

Financial Contagion within the Banking Sector - The Case of China

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Outline

Background

Building blocks

Fire sale module

Liquidity module

Future work

Background

- ▶ To prevent systemic risks is the top priority of the Chinese government
 - ▶ Growing private debt (255% of GDP)
 - ▶ Property market boom
 - ▶ Local government financing vehicle debt (15 trillion)
- ▶ China has never experienced a real financial crisis
- ▶ Nobody knows how the risks will spread

Background

- ▶ Stress tests on individual banks are in place
- ▶ Macroprudential Assessment(MPA) is also in place
 - ▶ Macroprudential tools are used to target sectoral risks
 - ▶ But contagion risks are not much considered
- ▶ Lack of a macro stress test
 - ▶ Identify the shock that may lead to systemic risks
 - ▶ Feature China's banking sector and interbank markets
 - ▶ Consider different channels of financial contagion

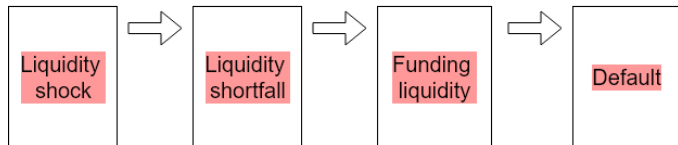
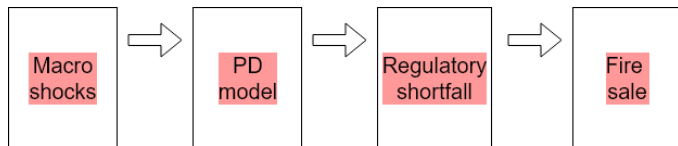
Building blocks

- ▶ Focus on the simulation of a systemic event
- ▶ Follow the approach developed by the BOC, the BOE and the BOK
- ▶ A model suite
 - ▶ Macro scenario and the credit loss (challenging)
 - ▶ Fire sale module
 - ▶ Funding liquidity module (in progress)

Macro scenario

- ▶ Two major sources of systemic risks
 - ▶ Property price correction and the loans to real estate developers
 - ▶ A major default of LGFV bonds/loans
- ▶ A bank centric financial system
 - ▶ Bank loans account for 2/3 of the total social financing and 60% of bank assets
 - ▶ Commercial real estate loans and construction loans account for 30% of total loans
 - ▶ Banks are major holders of LGFV bonds and loans
- ▶ Lack of empirical evidences is a challenge
 - ▶ Hard to translate a macro shock to the NPL of banks

Two simulations



Banks

- ▶ Draw on the balance sheet data of listed Chinese banks
- ▶ Classify the listed commercial banks into three categories
 - ▶ Big five state-owned banks: net lender in the interbank markets
 - ▶ Joint-stock banks: typically hold a large amount construction and commercial real estate loans, and rely heavily on interbank borrowing
 - ▶ Small and medium banks: typically hold a large amount of LGFV-related assets (loans and bonds) and rely heavily on interbank borrowing
- ▶ Balance sheet projection

Balance sheet

| Assets | Liabilities |
|-------------------------------|--------------------------|
| Cash and reserves | Central bank liabilities |
| Interbank lending | Interbank borrowing |
| Repurchase agreements | Repurchase agreements |
| Trading portfolio | Trading securities |
| Fixed income investments | Bonds |
| Commercial real estate loans | |
| Residential real estate loans | |
| Other loans | Deposits |
| Other investments | |

Fire sale

- ▶ Price channel of contagion, triggered by an initial credit loss
- ▶ Bank capital

$$N_{t+1} = N_t + (1 - \tau)(\Pi_t - \text{credit loss} - \text{market loss})$$

- ▶ Use the regulatory leverage ratio as the threshold
- ▶ The core of the MPA is the capital adequacy ratio

$$CAR = \frac{\text{Capital}}{\text{Risk-weighted Assets}}$$

- ▶ Risk weights are adjusted to target sectoral risks
- ▶ 11.5% for systemically important banks and 10.5% for other banks

