Discussion of "Collateralized Debt Networks with Lender Default" by Jin-Wook Chang

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Financial Networks

- Growing literature on how financial linkages...
  - (i) function as a mechanism for propagation and amplification of shocks
  - (ii) generate systemic risk from micro shocks

- For the most part, the literature makes two simplifying assumptions
  - unsecured lending
  - exogenously-specified network of relationships

- But in reality....
  - interbank lending is mostly collateralized
  - banks choose their partners and terms of contracts

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This Paper: A Model of Collateralized Debt Markets

- Allows for collateralized lending and borrowing
- Quantities and prices (including that of the collateral) are endogenously determined

- Two methodological contributions:
  - a framework for propagation of shocks in a collateralized lending network
  - a model of financial network formation
    (though sidesteps some of the intricate issues of network formation by assuming lenders/borrowers are competitive)

- Main results:
  - trade-off between counterparty risk and leverage
  - under-diversification in equilibrium
  - an application to loss coverage by a CCP

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Propagation of Shocks over Collateralized Debt Networks

- An exogenous network of pairwise collateralized debt contracts

  y_{ij} : borrowed cash per unit of collateral

  c_{ij} : amount of posted collateral

- Financial network represented by a pair of matrices (Y, C)

- Payment from j to i, per unit of posted collateral:

  $$x_{ij} = \min\{y_{ij}, p\},$$

  where p is the equilibrium price of collateral (non-recourse)

Propagation of Shocks over Collateralized Debt Networks

- Nominal wealth of agent j:

$$m_j = e_j - \epsilon_j + h_j p + \sum_k c_{jk} \min\{p, y_{jk}\}$$
$$- \sum_k c_{kj} \min\{p, y_{kj}\} - \sum_{k:m_k<0} \zeta(c_{kj})[p - y_{kj}]^+$$

- failure of lender makes the borrower incur a cost to recover her collateral
  - counterparty risk channel
- nominal wealth depends on the equilibrium price of the asset
  - collateral price channel of contagion

Payment Equilibrium

- Collection of nominal wealth $(m_1^*, \ldots, m_n^*)$ and asset price p^* such that:

  (i) nominal wealths are mutually consistent with pairwise contracts:

$$m_j^* = e_j - \epsilon_j + h_j p^* + \sum_k c_{jk} \min\{p^*, y_{jk}\}$$
$$- \sum_k c_{kj} \min\{p^*, y_{kj}\} - \sum_{k: m_k^* < 0} \zeta(c_{kj}) [p^* - y_{kj}]^+$$

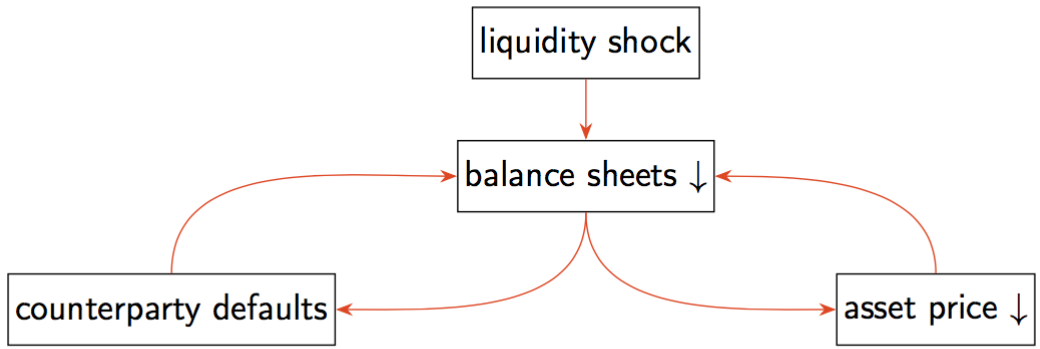
  (ii) asset market clears:

$$\begin{cases} \sum_{i=1}^n \max\{m_i^*, 0\} = p^* \sum_{i=1}^n h_i & \text{if } p^* < s \\ \sum_{i=1}^n \max\{m_i^*, 0\} \geq p^* \sum_{i=1}^n h_i & \text{if } p^* = s, \end{cases}$$

  where s is the asset's payoff.

Comment 1: Monotone Comparative Statics?

- Paper discusses the interaction of fire sale and counterparty risk channels:



- But this is an argument about "best responses" and not equilibrium.
- Should not be hard to prove a formal result for equilibrium using monotone comparative statics arguments:

Proposition

p^*, $(m_1^*, \ldots, m_n^*)$, and aggregate welfare, are decreasing in the shock ϵ_j.

