pressure to support the economy, banks channelled a huge amount of credit to state-sponsored long-term projects and the property industry, utilizing both on and off-balance sheet channels. Shadow banking (or bank off-balance sheet) activity was further expanded, as banks tried to avoid the policy tightening since 2010. Overall, the expansion of shadow banking credit was a key driver of China's escalating leverage ratio in the last few years.

To examine the system, we conduct a comparative study between shadow banking in China and the US. Our analysis uncovers many similarities but also important differences. Shadow banking in both countries started because of financial repression caused by regulations – the deposit ceiling in China gave rise to WMPs, while a similar restriction (Regulation Q) in the US led to growth of money market funds (MMFs) in the 1970s. On the lending side, non-bank credit (e.g. trust loans) in China and securitization in the US are subject to weak regulations, enabling banks to use them to circumvent official restrictions and expand lending off-balance sheet.

A key difference lies in the structural foundation of the two systems. In China, shadow banking relies on traditional banks to perform many basic functions of credit intermediation. This makes it very "bank-centric", and a true "shadow" of the banking system. In contrast, capital markets have long been an integral part of the US financial system and have provided an efficient platform for financial innovation. Shadow banking has relied on this platform for credit intermediation, risk redistribution, and price discovery. A natural consequence is that the US shadow banking system is more market-oriented, operating in parallel to banks.

To enrich our qualitative discussion, we develop a theoretical model, building on the existing work by Dang, Gorton and Holmstrom (2013), to explain the key characteristics of shadow banking in China. We employ the notion of "information sensitivity" – a new tail risk measure – as a unifying concept of our discussion. Our modelling analysis uncovers some unique features of the bank-centric shadow banking system:

[3] Large and institutional savers can place their savings with banks in the form of negotiated deposits, whose interest rates are negotiated by both parties and not subject to the deposit ceiling control.

First, the model can explain that, given controls on interest rates and loan quotas, projects that are highly information sensitive will not get sufficient financing from traditional banks. Since capital markets in China are also underdeveloped, this creates a demand for alternative financing from shadow banks. However, shadow banks lack sufficient credibility to operate independently, and have to rely on traditional banks for transforming risky assets into seemingly information-insensitive products for risk-averse investors. This explains why shadow banking in China is so closely intertwined with the banking system.

Second, there exists a significant risk misperception in the shadow banking system that has led to prevalent risk mispricing and moral hazard problems. The bank-centric nature of the system and a lack of hard defaults have given investors the impression that shadow banking investment offers high returns with limited risks. In reality, though, banks are not liable for credit risks in many of these products according to contractual agreements. Our model combines the concepts of "information sensitivity" and "agreeing to disagree", and argues that such misperception is a key driver of shadow banking growth.

However, because the underlying assets of shadow banks are intrinsically risky, default risk does not vanish, but is simply masked by the asymmetric perception. This creates a false sense of security, leading to unsustainable growth. As a fundamental problem, we believe that risk misperception needs to be addressed by future reforms.

Our model offers two options aimed at correcting this distortion. First, the "implicit guarantee" provided by banks can be made "explicit" by requiring banks to bring information-sensitive assets back on balance sheet. Banks can then choose to retain these assets and be the ultimate risk bearer, or sell them and transfer risks to others. The realignment of expectations can help to remove risk misperception, but it will likely reinforce banks' dominance in the financial system. The second approach is to guide shadow banking towards the US system, turning a "bank-centric" model into a "market-oriented" regime. Under that setup, it will be the market mechanism – formed by the collective wisdom of institutional investors, rating agencies, analysts and regulators – that performs the function of risk distribution and credit allocation. Besides addressing risk misperception, this process will also increase the diversity of China's financial system, striking a better balance between direct financing through capital markets and credit intermediation by banks.

The remainder of the paper is organized as follows. The next section discusses the characteristics of shadow banking in China, along with the structural and cyclical factors that propelled its rapid growth. Section 3 discusses the rise of shadow banking in the US and analyses its similarities and differences with China's experience. Section 4 provides a theoretical framework to illustrate the unique features of China's shadow banking system and the distortions that these features create. Section 5 concludes with a discussion of future regulation and reforms.

2. Shadow Banking in China

The rapid rise of shadow banking has been a major part of the financial transformation in China in recent years. To understand how it contributes to the liberalization process, we start this section by briefly discussing China's modern financial reforms. This helps to provide a useful context for rationalizing the existence of shadow banking and its unique features.

2.1 A Brief History of Financial System Reforms

China has come a long way in modernising its financial system since the grand economic reforms started in 1978. Prior to that, the People's Bank of China (PBOC) acted as the sole financial intermediary in the economy, performing all the basic functions of a bank – taking deposits, making loans, and conducting foreign exchange on behalf of the government and SOEs (Yi and Wu, 1999). A series of reforms took place in the 1980s, helping to establish a formal banking system, which remains a dominant part of the financial landscape today (Allen et. al, 2012).

The PBOC began to function exclusively as a central bank in 1984. As financial reforms deepened in subsequent decades, it gradually receded from micro credit management, focusing instead on aggregate liquidity allocation for banks. Over this period, banks were required to adhere strictly to the benchmark interest rates set by the PBOC, with little discretion to price loans and deposits independently. The inability to set interest rates according to different risk levels resulted in banks rationing credit in favour of the SOEs, leaving private-sector businesses starved of funding (Allen et. al, 2012). This bifurcation started to dissipate in the late 1990s, as the PBOC gradually relaxed interest rate controls. Liberalisation continued in the 2000s, with the removal of the deposit-rate floor and lending-rate ceiling in 2004, and the remaining restrictions on lending rates in 2013.[4]

The deposit rate ceiling is now the only remaining *price-based* control in the banking system.[5] But given the dominance of banks, which are mainly deposit funded, the ceiling remains an important anchor for overall interest rates in the financial system (He et al., 2014). By artificially suppressing the level of interest rates, the deposit-ceiling has created financial repression, which is believed to be one of the root causes of many distortions, including wealth transfers from savers to borrowers (Lardy, 2008), resource misallocation leading to structural imbalances (Zhu, 2012), fast credit growth causing high housing prices (Wang et al. 2013), and excessive investment resulting in over-capacity (Chow, 2005).[6] This, as we discuss later, is also the primary supply-side driver for the rise of shadow banking.

[4] Mortgage lending rates in the banking sector are still regulated by the central bank.

[5] Zhang (2012) reviews the monetary history of major economies over the past century and noted that the deposit-rate control tends to be one of last to be removed, given its importance to the overall stability of the monetary system. China's gradualist approach toward deposit-rate liberalization is consistent with these historic experiences.

[6] It also encourages illegal activities, such as borrowers bribing bank loan officers for funding at low interest rates.

Financial repression also presents a major challenge to the PBOC's monetary operation. By keeping interest rates below their equilibrium levels, it creates excess credit demand in the economy, leading to credit booms and rising inflation. To maintain price and financial stability, the PBOC actively employs a set of quantitative tools – including loan quotas, reserve requirements, loan-to-deposit ratios and window guidance – to control bank lending (He and Wang, 2012). However, the success of these measures relies on quantitatively restraining credit to some borrowers, which hits small businesses in the private sector disproportionally hard. This creates desire for these borrowers to explore alternative financing to bank loans, which gave a demand-side push for shadow banking.

2.2 An Overview of China's Shadow Banking Industry

The Financial Stability Board defines shadow banking as a system of credit intermediation that involves entities and activities outside the regular banking system (FSB, 2013). Applying this definition, we can trace the origin of shadow banking in China all the way back to the start of modern economic reforms. The first trust company, CITIC Group, was created in late 1979, approved by the chief architect of China's economic reform, Deng Xiaoping. Under his endorsement, the trust industry flourished in the 1980s, with the number of companies reaching more than 1,000 by 1988 and assets under management accounting for almost 10% of the financial system (Pan, 2003). However, the rapid growth subsequently led to loose lending standards, prompting concerns about financial stability. The authorities responded by clamping down on these activities in the late 1980s. After a few years of stagnation, the industry grew again from mid-1990s, but the cycle was terminated by a major bankruptcy in 1999.[7] Along with other non-bank credit activities, shadow banking in China has gone through a few cycles in the last 35 years.

Despite a long history, our understanding about the shadow banking sector is limited by a general lack of data and transparency.[8] Thus, the word *"shadow"* banking, has an explicit meaning of invisibility and opacity.[9] The lack of comprehensive data makes gauging the precise size of the system difficult. Estimates from market analysts and academia put the aggregate size at RMB15~25 trillion as of mid-2013, equivalent to 43% of GDP and 17% of the banking system at the upper end of the estimates. These ratios are considerably smaller than those of most developed countries e.g. US: 160% and 168%, UK: 380% and 43%, and Germany: 70% and 25% (Figure 1).

[7] Guangdong International Trust and Investment Corporation (GITIC) was one of People's Republic of China's largest state-owned companies. On January 16, 1999, its bankruptcy was the biggest in the history of the country to date.

[8] Recognizing their growing importance, the PBOC started to collect data on the sector in 2012 and publish it as part of their "total social financing" measure. However, detailed information on data collection, sector classification, and compilation and aggregation are not revealed to the public, and hence, its quality is often questioned by users.

[9] In developed countries like the US, shadow banking tends to be well established with a long history, and activities are more clearly defined. There is also a relatively higher level of transparency which was driven by both regulatory scrutiny and market monitoring. US money market funds, for example, conduct credit intermediation outside the banking system, but still need to diligently report their operating information to investors as part of their fiduciary duties. In securitization, the SPV set up by sponsor (bank or broker dealer) needs to report to the trustee portfolio details at inception, and changes to portfolio values and compositions over the time of the SPV (Gorton and Metrick, 2012)

Activities in China's shadow banking system have grown significantly in diversity and breadth. In general terms, they can be classified into three broad classes based on organization structures. The first class involves banks as a direct intermediary, where wealth management products sold by banks or subsidiaries of banks are the main component. Despite their direct involvement, these activities are recorded off banks' balance sheets, and hence, are not subject to official oversight. The lion's share of funds raised by WMPs is invested in money and bond markets, making them very similar to the money market funds in developed countries.

The second class of activities consists of credit intermediation conducted by non-bank financial institutions like trusts, brokers, insurance companies, and security firms. Some of these entities can raise funds directly from investors, but most of them need to cooperate with banks in reaching out to high-net-worth individuals or corporate savers. Funding costs for these institutions are higher than WMPs structured by banks, forcing them to move down the risk/return spectrum for riskier investment, such as lending to property developers, mining companies and local government financing vehicles.

The last class of activities comprises lending by micro lenders, pawn shoppers, and the underground black market. This is the most opaque and riskiest segment of the shadow banking system.