Risk Weights

| Assets | Weights |
|-------------------------------|---------|
| Cash and reserves | 0 |
| Interbank lending | 0.25 |
| Repurchase agreements | 0.2 |
| Securities (government bonds) | 0 |
| Securities (corporate bonds) | 1 |
| Commercial real estate loans | 1 |
| Residential real estate loans | 0.5 |
| Other loans | 1 |
| Commercial paper | 1 |
| Other investments | 4-12.5 |

Price elasticity

- ▶ Price contagion works through mark-to-market channel
- ▶ Estimating the price elasticity is the key. Following Cont and Schaanning (2016,2017)

$$\frac{\Delta p}{p} = 1 - \exp^{-\frac{q}{D}}$$

where D is the market depth and is defined as

$$D = c \frac{ADV \sqrt{\tau}}{\sigma}$$

Market depth

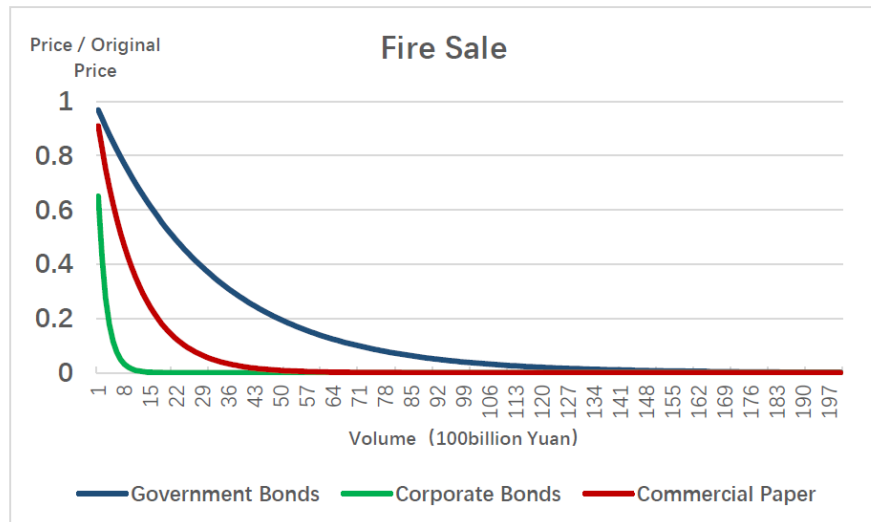
| China | | | US | | |
|-------|-----|--------------|----|-----|--------------|
| | ADV | market depth | | ADV | market depth |
| GB | 184 | 3,276 | GB | 568 | 428,800 |
| CB | 10 | 324 | CB | 270 | 70,200 |

Cont and Schaanning (2016) and author's calculation

Bank behaviors

- ▶ It is still rather mechanic
- ▶ To boost CAR, banks sell risky assets
 - ▶ Start with assets with high risk weights
 - ▶ From liquid assets to illiquid assets
- ▶ We assume assets sold in the following sequence
 - ▶ Commercial paper, corporate bonds, government bonds