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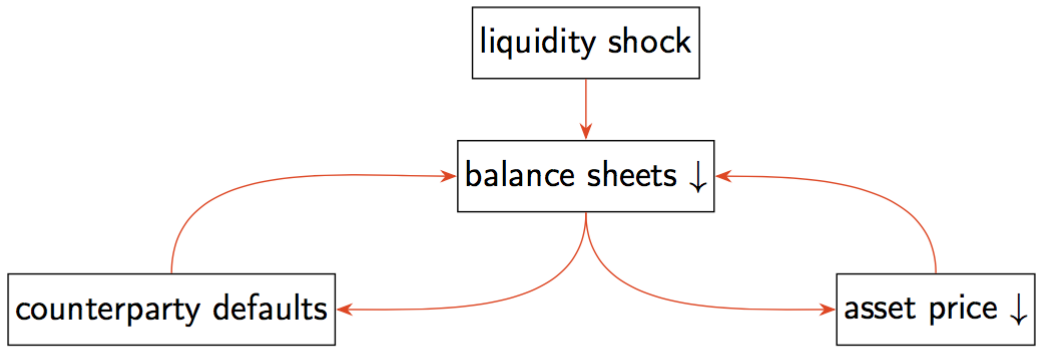

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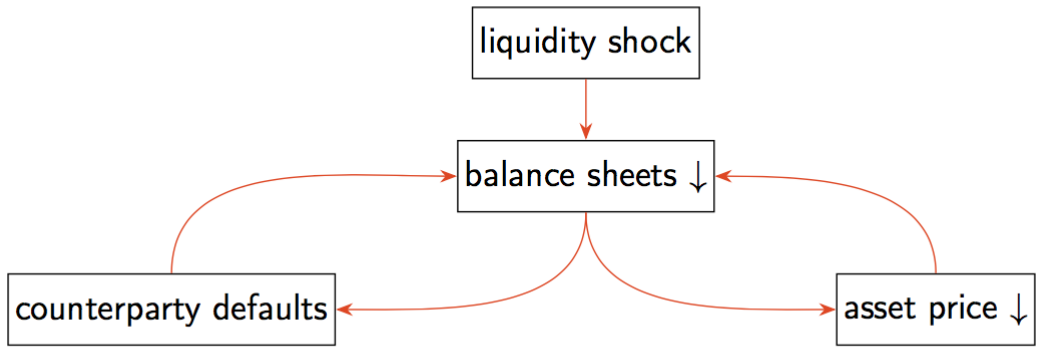

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Comment 2: Network Comparative Statics?

- There is a literature that studies the role of network structure for systemic risk, but mostly focused on unsecured lending.
- Current framework can be used to investigate the robustness of those results.

- Can one say anything about how changes in C and Y impact equilibrium objects?

- For example, suppose $y_{ij} \geq \tilde{y}_{ij}$ for all $i \neq j$. What can one say about p^* and $\tilde{p}^*$?
- How about uniformly higher haircuts? More diversified patterns of lending?

Network Formation Stage

- Where do C and Y come from?
  Assume agents disagree about asset payoff $s \rightarrow$ gains from trade.

- Each agent takes pairwise interest rates and the price of the asset (today and tomorrow) as given and chooses the contracts:

$$\begin{aligned} \max_{\{c_{jk}, c_{kj}, y_{jk}, y_{kj}\}} \quad & \mathbb{E}_j \left[\max \left\{ m_j \frac{s}{p_1}, 0 \right\} \right] \\ \text{subject to} \quad & \text{budget constraint} \\ & \sum_k c_{kj} = \sum_k c_{jk} + h_j . \end{aligned}$$

- Interest rates and prices determined such that asset market and contract markets clear.

Network Equilibrium Results

(1) If there is a cost to recovering collateral, borrowers have an incentive to borrow from more than out lender

→ counterpart risk vs. leverage trade-off

(2) Yet, they do not internalize the full benefit of diversification on others

→ under-diversification externality.

Comment 3: Framing?

- Both results are novel, and yet, they have counterparts in the earlier literature and are well known (for non-secured lending).

- Would be great to use the powerful framework (and characterization) to obtain novel comparative statics and answer policy-relevant questions.

- Already some of the ingredients are there:
  - impact of distress on lending volume, velocity of collateral
  - CCP
- Would be great to push this further