We use Figure 2 to show the relationship among the key players of the shadow banking system, and demonstrate how credit is intermediated. At the funding end, households and corporates are the fund providers through: 1) bank deposits, which are channelled to shadow banks, 2) WMPs, sold and managed by banks, and 3) financial products, originated by trusts or brokers, but sold through banks.[10] On the asset side of the balance sheet, shadow banks can lend directly to borrowers in the real economy. These borrowers are typically those who cannot access cheaper funding from traditional banks, and hence are willing to pay extra for credit from shadow banks.

2.3 Drivers of Shadow Banking in China

The above discussion reveals an important characteristic of shadow banking in China: its close connection with the formal banking system. In fact, without the active involvement of banks, it is unlikely that shadow banking would have experienced such rapid growth, reaching the scale and significance today. But an obvious question is: why do banks participate in these off-balance sheet operations when they could lend through on-balance sheet channels? To answer this question, we have to delve deeper into the regulatory structure of the banking system and understand the distortions it creates.

[10] Banks can also play a pure intermediating role for bridging credit between two non-bank entities. An entrusted loan, for example, is when one corporate (or individual) lends to another with a bank serving as a middleman. The entrusted loan market has grown substantially in recent years, as the interest rate differential between the banking and shadow banking systems widened. Some SOEs, who can borrow cheaply from banks, have incentives to lend excess funding to others in shadow-banking markets to arbitrage the interest rate difference. Standard corporate lending rate is between 5 and 8%, but small corporates, who do not have the access to bank loans, often have to pay substantially higher interest rate to borrow in private (or underground) loan markets. In Wenzhou, where the private lending market is the most well-established, interest rates on short-term loans have been running above 20% per annum in recent years.

2.3.1 Banks Desire to Circumvent the Regulations

Despite substantial progress on financial liberalization, China's banking system is still subject to significant regulations. The deposit rate ceiling, in particular, has depressed interest rates in the economy and created financial repression. Because of the upward rigidity on nominal deposit rates, real interest rates have been either negatives or close-to-zero in recent years (Figure 3). Many savers had started to move deposits out of banks into higher-yielding investment to preserve the purchasing power of their savings. To limit the deposit outflows, banks needed an instrument for which they can offer higher interest rates to maintain their funding base.

WMPs were created precisely for this purpose. By structuring them off banks' balance sheet, WMPs are not subject to the deposit ceiling regulation, allowing yields on these products to move in line with market interest rates. Some of the WMPs carry explicit credit guarantee by banks, and most of them are structured as short-term investment, making them a close substitute to deposits from credit and liquidity risk perspective (Figure 4). For banks, the maturity of WMPs is structured carefully to coincide with the timing at which they need to comply with the RRR and loan-to-deposit ratio (LTD) requirements at month or quarter end (IMF, 2012). Overall, WMPs offer banks a tool to break through the deposit ceiling, without losing their funding base.[11]

In addition to circumventing interest rate controls, banks can also overcome lending-side restrictions, such as the reserve requirement and credit quota, using shadow banking transactions (Acharya et al., 2013; Plantin, 2014). Compared to banks, shadow banks are exempt from many credit and macro-prudential requirements, and their lending is subject to less official interference. However, in compensating for greater lending capacity, shadow banks lack the credibility to raise funds independently and the ability to screen borrowers. Cooperation between the two entities makes perfect sense, as their competitive edge complements each other's weakness. On the one hand, banks can utilize its vast sales network to help shadow banks to raise funds and source potential borrowers. On the other hand, shadow banks can help banks to extend credit creation beyond what is allowed by existing regulations. Once again, the desire for bypassing regulations has played an important role in propelling the rise of shadow banking.

2.3.2 Investor Demand for Alternative Investments

Besides the supply-side push from banks, investors' desire for alternative investments also creates demand for shadow banking products. China has one of the world's highest saving rates, but there are few investment channels available to deploy that saving given the underdeveloped capital

[11] A similar development that has gained significant publicity recently is the rapid growth of online WMPs, including those offered by Yu'E Bao. These products are money market funds or WMPs distributed via the internet. Indeed, a lion's share of Yu'E Bao's investment is made in negotiated deposits with banks, whose yields are usually benchmarked to inter-bank market interest rates. Relatively tight liquidity conditions in the second half of 2013 provided the ideal timing for the advent of Yu'E Bao, as money market interest rates shot up sharply, while bank deposit rates were kept low by the ceiling. Retail deposits rushed out of banks and flooded Yu'E Bao , which offered between 300 and 500bps interest rate premium over bank saving accounts. Within a period of six months, Yu'E Bao's total AUM bloomed to RMB 400bn, and continued to rise to RMB 500bn by February 2014.

markets and near-closed capital account. Bank deposits are an important storage of savings, but they have been offering meagre returns. The housing market is another popular investment choice for those who can afford to buy, but its illiquid nature often makes it a poor investment choice for institutional investors. Disappointing performance and weak investor protection in the equity markets, and limited liquidity in the bond markets, also deter participation of retail investors.

The desire for alternative investment provides a fertile ground for the rise of WMPs and other shadow banking products. The involvement of commercial banks in structuring, managing, promoting and distributing these products has significantly enhanced their creditworthiness among investors. Monthly issuance of bank-sponsored WMPs has grown substantially since 2009, reaching almost 4,000 issuances per month in 2013 (Figure 5).

2.4 Growth and Regulatory Endorsement of Shadow Banking

The above discussion suggests that there are structural supply and demand justifications for the rise of shadow banking. However, factors relating to circumventing regulations cannot fully explain why the industry has grown rapidly only in recent years, since these regulations have existed for decades. There must be some cyclical impulse behind the recent surge in shadow banking, which is examined in this section.

2.4.1 Regulatory Endorsement for Financial Liberalisation

First, the rapid growth in shadow banking would not have taken place without the implicit endorsement by regulatory authorities. Up until recently, the rise of shadow banking has been seen as an unequivocal positive development to broaden the diversity of China's financial system and expedite interest rate liberalisation. On the one hand, shadow banking complements traditional credit channels by serving borrowers who are unable to get financing from banks and capital markets. Since SMEs account for a large share of these borrowers, shadow financing has supported the development of private businesses in China. On the other hand, shadow banking provides a testing ground for interest rate liberalisation, as credit allocation in the sector is driven freely by market forces (Zhang, 2013). The authorities hope that by allowing banks to participate in these activities they will become more adept at competing in a liberalised interest rate environment. Increased market influence will in turn reduce the binding effect of regulatory controls, leading the overall system to converge towards a market-based framework.

Second, financial deregulation that allows for more diverse operations of banks also helped to increase shadow banking activities. Before 2005, China followed the traditional regulatory framework that prevails in advanced economies by banning banks from venturing into the operation of securities houses, trust companies, money market funds and insurers. However, as deregulation took place in the US in late 1990s, China followed suit by allowing mixed-operations of banks to sharpen their competitiveness in the context of financial and economic globalization. Nowadays most major banks

in China have their own subsidies in the shadow banking sector (e.g. security houses, trusts, and mutual funds) which help to channel funding directly to the real economy, bypassing banking regulations (Pan, 2014).

2.4.2 Cyclical Push from Post-Crisis Stimulus

Another driver for the recent surge in shadow banking comes from the dramatic policy change after the global financial crisis. It is well known that China's fast recovery from the crisis had a lot to do with the substantial policy stimulus and significant liquidity injection by the PBOC. State-owned banks were ordered to support an aggressive stimulus agenda, forcing them to become innovative in expanding alternative credit channels. These efforts paid off handsomely, as the credit-charged recovery carried the economy through a turbulent period with enviable growth rates.

However, by late 2010, the economy showed signs of overheating, with inflation rising above 5%. The PBOC swiftly cut back stimulus and ordered banks to reduce their lending. The abrupt policy change created a problem for banks, as they had lent significantly to large and credit-intensive infrastructure projects, which usually take years to complete. The long-term nature of these investments means that their survival requires continued credit infusion, without which there would likely be wide-spread project failures, risking a substantial rise in bank non-performing loans. In order to protect their balance sheets, banks further expanded their off-balance sheet operations and became increasingly reliant on shadow banking to intermediate credit. The success of this policy circumvention was evident in the continued rise in total credit in the economy, despite stable banks' on-balance sheet lending since 2010 (Figure 6).

3. Comparison Between the Chinese and US Shadow Banking System

Shadow banking has been part of the financial system in many countries for a long time. However, these activities are not widely understood until the US subprime crisis, which drew the spotlight on this complex, opaque and interconnected part of the financial system. Given concerns about rising financial risks, many people are drawing parallels between the shadow banking sector in China today and that of the US before 2008. In this section, we provide a historic recount on the development of shadow banking in the US, and compare and contrast it with how the system functions in China.

Shadow banking in the US emerged in 1970s and grew rapidly in the last 40 years. According to Federal Reserve Flow of Funds data, the ratio of off-balance-sheet to on-balance-sheet loan funding grew from practically zero in the early 1980s to over 60% prior to the global financial crisis. Gorton and Metrick (2010) classify US shadow banking activities into three main categories of activities: 1) money market funds (MMFs) that capture retail deposits from traditional banks, 2) securitization that moves assets from banks off their balance sheets, and 3) repurchase agreement (repos) that facilitates the use of securitized bonds as money. We briefly explain each of these activities below.

3.1 Money Market Funds

The first MMF in the US was established in 1971. The catalyst for its creation was a mismatch between short-term interest rates in money markets and controlled rates on banks' saving deposits (Figure 7). This mismatch was primarily a result of two Depression-era banking laws, the Glass-Steagall Act of 1933 and the McFadden Act of 1927 (Borst, 2013).[12] Together, these regulations made banking in the US a highly protective industry, giving it a comfortable monopoly profit.

However, abrupt changes in the macro environment in the 1970s turned the favourable regulations against banks. A sharp spike in inflation in 1973, and again in 1976 and 1978, drove market interest rates significantly above regulated deposit rates. Depositors started to withdraw from banks, investing the proceeds in Treasury securities for higher yields. This behavioural change provided a catalyst for the birth of MMFs, which catered to retail investors to gain exposure in the money and bond markets. Assets managed by MMFs grew rapidly in the late 1970s, reaching 8% of total financial sector assets by the early 1980s. Despite interest rate deregulations in the banking system, inflows to MMFs continued in subsequent decades, as investors were enticed by the interest rate premium offered by MMFs over bank deposits.[13]

3.2 Repos and Securitization

Besides MMFs, a significant part of recent growth in shadow banking in the US can be attributed to the rise of repo and securitization markets. Repo – a form of collateralized short-term lending – has gained popularity among institutional investors in recent decades. Its rapid growth has been facilitated by three factors: 1) increased money under management by institutional investors, who look for safe and short-term investments; 2) favorable bankruptcy treatment that allows repo collateral to be detached from the credit quality of counterparties (i.e. "bankruptcy remoteness"); and 3) a rising need for financing securitization vehicles (Gorton and Metrick, 2012). Today, repo is a major source of funding in the US, and repo interest rates are key monetary indicators for the Federal Reserve.[14]

The securitization market in the US started in the 1970s, with Ginnie Mae selling the first security which was backed by a pool of mortgage loans. Since then, securitization has been applied to auto loans, student loans, credit cards, and a large range of financial assets. The market grew rapidly from the mid-1990s onwards, as the housing market started to accelerate, driven partly by the government's push to increase home ownership (Brandlee, 2011). Banks worked closely with broker-dealers (i.e. investment banks) in developing innovative ways to expand credit creation. This growth

[12] In the 40 years since the Great Depression, the banking industry in the US was a highly protected industry, with tight restrictions on entry/exit, branching across states, and flexibility on setting interest rates for deposits. In particular, Regulation Q of the Glass-Steagall Act prohibited banks from setting deposit rates, as such discretion had led to fierce competition for deposits in the 1930s, resulting in large bank failures.