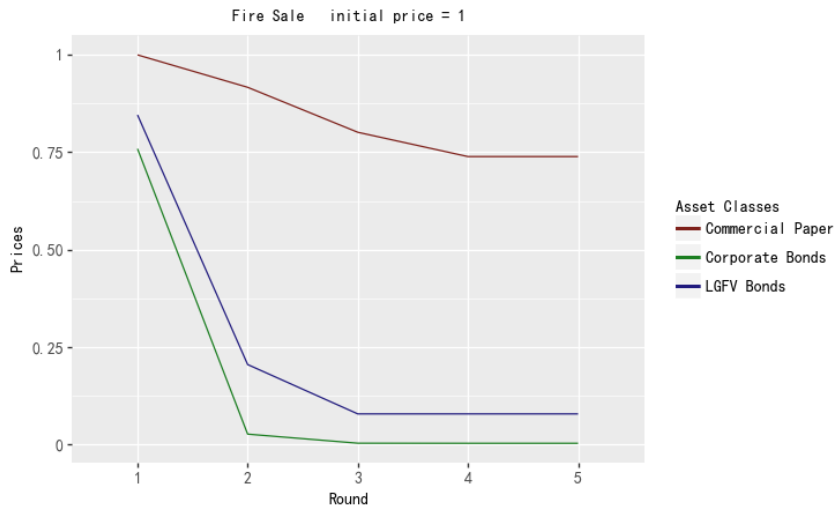
Price impact



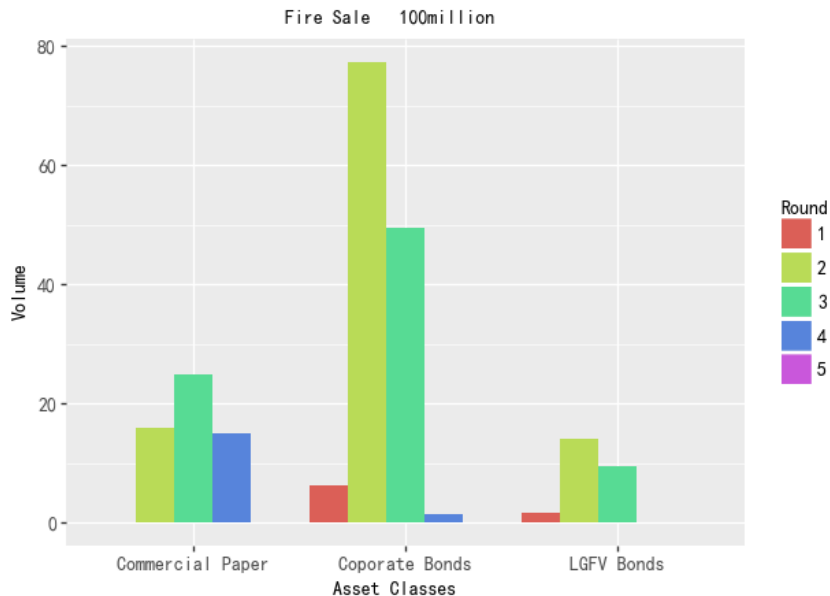
Simulation results

- ▶ The macro shock: correction in property markets
 - ▶ Double the NPL ratio of loans to real estate developers (from 1.04% to 2.08%)
- ▶ Results
 - ▶ On impact, 1 small-to-medium sized bank falls short on capital
 - ▶ After the first round of fire sale, 3 banks fall short on capital

Fire sale: price



Fire sale: volume



Results

- ▶ The price channel of financial contagion is prominent
 - ▶ Even though financial assets only accounts for a small share of bank assets
- ▶ Bond markets are thin, especially corporate bond markets
- ▶ A small volume can generate a significant decline in bond prices
- ▶ Policy implications
 - ▶ Risks are more likely to stem from small-to-medium sized banks
 - ▶ Systemic risks at the early stage can easily be ignored
 - ▶ Direct intervention by the authority can be very costly

Liquidity risk(in progress)

- ▶ According to the data, banks typically have net cash outflow (within 1 month)
- ▶ Two options to meet the payments
 - ▶ Sell some assets (price channel)
 - ▶ Raise more funds (funding liquidity risk)
- ▶ We focus on the latter channel of contagion

Contagion of liquidity risk

- ▶ In China, banks' balance sheets grow 2.5% annually on average
- ▶ Growing assets/liabilities reflects the ability of banks to raise funds
- ▶ Contagion channel
 - ▶ Banks are able to raise funds up to α times the average amount
 - ▶ α decreases as crisis evolves, from positive to negative
 - ▶ If a bank cannot meet the payment and defaults, the loss is absorbed by other banks
 - ▶ Assume loss is distributed across banks according to their sizes
 - ▶ Cash inflow decreases and cash outflow increases
- ▶ Challenge
 - ▶ To project cash inflow and cash outflow
 - ▶ To incorporate the network

Future work

- ▶ To build in Chinese characteristics
 - ▶ The structure of the interbank market
 - ▶ Model different behaviors of different types of banks
 - ▶ Match data
- ▶ Policy analysis
 - ▶ Structure of the inter-bank market
 - ▶ Possible policy intervention

Thanks a lot
Comments welcome