[13] The fact that MMFs are exempt from capital and reserve requirements and paying deposit insurance allows MMFs to pay higher interests than banks do on saving deposits.

[14] Dang, Gorton and Holmstrom (2013b) provide a model of repo trading.

was also fuelled by the entry of many non-bank entities, such as government agencies (Fannie and Freddie), insurance companies (to provide guarantees on securitized products), ratings agencies (to provide credit assessment), and institutional investors, like MMFs (to provide funding for highly-rated ABSs). However, the relentless rise of the market came to a halt in 2008, following the bursting of the housing market bubble and the subsequent financial crisis. The collapse in asset securitization, in turn, caused the repo market to freeze and inflicted pain on MMFs, setting off contagion throughout the shadow banking system. Whilst a complete collapse was later averted by a rescue by the US government, confidence was severely damaged and calls for an overhaul of the industry were prevalent.

3.3 Similarities and Differences in Shadow Banking between China and US

Comparing the shadow banking activities in China (e.g. WMPs and trust credit) with those in the US (e.g MMFs and securitization), there are important similarities and differences.[15] Both developments were triggered by financial repression caused by interest rate regulations: the trigger for growth of MMFs in the US (i.e. Regulation Q) was indeed similar to that for WMPs in China (i.e. deposit rate ceiling). In addition, WMPs structured by banks invest in interbank money and bond markets, similarly to the MMFs, which invest in highly rated short-term commercial paper and repos.

The desire to circumvent lending and macro-prudential regulations encouraged banks in both countries to develop off-balance sheet operations (e.g. trust loans and securitization). These activities are prone to significant liquidity mismatches (i.e. borrowing short and lend long), and lack the explicit backstop of central banks.[16] All of these make shadow banking systems, in general, more risky than traditional banks.

The fundamental difference of the two systems lies in their structural foundations. In the US, shadow banking activities exist mainly in the capital markets (Figure 9), while the Chinese system has relied more on the backstop of traditional banks (Figure 2). This structural difference has led to different innovations. For example, a large and efficient capital market was needed to support rapidly expanding securitization in the US before the subprime crisis. Given the desire was to amplify returns on tiny spreads, these transactions required complex structure and high embedded leverage. In contrast, shadow banking in China remains a simple conduit for banks to circumvent existing regulations. Transactions, in this regard, require neither complex structure nor high leverage. The lack of efficiency and depth in China's capital markets means that shadow banking has to rely on banks to provide critical intermediation service.

[15] China also has a very liquid and large repo market, interbank lending market and interbank-bond market for wholesale funding.

[16] As both systems have become "too big to fail", implicit guarantee is prevalent. In China, a major liquidity shortage caused by shadow banking activities in mid-2013 prompted the PBOC to intervene to prevent an escalation of tension in the system. In the US, the Fed stepped in after the Lehman failure in 2008 to contain the rapidly spreading crisis caused by shadow banking transactions.

An important consequence of this "bank-centricness" in China is that it creates a widespread risk misperception. Because of banks' active involvement in both financing and structuring shadow banking products, investors who provide liquidity to the system think their investments carry banks' credit guarantee, which make them as safe as deposits. In reality though, these perceptions are misplaced from a legal perspective, as banks mostly serve as non-risk-bearing intermediaries. Further, the misperception of risk is reinforced over time by the absent of hard defaults, as previous failures of shadow banking products have been resolved through shared bailed-ins or bailed-outs involving the originators, banks and in some cases the government. [17]

In the run-up to the subprime crisis, significant risk misperception also existed in the US. Risky subprime mortgage loans were repackaged into AAA-rated investment products, which were sold to highly risk-adverse investors. As it turned out, complex financial engineering failed to transfer risks effectively, but merely hid risks in an increasingly interconnected and complex financial system. But different from China, where risks were masked by the misperceived implicit guarantee from *banks*, the misperception in the US was built on too much faith in the *market*'s ability to transfer and redistribute risk. This difference is a result of the structural differences underneath the two shadow banking systems.

4. A Model of Shadow Banking in China

To deepen our analysis of China's shadow banking system, we develop a theoretical model, building on the concept of "information sensitivity" from Dang, Gorton and Holmstrom (2013, 2013a). We use it to supplement the qualitative discussion above, and to demonstrate the key features of shadow banking in China. The section is structured as follows: 4.1 introduces the concept of information sensitivity and discusses its application for shadow banking; 4.2 and 4.3 illustrate the key drivers of shadow banking activities; 4.4 shows how risk misperception is modelled and discusses its implications, and 4.5 outlines the solutions offered by the model to address such a structural flaw of the system.

4.1 Information Sensitivity as a Tail Risk Measure

Given the importance of "information sensitivity" in our model, we first explain this concept before launching into the application for shadow banking. Consider the two basic functions performed by banks in the economy. On the asset side, a bank provides loans to borrowers. On the liability side, a bank issues debt (demand deposit) as a money-like security for savers to store wealth. Using the

[17] This misperception is perhaps best illustrated using the example of a trust product issued by China Credit Trust (CCT), which nearly defaulted in early 2014. In this case, CCT raised funds from some 700 high-net-worth investors through Industrial and Commercial Bank of China (ICBC) as its distributor. CCT used the proceeds to make a loan to Zhenfu Energy Group – a mining company that was also introduced to CCT by ICBC. The role played by ICBC in both funding and lending was critical for bringing the deal together. But it was also a major source of misperception. At the funding end, investors who bought the trust products from ICBC thought their investment carried the bank's credit guarantee, and hence, contained little risk. At the lending end, since ICBC was involved in arranging the trust loan, CCT believed that the credit risk in the loan was shared between itself and the bank. In reality however, the legal document freed ICBC from any credit risks, given its role as a product distributor.

terminology from Dang, Gorton and Holmstrom (2013, 2013a), we call these bank debts, or demand deposits, "private money", which carry two defining characteristics: i) it is issued by private institutions and ii) savers or investors can easily convert it into cash at par value when needed. In the US, money market funds, repos, and highly-rated senior tranches of asset backed securities are regarded as private money, although the global financial crisis has affected investors' perception of the last category.[18] Similarly, investors in China perceive, rightly or wrongly, WMPs and trust products as equivalent to private money.

To support the creation of private money, originating institutions need to invest and hold assets that are liquid and low in credit risk. Otherwise, the value of debt they issue will not be stable enough to be regarded as private money. This is, in our view, precisely the issue facing shadow banking in China, as financial entities invest in risky assets but issue liabilities that are widely seen as risk-free. To analyze the way in which shadow banks create private money, we need an economic model that explains the dynamic interaction between assets (loans to firms) and liabilities (demand deposits) on their balance sheets.

We use the concept of "information sensitivity" introduced by Dang, Gorton and Holmstrom (2013) as a measure of tail risks in our model. Loosely speaking, an institution that finances risky projects has "information-sensitive" assets on its balance sheet. These assets are, in turn, used as collaterals to back its liabilities. Therefore, if the collateral is intrinsically information-sensitive so are the liabilities. In such a case, the value of private money (i.e. the liabilities it issues to investors) becomes volatile, and investors might not be able to withdraw it at par value.[19]

To formally imbed "information sensitivity" in our model, consider a financial instrument or security with payoff s(x), which is backed by an underlying asset x with payoff distribution function F(x) and density f(x) with positive support on the interval $[x_L, x_H]$. If s(x) is debt, then s(x)=min[x,D] where D is the face value of debt and x the underlying cash flow of the backing project or issuing firm. Dang, Gorton and Holmstrom (2013, 2013a) define the information sensitivity π_L of a security s(x) as:

$$\pi_L = \int_{x_L}^{x_H} \max[\, p - s(x), 0] \cdot f(x) dx$$

where p is the market price of the security. π_L measures the expected loss of a security in low payoff states. To see this, suppose an agent buys s(x) at price p or deposits the amount p at a bank as demand deposit. If s(x)<p (i.e. he is only repaid less than his deposit) he makes a loss of s(x)-p.

[18] Technically speaking, cash or bank notes are money. Other securities with stable value are typically called private money. For example, banks create private money (demand deposit) under regulatory oversight and deposit insurance while shadow banks create private money (e.g. MMF shares), without official oversight and deposit insurance.

[19] In contrast, investments banks and equity mutual funds typically holds more information-sensitive assets since the creation of private money is not the objective of these institutions. Instead, these vehicles provide risk sharing and long-term investments opportunities with more risks and higher expected returns.

Integrating over all states x where s(x)<p yields the expected loss of the security or the deposit. Appendix A1 provides a numerical example.

Figure 10 depicts the information sensitivity of a debt security, which we can treat it as equivalent to a WMP (or trust product). On the liability side of the issuer, i.e. $s^{WMP}(x)=\min[x,D]$ where $D=p*(1+r)$ is the repayment of principal plus interest (see Figure 10(a)). This liability, $s^{WMP}(x)$ is backed by some asset x on the asset side. The payoff of the underlying collateral x can be described by the distribution function F(x). Figure 10(b) depicts three different projects x that backs the WMP. If the principal plus interest D is guaranteed then this is equivalent to assuming that the backing asset x has a minimum payoff of $x_L>D$ or f(x) is only positive on $[D,x_H]$. (See (blue) density $f_1(x)$ in Figure 10(b)). If only the principal is guaranteed then $f_2(x)$ is the density of the payoff of the underlying asset that backs the WMP and has only positive support on $[p,x_H]$. If $f_3(x)$ has positive density on the interval $[0, x_H]$, then the WPM has default risks. The triangle π_L in Figure 10(a) is the information sensitivity of the WMP or the expected loss in low payoff states. Note, if there is no positive density for x smaller than p, then the value of the triangle is zero and the principal of the WPM is safe. So information sensitivity is a tail risk measure.

Dang, Gorton and Holmstrom (2013, 2013a) show that π_L is also the value of information. Suppose an agent can learn about the true realization of x at information cost γ before making his decision to buy the bond (or put his money in a demand deposit or invest in WMP). If $\gamma<\pi_L$, i.e. information cost is smaller than the expected loss the agent can avoid by learning, then the agent will acquire information and does not deposit when knowing s(x)<p, i.e. his money is not safe at the bank.

4.2 Economic Forces that Drives Shadow Banking

The model we employ here is a simplified version of Dang, Gorton, Holmstrom and Ordonez (2014) enriched with specific elements that tailor towards Chinese shadow banking. Consider a bank that obtains deposit of the amount w at t=0 and gives a loan of w to a firm that invests in a long term project which pays off x at date t=2 and the payoff distribution is F(x).[20] At t=1, the first depositor wants to withdraw w from the bank. Since the fund is lent out, the bank needs to attract a new depositor at t=1. A bank will only be able to obtain a second deposit of w if new depositors are willing to deposit. This depends on the information sensitivity of the asset of the bank holds in supporting its liability. Suppose the information sensitivity is π_L and depositors can learn about the bank at the cost γ before depositing. If $\gamma<\pi_L$, the second depositor has an incentive to learn about the bank. When obtaining information that the payoff of the asset is low he does not deposit which means the first depositor cannot withdraw. Anticipating this, the first depositor either demands for a higher interest rate or refuse to deposit. In order to avoid information production by late depositors, the loan must be information insensitive. Loosely speaking, we can also interpret π_L as a measure of "suspicion". If π_L is

[20] More realistically, the bank invests in a portfolio of assets and loans and F(x) is the joint distribution of the payoffs of the assets.

larger than a threshold value γ then depositors have more reason to become concerned about how safe their deposits would be. We enclose the proofs of all results in Appendix A3.

Proposition 1

A commercial bank holds a portfolio of assets (i.e. finance projects) such that its information sensitivity $\pi_L \leq \gamma$.

Proposition 1 shows that stable banking requires the information sensitivity of banks' loan portfolio (i.e. assets) to be smaller than a critical value γ. Conversely, risky projects with $\pi_L > \gamma$ will not be financed by commercial banks, all else equal. The model captures two stylized facts in China: (i) commercial banks prefer to lend to state-owned enterprises, since these loans have low information sensitivity because of the implicit government guarantee.[21] (ii) Since loans to private-sector businesses have higher information sensitivity per unit capital, banks are less inclined to lend to these companies.

Proposition 1 also applies to MMFs and securitization vehicles in the US. Rather than directly providing loans to firms, MMFs hold high quality bonds and assets with low information sensitivity. Similarly, securitization vehicles repackage a pool of loans and create senior tranches of low information sensitivity. In a sense, these are quasi banks that create private money that are backed by risky assets.

In addition to the natural behavior of banks, the existence of credit restrictions in China further constrains credit to private-sector businesses.

Corollary 1.1

Lending quota magnifies the shortage of funding for borrowers.

Proposition 1 shows that banks have an endogenous incentive to restrict borrowing to risky firms. Because of information sensitivity concerns, banks lend out an amount L, and the marginal project that obtains funding is $\pi_L \leq \gamma$. If L is larger than the loan quota Q, then some projects that banks would otherwise finance will not get funding. So a loan quota increases excess demand for funds. See the numerical example in Appendix A1.

In most developed economies, borrowers have a choice of financing directly in the capital markets or indirectly via intermediaries. In China, the public bond markets are under-developed with thin liquidity, while the financing capacity of the equity markets is constrained by structural impediments (Allen, et.al

[21] Although the big four commercial banks are government backed so that savers are less concerned about their deposits, high-ranked bankers might be still reluctant to have risky loans on the balance sheet because of career concerns. Smaller banks are intrinsically concerned about information-sensitive assets on their balance sheets because of potential bank runs.

2014). Small companies in the private sector are also shut out of banks, leaving them no choice but to rely on shadow banks for financing.

4.3 The Demand for Information Insensitive Products and Shadow Banking As a Bank-Centric Phenomenon

The previous section discusses, from *borrowers'* perspective, how demand for shadow banking has risen, given the existing regulations and underdeveloped capital markets. For investors of shadow banking products, they are looking for safe and liquid investments that can preserve the value of their savings. Most buyers of WMPs and trust products expect their investment to be redeemable at par value (i.e. information insensitive), but carry yields higher than bank deposits.

Proposition 2

Suppose investors are looking for information insensitive financial products and the information sensitivity of a product is $\pi_L > 0$*. A sufficient condition for* $\pi_L^{Investor} = 0$ *is that a credit guarantee is provided.*

In order to create a product with low or even zero information insensitivity that is backed by risky assets a credit guarantee must be provided. We use Figure 10 to illustrate Proposition 2. Consider a trust product s(x) is backed by cash flows x of a project. For a realization of x with x<p, the investor suffers a loss of p-s(x). Integrating all low payoff states the trust product has $\pi_L > 0$. See the red distribution F_1 in Figure 10(b). Now suppose the seller has assets in place denoted y with payoff distribution F(y) and provide a guarantee. The payoff of the trust product is s(x+y). If s(x+y) $\geq$ p for all x, then the principal payment is safe. This is equivalent to the green distribution F2 where s(x) is replaced by s(z) and z=x+y. If the seller also covers interest payments then this is similar to the blue distribution F3 where s(x+y)=D for all x. This can be modelled by the (red) distribution F3 by replacing s(x) by s(z) where z=x+y. Even if the project does not have enough resources to repay the loan (i.e. x<D), investors do not suffer a loss since the guarantor will cover the amount D-s(x) using its assets y.

Corollary 2.1

Since state-owned banks are one of the few entities in China that can provide a credible guarantee to shadow banking products, their involvement is critical for the functioning of the system.

In China, the big four state-owned banks are perceived as risk-free, because they are majority-owned by the government and have the central bank as a liquidity backstop. In contrast, shadow banks, such as trust companies, are much smaller, less well-known, and carry little credibility with the public. To produce information insensitive liabilities with risky assets, shadow banking entities need to reply on banks to provide credit guarantees, explicitly or implicitly, in order to successfully raise funds from

investors.22 However, as we show next, these credit guarantees are mostly non-contractual, building purely on a misperceived faith of banks' unconditional backstop.

4.4 Shadow Banking Based on the Asymmetric Perception of Information Sensitivity

In this section, we formalize the notion of asymmetric perceptions of information sensitivity and argue that the rapid growth of shadow banking is partly driven by this misperception. For most trust products and WMPs, banks simply provide a distribution service, and have no legal obligation to shoulder any credit risks. The involvement of banks as non-risk-bearing intermediaries does not alter the information sensitivity of these products. However, the extensive involvement of banks in structuring and distributing the products creates the misperception that credit guarantees have been provided.

Proposition 3

Suppose the information sensitivity of a trust product is $\pi_L^{Trust} > 0$. *In an equilibrium, with asymmetric perception of information sensitivity between banks and investors,* $\pi_L^{Bank} = \pi_L^{Investor} = 0$ *and the trust product is sold.*

This is one of the main results of the model. Proposition 3 shows that if a financial product is backed by information sensitive projects, and sellers do not provide explicit credit guarantees, for a trade to occur with buyers looking for information insensitive investments, there must be an asymmetric perception of tail risks. In contractual terms, since banks are not liable for default, selling trust products does not affect the information sensitivity of their own balance sheets. The information sensitivity of the trust product for banks is $\pi_L^{Bank} = 0$. On the other hand, investors believe that banks will bail out the trust product in case of default, so $\pi_L^{Investor} = 0$. Since both parties care about information sensitivity, trade can only occur if there is an asymmetric perception.

Corollary 3.1

If banks and investors had consistent beliefs, then $\pi_L^{Bank} = \kappa\pi_L^{Trust}$ *and* $\pi_L^{Investor} = (1-\kappa)\pi_L^{Trust}$ *where* $\kappa \in [0,1]$ *denotes how banks and investors share information sensitivity.*

Corollary 3.1 states that, irrespective of risk perception, the information sensitivity of a shadow banking product does not vanish. What is affected by the misperception is who bears that risk. If $\kappa = 1$, i.e. banks provide a credit guarantee by bearing full default risks, then investors obtain an information insensitive asset. But if banks are no liable ($\kappa = 0$), then $\pi_L^{Investor} = \pi_L^{Trust}$ and investors

22 In contrast, MMFs and ABCPs and other senior securitized products are also sold by non-bank institutions.

become the risk bearers. Figure 11 provides a visual illustration. Suppose an investor deposits the amount p, and the bank provides guarantee of the amount k and thus bears an expected loss π_L^{Bank} equals to the red triangle. In states where x<k, bank has to pay the investor k and makes a loss of k-x. For k<x<D where D represents interest and principal payment, the investor obtains x. If x<p, then the investor faces a loss of p-x. So the expected loss $\pi_L^{Investor}$ is the green shaded area. If k=p, the principal payment is guaranteed. Note, irrespective of how information sensitivity is shared, the total information sensitivity is $\pi_L^{Bank} + \pi_L^{Investor} = \pi_L$ (the blue triangle).

We provide three prominent examples in China and the US to highlight the economics of asymmetric perception of information sensitivity in Appendix A2. In our view, this is a critical mechanism that has driven fast growth of shadow banking in China. However, growth built on such risk misperception is not sustainable. Should defaults in the shadow banking system rise, risks will emerge one way or another, inflicting pains on either investors (under a no-bailout scenario), banks (under a bailout scenario) or a combination of the two (under shared bailouts). The question then becomes how to make the system more sustainable by eliminating this asymmetric perception of risks. Our model offers some practical suggestions, which are discussed next.

4.5 Towards More Transparency of Tail Risks and Market Based Shadow Banking

In a quick recap of the model results, our framework of information sensitivity successfully captures a number of stylized facts of shadow banking in China. First, commercial banks bias their (on-balance sheet) lending to risk-insensitive projects and companies, creating a funding shortfall for risky borrowers in the private sector. This discrimination is made worse by the existence of credit restrictions in the banking system and an underdeveloped capital market. Second, investors, who are investing in shadow banks products, are looking for information-insensitive investment, equivalent to bank deposits, but offer higher yields – unconstrained by the interest rate regulation. Since yields on shadow banking products are largely market driven, the expansion of the system yields a de facto contribution to interest rate liberalization. Third, because the assets invested by shadow banks are intrinsically risky, while the liabilities they issue are supposed to be "information-insensitive", credit guarantees need to be provided. We argue that banks are the only institutions in China that are capable and credible enough to provide such guarantees.

However, as we observe from a number of failed instances (see Appendix A2), this credit guarantee is nothing more than a perceived dilution on the part of investors. The final proposition of the model suggests that it is precisely this misperceived credit guarantee that creates an asymmetric perception of risks in the shadow banking system. This misperception has prevented risks from being properly priced and distributed, making the shadow banking system non-transparent and unsustainable in the long run.

The solution for the risk misperception is to realign expectations among different parties: investors, banks, shadow banks and borrowers. This can be done in one of two ways. First, banks can take the shadow banking assets back on balance sheets, and start to provide genuine credit guarantees. This will essentially equalize shadow banking products to bank deposits in terms of information sensitivity, substantiating their role as "private money". Such a move would help to realign risk expectations, but at the expense of reducing the diversity of credit intermediation, as banks would once again dominate financing in the economy. Moreover, the reversal of shadow banking could reduce funding availability to SMEs, and without relaxing regulatory controls, interest rate liberalization could be backtracked.

Given these undesirable consequences, we think a more proper way to address risk misperception involves fundamentally changing the structure of the shadow banking system. This involves transforming shadow banking from being a de-facto part of the banking system to one that relies on the capital markets. Under a market-based framework, it will be the mechanism – built on the collective wisdom of investors, analysts, rating agencies and regulators – that performs the role of investment selection, price discovery and risk allocation. Our model offers some interesting insights on this transition:

Proposition 4

Suppose investors are aware that shadow banking product are information sensitive and they bear default risks. The more information sensitive the product the higher the expected return.

Information sensitivity is a new measure of tail risks. Proposition 4 links information sensitivity to expected return and shows that if agents are risk averse, they demand higher expected return for bearing higher information sensitivity.[23] If shadow banking products are traded without explicit guarantees, investors need to know the information sensitivity of the products so as to determine the risk-adjusted expected return. An important practical implication of the proposition is that market participants need institutions to determine the information sensitivity of tradable securities.

Corollary 4.1

Market participants need (credible and independent) institutions to determine the information sensitivity of shadow banking products.

Shadow banking has a rather simple structure in China: banks issue WMPs or sells trust products that are backed by specific projects. All investors receive pro-rata payments from incoming cash flows. Through tranching, shadow banking can distribute tail risks more efficiently to investors who are more willing to bear them by obtaining higher expected returns.

[23] Dang, Gorton and Holmstrom (2013a) show that information sensitivity is not ranked correlated with variance and skewness. A security with higher information sensitivity can have lower variance and vice versa.

Corollary 4.2

Tranching can provide a better information sensitivity-return profile and more investment products to investors, i.e. $\pi_L^{Bank} + \pi_L^{riskaversInvestor} + \pi_L^{risktolerantInvestor} = \pi_L$.

We can interpret Proposition 3 as representing the current Chinese shadow banking model and Corollary 4.2 as the US securitization model. Issuers pool risky loans, tranche them and sell different tranches with different information sensitivities to investors with different risk bearing capacities. Investors looking for low information sensitive assets purchase the senior tranche while more risk tolerant investors buy the junior tranche or residual equity part.[24] However, the financial crisis has highlighted some weaknesses along the securitization process. If China is moving to a market based system of risk distribution potential conflicts of interests need to be addressed and corrective mechanisms need to be established.

5. Concluding Remarks

The rapid rise of shadow banking in China is an integral part of the overall financial transformation, and has brought profound changes to how credit is priced and allocated in the economy. Its expansion has increased the diversity of the financial system, meeting the credit demand of those who have no access to bank loans or capital markets, and expedited the process of interest rate liberalization. However, recent instances suggest that shadow banking also contains significant risks, induced by structural flaws in the system design. These flaws need to be addressed by future reforms in order to redirect the system onto a more sustainable path.

This paper is the first to our knowledge that provides a systematic discussion of the nature and characteristics of shadow banking in China. Our analysis suggests that the rise of the system has been closely associated with the collective desire of banks, shadow banks, investors and borrowers to circumvent existing interest rate and credit regulations. By structuring operations off-balance sheet, banks can bypass loan quota and macro-prudential rules to expand lending capacity. Investors have benefited from the rise of shadow banking products, which widen the investment choices for their savings. For small companies in the private sector, shadow banking credit provides them the necessary liquidity needed to sustain business at a time when bank loans are difficult to obtain and direct financing in capital markets is unavailable. Finally, non-bank entities, such as trusts, insurance companies and brokerage houses, have been drawn into shadow banking activities by profit motivations.

Besides the desire to circumvent regulations, rapid growth of shadow banking in recent years has been closely associated with the government's massive stimulus following the global financial crisis.

[24] In addition, ABS insurers (such as Monoline insurers) provided further credit insurance. However, most private ABS insurers went bankrupt during the financial crisis.

Our analysis suggests that shadow banking credit has grown substantially since 2009, playing a key role in complementing the banking system for sustaining credit growth in the economy. The desire for financial system reforms, via bank deregulation and interest rate liberalization, also granted shadow banking the official endorsement for its subsequent flourish.

Our comparative analysis of shadow banking in China and the US suggests that circumventing regulations, which led to rapid growth in China was also a key driver of similar activities in the US. The existence of interest rate controls, known as Regulation Q in the 1970s, gave rise to MMFs, in much the same way as the deposit ceiling drove growth of WMPs in China. In addition, securitization was used as a tool by US banks to circumvent various macro-prudential restrictions, similar to how Chinese banks use trust credit to expand lending off-balance sheet.

However, there are also structural differences underneath the two systems. In the US, shadow banking activities, such as securitization and MMFs, mostly take place in the capital markets. Banks are important participants in these activities, but they are not critical to the functioning of the system. In contrast, shadow banking in China relies critically on the services provided by banks to perform credit intermediation. Without the active involvement of banks in many basic functions, such as liquidity provisioning, product distribution, credit guarantee and investment recommendation, shadow banking would not have reached its scale and significance today.

The second important difference is how the shadow banking sectors create “safe” assets and distribute risks. In the US, MMFs invest in high quality assets, while securitisation vehicles repackage loans, and generate “safe” assets through financial engineering. The latter however was proven a mirage by the subprime crisis in 2008. In China, shadow banking products are much simpler in structure, as many products are backed by direct business loans without complex financial engineering. What has made these intrinsically risky products “safe” is a widely *perceived* credit guarantee from banks on the part of investors. However, these perceptions are misplaced from a legal perspective, because banks, in most cases, are not contractually liable. Overall, we argue that shadow banking risks in China are hidden by the misperceived implicit guarantee from *banks*, while the “misperception” in the US was built on too much faith in the *market*’s ability to redistribute risks.

Our notion of risk misperception is substantiated by our theoretical analysis building on the concept of “information sensitivity” – a measure of tail risks from Dang, Gorton and Holmstrom (2013). Our model captures a number of unique characteristics of shadow banking in China and reveals some novel insights.

First, we are able to show that the existence of credit and interest rate regulations has exacerbated the bias of banks to lend to low-information-sensitive borrowers, such as state-owned enterprises. This, coupled with underdeveloped capital markets, forces credit-starved private businesses to seek funding from shadow banks. Second, investors of shadow banking products are looking for low-information sensitive investment, akin to bank deposits, but whose interest rates are not constrained

by the deposit ceiling. This naturally creates a conflict of risks between the assets held by shadow banks (i.e. loans to SMEs are risky) and the liabilities they issue to investors (which are supposed to be information insensitive). Our model shows that this conflict can be rectified through a provision of credit guarantee, which can only be performed in a credible way by large commercial banks. This, in our view, is the key reason why growth in shadow banking has been so reliant on the involvement of traditional banks. However, this perceived credit guarantee from banks in most cases is a mere delusion, without legal supports. The resulted risk misperception represents a critical structural flaw that hinders the sustainability of the shadow banking system.

Finally, our model offers two practical solutions for realigning the asymmetric perception of risks. First, banks can bring shadow banking assets back on balance sheets, and start to apply genuine credit guarantee, consistent with what is expected of them by investors. The problem of this is that the shadow banking system will likely shrink dramatically, as resources flow back to banks. This could reduce the diversity of the financial system and may affect credit financing for private-sector businesses. The second, and a more desirable, solution is to transform China's bank-centric system to a market-based system, similar to that in the US. Once completed, risks in shadow banking would be priced and distributed collectively by all participants in a more transparent manner. This transition should help to make shadow banking in China more sustainable, improving its ability to price and distribute risks.

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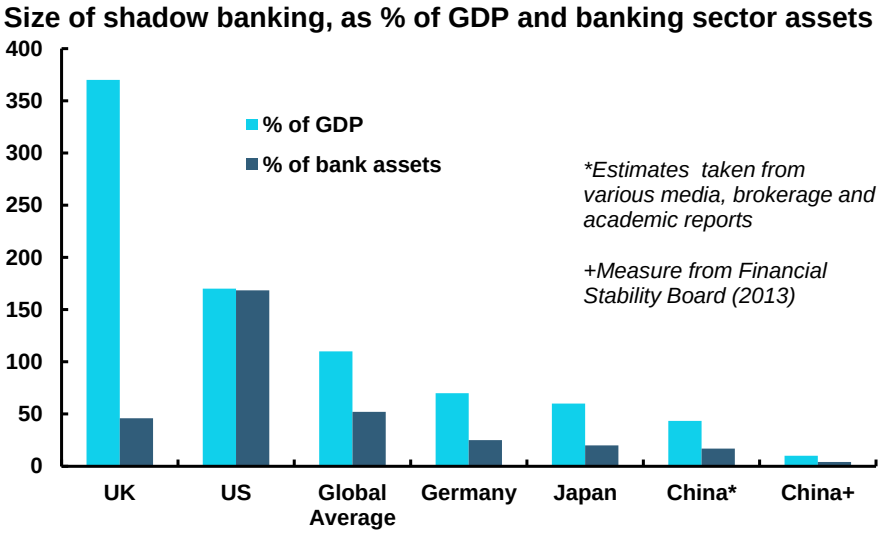
Figure 1. Shadow Banking Industry across Countries (2013)



Source: FSB (2013), various sources and CEIC.

Figure 2. The Structure of Chinese Shadow banking

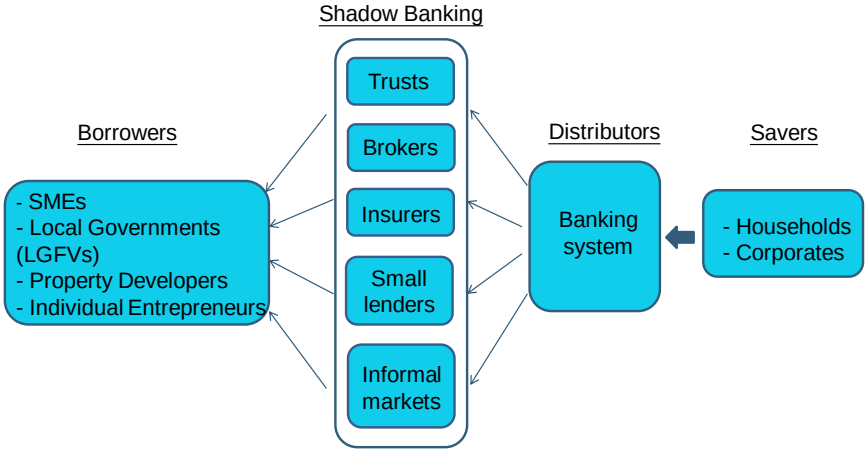
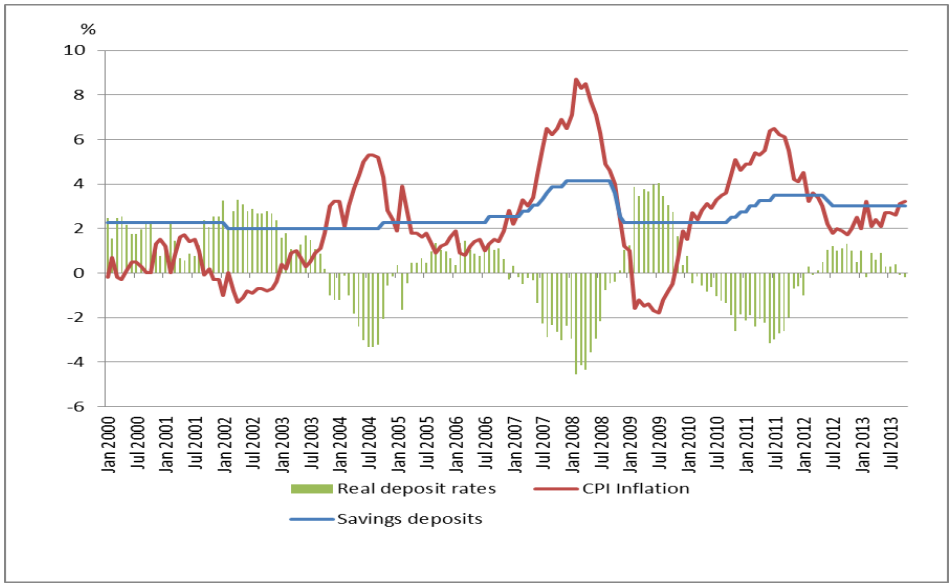
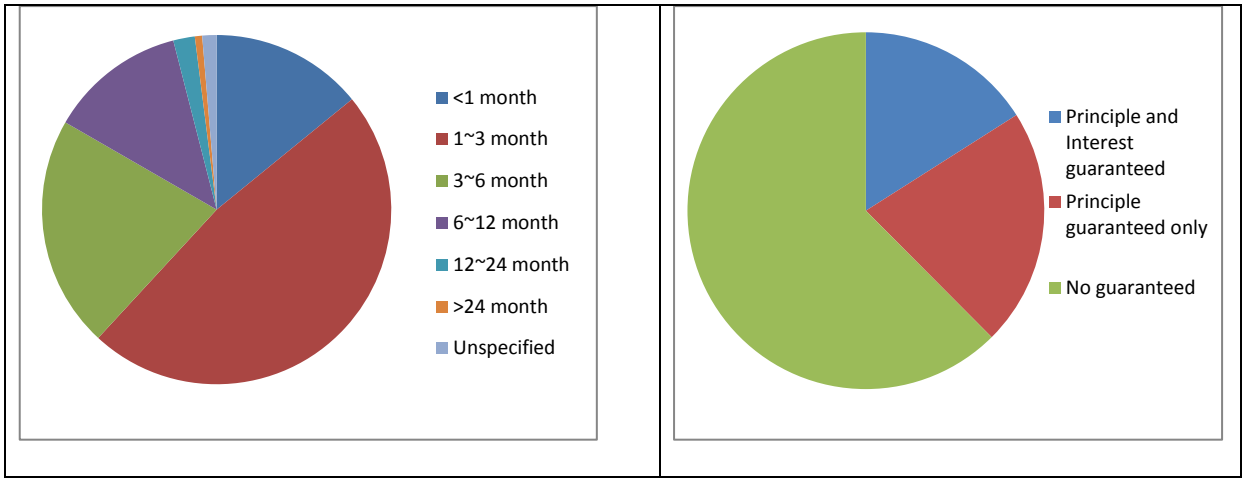


Figure 3. Deposit Rates and Inflation in China



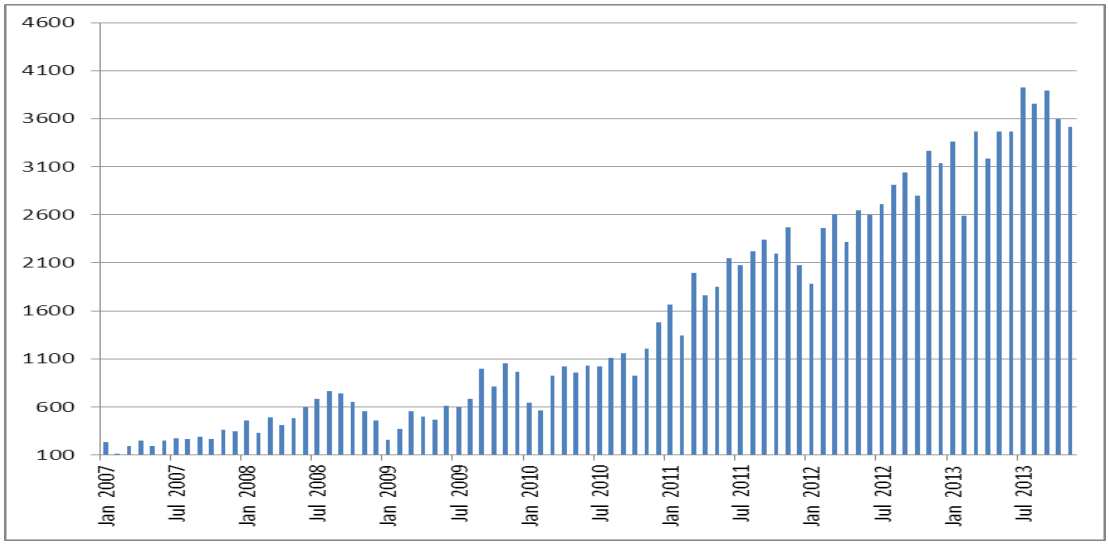
Source: CEIC

Figure 4. The Distribution of WMPs by Maturities and Types (2013)



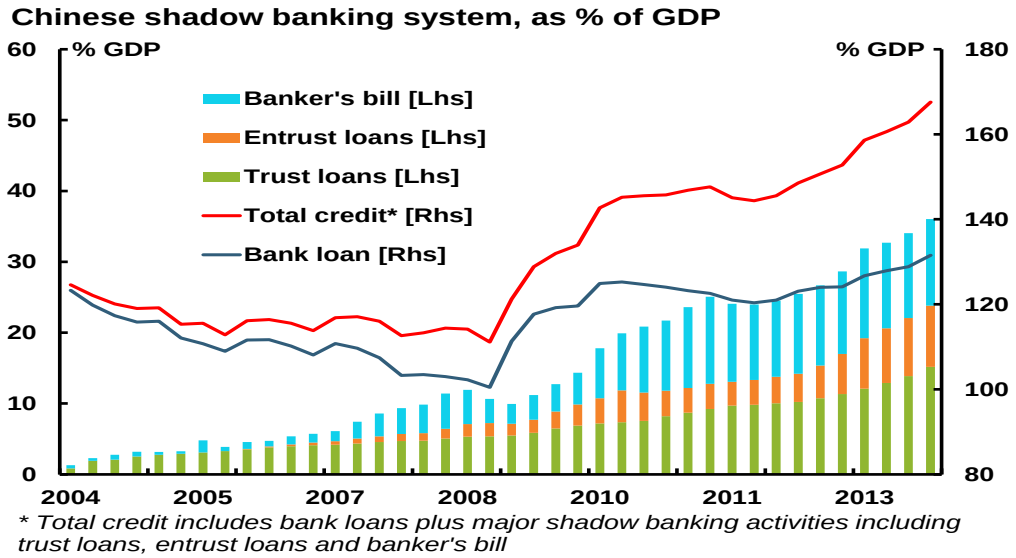
Source: WIND

Figure 5. Bank-Sponsored WMP Issuance



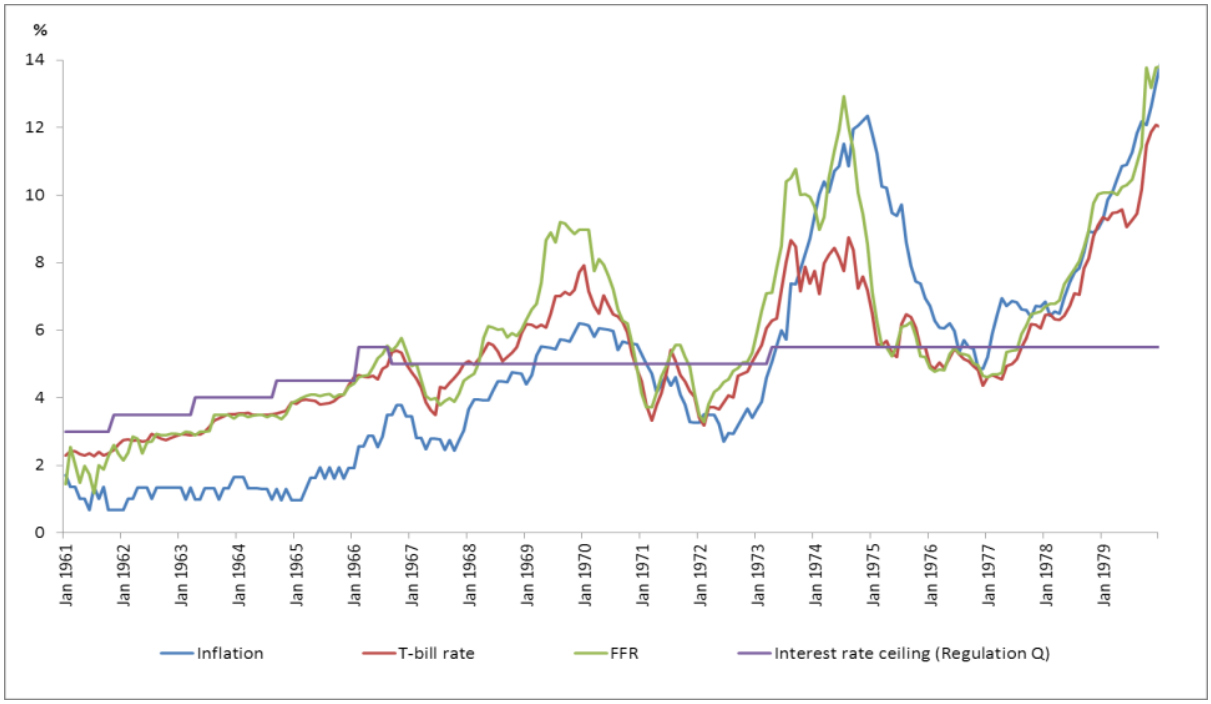
Source: WIND

Figure 6. Total Credit Growth versus Loan Growth



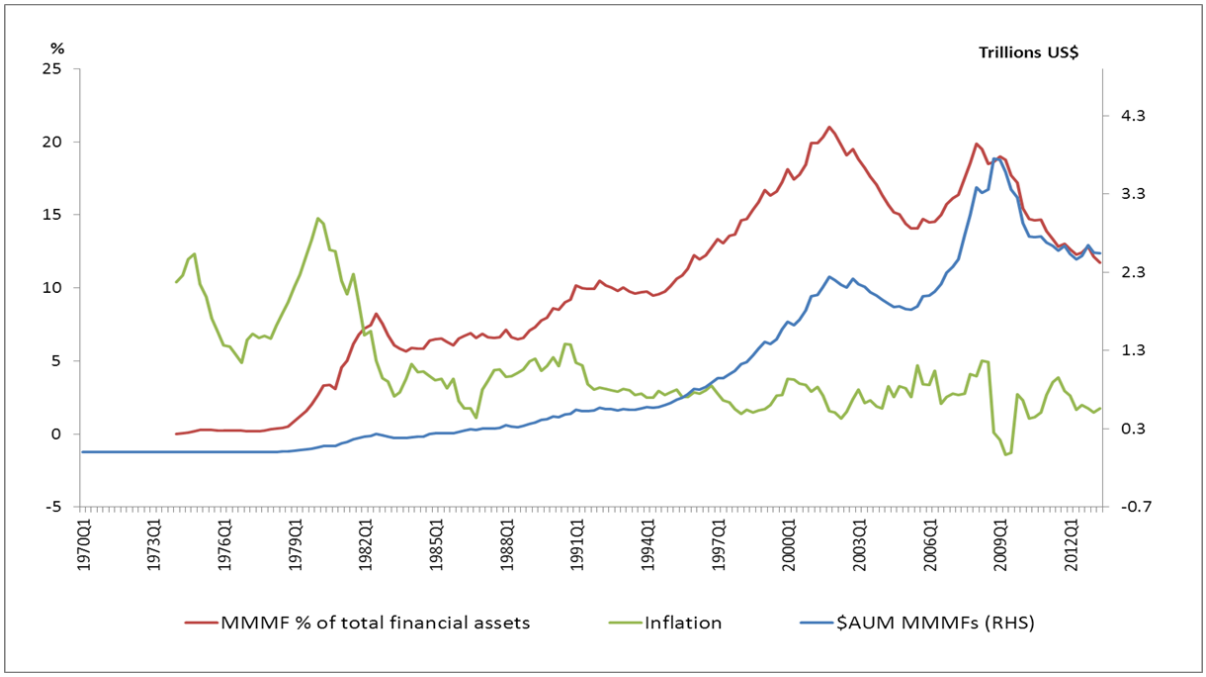
Source: Bloomberg and CEIC

Figure 7. Interest Rates and Inflation in the US before 1980s



Source: Bloomberg and CEIC

Figure 8. Money Market Fund and Inflation in the US



Source: Bloomberg

Figure 9. The Structure of Shadow Banking in the US

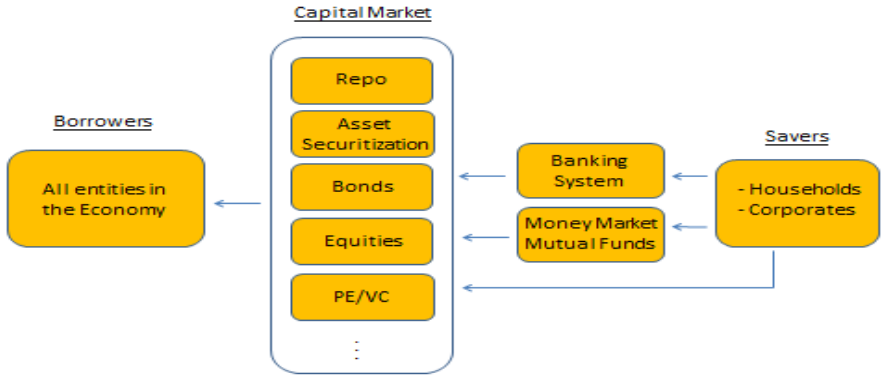


Figure 10. Information Sensitivity of WPM

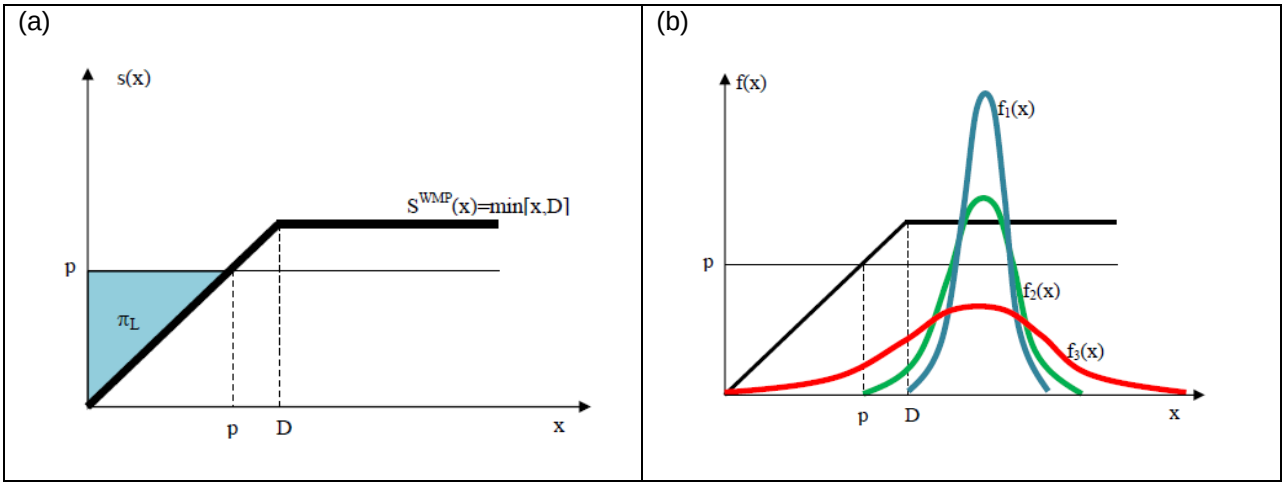
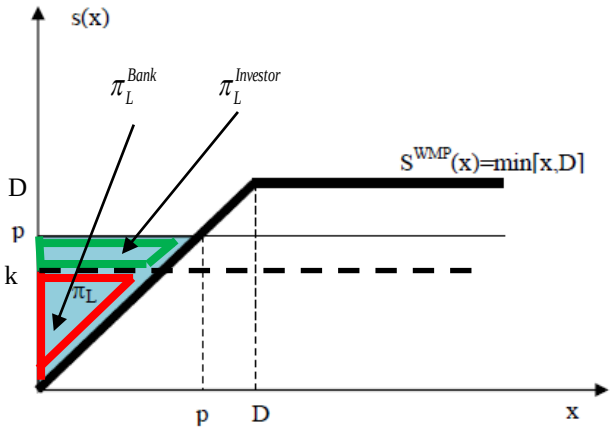


Figure 11. Information Sensitivity Sharing



Appendix

A1. Numerical Examples

Example 1 (Information sensitivity of a single project)

We show how to calculate the information sensitivity of a security. Consider a debt contract with price p=$10 and face value D=$12, i.e. $s^D(x)=\min[0,12]$ and the backing asset x is uniformly distributed between [0,40]. The expected loss of this bond (uninsured demand deposit) is $1.25 since the information sensitivity is

$$\pi_L = \int_0^{40} \max[10-\min[x,12],0]\cdot \tfrac{1}{40}\,dx = \int_0^{10} (10-x)\cdot \tfrac{1}{40}\,dx + \int_{10}^{40} 0 = \tfrac{1}{40}[10x - \tfrac{1}{2}x^2]_0^{10} = \tfrac{50}{40}.$$

If a risk neutral agent can learn about the realization of x before deciding whether to buy the bond, he will do that if the cost of information is less than $1.25. Note, if the agent know x and when x<$10, he does not buy the bond. In expectation, with information he can save a loss of $1.25 and this is what he is willing to pay for information.

Example 2 (Information sensitivity of a loan portfolio)

Consider an economy with two dates (t=0,1,2) and two equally likely states (s_1, s_2) at t=2. The bank can invest in a safe asset and two potential projects with the following cash flow at t=2. The risk free rate is normalized to zero.

	s_1	s_2	Investment amount
Asset	1	1	1
Project 1	0.5	2	1
Project 2	0.4	2.1	1

$\pi_L(\text{Asset}) = 0$, $\pi_L(\text{Project1}) = \frac{1}{2}(1-0.5) = \frac{1}{4}$, $\pi_L(\text{Project2}) = \frac{1}{2}(1-0.4) = \frac{3}{10}$

$\pi_L(\text{Asset}+\text{Project1}) = \frac{1}{2}(2-1.5) = \frac{1}{4}$, $\pi_L(\text{Asset}+\text{Project2}) = \frac{1}{2}(2-1.4) = \frac{3}{10}$

$\pi_L(\text{Project1}+\text{Project2}) = \frac{1}{2}(2-0.9) = \frac{11}{20}$, $\pi_L(\text{Asset}+\text{Project1}+\text{Project2}) = \frac{1}{2}(3-1.9) = \frac{11}{20}$

A2. Examples of Asymmetric Perception of Information Sensitivity

Example 1 ("Credit Equals Gold No.1")

As discussed in footnote 18, China Credit Trust raised RMB 3 billion through a trust product called "Credit Equals Gold No.1" in 2011, which was sold to 700 high net worth investors through the private banking arm of Industrial and Commercial Bank of China (ICBC). Most investors believed they were buying something with an implicit guarantee from the bank. There is anecdotal evidence that local bank branch managers told investors that the product was safe. The funds raised by the trust product were channelled to Zhenfu Energy company for new projects in coal mining industry in the Shanxi province and the product promised investors a yield of 10 per cent in the next three years. However, in the end of 2013, it became clear that the Zhenfu could not pay 3 billion back to the trust company due to deteriorating profits in the coal mining industry. The market became nervous when ICBC refused to bail out. Under this intense glare, the China Credit Trust announced at the last minute that it had reached an agreement with an unnamed third party to sell its shares in Zhenfu so that investors could be offered a deal to recoup their principle but not the remainder of their third year's interest payment. With the product yielding 10 per cent in the first two years, only three per cent interest was paid in the final year.[25]

Example 2 (Yu'E Bao)

Before the internet giant Alibaba entered the money market funds (MMF) business in June 2013, the MMF sector was small and did not attract many retail investors. After Alibaba acquired about 51% of the MMF provider Tian Hong and offered MMF types of products through YuE Bao, these investment products sold online gained huge popularity with YuE Bao' total asset under management blooming to RMB500 billion by the end of February 2014. Our theory suggests that this was partly driven by the misperception that these investments were safe. Since Chinese consumers and investors are familiar with Alibaba and its online market place, they implicitly assume that, in the case of default, Alibaba will bail out the failed investments products because of reputational concerns. Furthermore, investors have information about the financial strength of Alibaba that it is able to rescue any failed product although legally Alibaba does not provide any credit guarantees.

Example 3 (Agency MBS)

To some extent, such implicit guarantees or asymmetric perception of tail risks were also observed in US shadow banking. Ginnie Mae is the only mortgage-backed securities (MBS) issuer with explicit government guarantee. Although there were no such guarantees for Fannie Mae and Freddie Mac

[25] It is interesting that it was not ICBC that bailed out the product but by an undisclosed unknown third party. If the regulatory authority is to set the precedent case that banks are liable this is likely to affect the business model of selling trust products through banks and in the consequence lending to the real economy. If a bank is (fully) legally liable for default, it might be reluctant to sell trust products with high information sensitivity. On the other hand, if the government itself bailed out the product, banks might have excessive incentive to sell trust products.

before the financial crisis, MBS investors seemed to have implicitly assumed this. As long as the market is functioning well and there were no defaults of the AAA rated Agency MBS tranches, investors may have no reason to question that MBSs were information insensitive. When the losses of Fannie and Freddie accelerated as housing prices continued to decline, the US government took both enterprises into conservatorship in early September 2008 and provided explicit guarantees so as to avoid a potential collapse of the primary and secondary Agency MBS markets (FHFA, 2008). After the financial crisis, the private sector of MBS issuance basically disappeared which suggests that investors looking for information insensitive products do not believe that private labeled MBSs are information insensitive anymore.[26]

A3. Proofs

Proof of Proposition 1

This proposition is similar to Proposition 3 in Dang, Gorton, Holmstrom and Ordonez (DGHO 2014) while employing more general distributional assumptions. Suppose a bank obtains deposit of w at t=0 and gives a loan to a firm that invests in a long term project which pays off x at t=2. At t=1, the first depositor withdraws w from the bank. Since the fund is lent out, the bank needs to attract a new depositor at t=1. A bank will only be able to obtain new deposits if new depositors will deposit. This depends on the information sensitivity of the asset of the bank. In particular, if $\pi_L > \gamma$ (i.e. information cost), the second depositor will try to learn something about the bank. If he obtains information, that the value of the asset x is smaller than the amount he deposits then he does not deposit and the first depositor cannot withdraw. Anticipating this at t=0, the first depositor does not deposit or ask for a higher interest rate which leads to higher borrowing costs for firms. For a complete proof see DGHO 2014.

In order to highlight the intuition, consider Example 2. Suppose the risk free rate is normalized to zero. Assets are long term projects and only payoff at t=2. There is no interim payments at t=1. Suppose the first depositor deposits RMB1 with the bank at t=0. The bank invests RMB1 the safe asset. At t=1, the second depositor decides whether to deposit RMB1 with the bank. If he knows the asset is safe he will deposit and the bank has RMB1 for the first depositor to withdraw. If the bank has invested in project 1 instead, then the deposits are information sensitive since $\pi_L(\text{Project1}) = \frac{1}{2}(1-0.5) = 0.25$. Suppose the information cost $\gamma = 0.26$ then the second depositor will not try to learn about the bank and is willing to deposit. So the first depositor can withdraw RMB1. If project 2 is the only project the bank can fund then the second depositor will learn about the bank before making his depositing decisions since $\gamma = 0.26$ <

[26] Similarly, the market for ABCPs exhibits such features. Despite their off-balanced sheet characteristics banks provide credit guarantees. See Acharya, Schnabl and Gustavo (2013).

$\pi_L(\text{Project2}) = \frac{1}{2}(1-0.4) = 0.3$. In state 1 the second depositor does not deposit. This means the first depositor cannot always withdraw. So the first depositor does not deposit RMB1 with the bank at t=0 so there might be no funds for funding projects.

Proof of Corollary 1.1

Suppose there is no lending quota. The loan portfolio of a bank consists of projects such that the information sensitivity of the portfolio is $\pi_L^{Portfolio} = \gamma$. Without loss of generality, suppose the projects financed 1 to N project and the N project is the marginal project that the bank is still willing to finance. Suppose the total amount of lending is L. If there is a lending quota Q and L>Q, then the first project that will not be financed is the project N. The bank will cut back projects and only finances N-k projects such that total lending is Q. A lending quota reduces the total number of projects that get finance by k.

We use Example 2 above to highlight the proof. If $\gamma \geq 0.3$, then the bank finances both projects and provide total loans of L=2. If the loan quota is Q=1, project 2 will not be financed.

Proof of Proposition 2

Without credit support, the information sensitivity of a product s(x) from the investor's perspective is

$$\pi_L = \int_{x_L}^{x_H} \max[p - s(x), 0] \cdot f(x)dx.$$

Suppose the bank has asset in place with payoff y and positive density f(y) on $[y_L, y_H]$ and provide guarantee. Denote z=x+y where f(z) is the joint density of x+y. Then

$$\pi_L = \int_{z_L}^{z_H} \max[p - s(z), 0] \cdot f(z)dz.$$

If $s(x+y) \geq p$, for all x then $\pi_L^{Investor} = 0$. A stronger sufficient condition is $y_L \geq p$.

Proof of Corollary 2.1

Suppose the bank has asset y in place where y is a random variable with distribution $F^{Bank}(y)$ and support $[y_L, y_H]$. In order to provide guarantee that is credible, investors need to know that seller is able to pay p in the case where x<p. This means investors need to have expectation about $F^{Bank}(y)$. Since the big four commercial banks are majority state-owned and government is implicitly liable, investors

think that y_L>p or s(x+y)≥p for all x. Formally, the information costs of learning about yL>p is low or zero. In contrast, investors have little information about the assets of other issuers, say a trust company, i.e. $f^{Trust}(y)$. If investors have no ability to evaluate assets (i.e. information costs is large), then investors looking for information insensitive will not buy from a trust company or other sellers.

Proof of Proposition 3

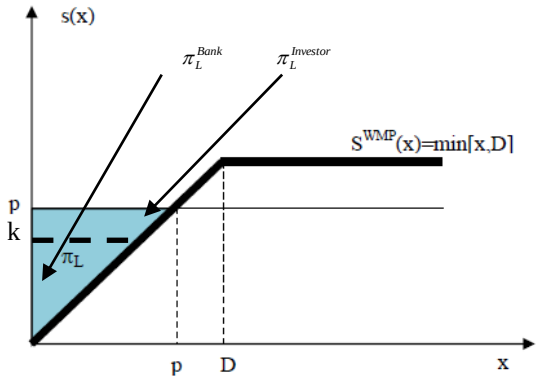
Since the trust product is off balance sheet and the bank is not liable, a default of trust product does not affect the information sensitivity of the assets on the balance sheet of the banks. So the trust product contributes zero information sensitivity to the bank's portfolio, i.e. $\pi_L^{Bank} = 0$. From Proposition 2, $\pi_L^{Investor} = 0$. Since $\pi_L^{Bank} = \pi_L^{Investor} = 0$, investors buy and banks sell trust products.

Proof of Corollary 3.1

Total tail risk of a product is independent of how it is shared. So $\pi_L^{Bank} + \pi_L^{Investor} = \kappa\pi_L + (1-\kappa)\pi_L = \pi_L$.

Example

Suppose the bank promises to guarantee at least the amount k. Then investors bear the residual risks.



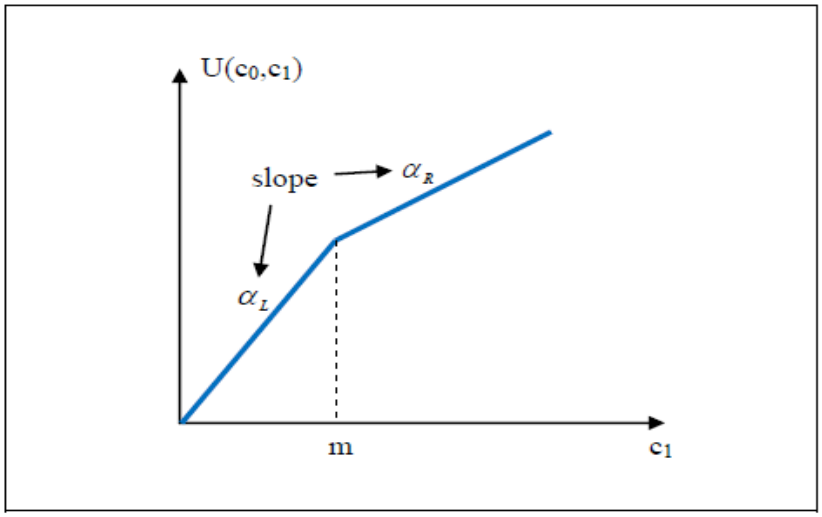
Proof of Proposition 4

This proposition is proven in Dang, Gorton and Holmstrom (2013a), which states that if an agent has a liner reference point utility function, the agent requires a higher expected return for holding a security with higher information sensitivity.

Definition (Linear reference point utility function)

$U = c_0 + \alpha_L \cdot \min[c_1, m] + \alpha_R \cdot \max[c_1 - m, 0]$ is called a linear reference point utility function where $\alpha_L, \alpha_R, m > 0$ and m is the amount invested and the reference point (Figure 11).

Figure 11. Linear Reference Point Utility Function



Lemma (Proposition 8 in DGH)

Consider a set of *N* assets where all assets with the same price *m* and expected return *m*. Suppose the agent with quasi linear reference point utility and reference point *m* can choose (only) one asset. Then $\pi_L(i)$ and $\pi_R(i)$ are sufficient statistics for expected utility maximization.

Proof:

$$\begin{aligned} EU &= E\left[\alpha_L \min[x, m] + \alpha_R \max[x - m, 0]\right] \\ &= \alpha_L E[m - \max[m - x, 0]] + \alpha_R E[\max[x - m, 0]] \\ &= \alpha_L (m - \pi_L) + \alpha_R \pi_R \end{aligned}$$

where $\pi_R = \int_{x_L}^{x_H} \max[s(x) - p, 0] f(x) dx$.

Proposition 4 (Proposition 9 in DGH) : An agent with a linear reference point utility function faces the following trade-off between expected return and information sensitivity. Along an indifference curve $\frac{dR}{d\pi_L} > 0$

Proof: The expected utility at *t=1* is $EU = \alpha_L(m - \pi_L) + \alpha_R\pi_R$. Fixing a utility level $\bar{U}$, we have $\bar{U} = \alpha_L m - \alpha_L\pi_L + \alpha_R\pi_R \Leftrightarrow m = \frac{1}{\alpha_L}\bar{U} + \pi_L - \frac{\alpha_R}{\alpha_L}\pi_R$. Dividing both sides of the equation by *p*, yields gross return

$$R = \frac{1}{p\alpha_L}\bar{U} + \frac{1}{p}\pi_L - \frac{\alpha_R}{p\alpha_L}\pi_R .$$

Proof of Corollary 4.1

The argument is similar to the proof of Corollary 2.1. In order to determine the information sensitivity of a financial product s(x) which payoff is backed by project x investors need to determine distribution f(x). Investors typically do not have the enough financial sophistication and knowhow to do that. So they need third party institutions to provide information about f(x) and thus the information sensitivity of s(x). In addition, these institutions need to be credible in the sense of having knowhow to evaluate risks.

Proof of Corollary 4.2

Lemma 2 in Dang, Gorton and Holmstrom (2013) shows that senior debt minimizes the information sensitivity.