Intermediation and Voluntary Exposure to Counterparty Risk

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Motivation

- Systemic risk and contagion
- Too-connected-to-fail
Motivation

- Systemic risk and contagion
- Too-connected-to-fail
- What is *too-connected*?
- Why do banks form connections in the first place?
  - Structure of endogenous equilibrium network
  - What is the optimal financial structure?
This Paper

- Models banks and their bilateral exposures as a network
  - *Intermediation* needed to fund investment
  - Endogenous inter-bank network formation
Models banks and their bilateral exposures as a network

- \textit{Intermediation} needed to fund investment
- Endogenous inter-bank network formation

Equilibrium network has \textit{core-periphery} structure

- Banks who invest at the core
- High gross and low net exposure within the core
This Paper

- Models banks and their bilateral exposures as a network
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- Equilibrium network has core-periphery structure
  - Banks who invest at the core
  - High gross and low net exposure within the core

- Equilibrium network is inefficient
  - Intermediators exposed to excessive counterparty risk
  - Too many connections among banks who invest in risky asset
  - Too few connections among banks who provide funds
Frictions

- Contracting friction
  - Surplus allocation depends on network structure
  - Intermediators get positive share
  - Rents cannot be negotiated away

- Lending friction
  - Minimum size of lending contract
  - Intermediation required
Banking, intermediation and insolvency

Networks
- Allen and Gale (2000), Eisenberg and Neo (2001), Elliott, Golub and Jackson (2011)

Bargaining
Outline

1. Model
2. Equilibrium Intermediation
3. Concluding Remarks
Model

Environment

- \( I \): banks who can invest
  - Potential to make risky investment
- \( NI \): banks who can never invest
  - Have raised one unit on competitive market (debt)

Value of other businesses for each bank: \( V_i \)

Maximize expected return net of expected cost of failure

Universal risk neutrality, no discounting
Risky Technology

- Date 1
  - Investment opportunity arrives with iid probability $q$ at each $l$
- Date 2
  - iid return across investors $\tilde{R}$

$$
\tilde{R} = \begin{cases} 
R & \text{with probability } p \\
0 & \text{otherwise}
\end{cases}
$$

- Scalable
Timing

- **Date 0**
  - Network formation: banks enter *potential* lending relationships

- **Date 1**
  - Risky investment opportunities arrive
  - Loans made

- **Date 2**
  - Return realized
  - Debt payed back
  - Bank fails and looses $V_i$ if unable to pay back obligation
Frictions and Network Formation

- Contracting friction
  - Cannot negotiate rents down
  - Intermediation payoff only depends on endogenous network structure
Frictions and Network Formation

- Contracting friction
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- Minimum size constraint
  - Limit on number of counterparties (endogenous)
Frictions and Network Formation

- Contracting friction
  - Cannot negotiate rents down
  - Intermediation payoff only depends on endogenous network structure
- Minimum size constraint
  - Limit on number of counterparties (endogenous)
- Solution concept: Group Stability
Outline

1. Model

2. Equilibrium Intermediation

3. Concluding Remarks
Evolution of Financial Network ($t = 0$)

Equilibrium Intermediation

Wachovia  Lehman  Wachovia  Lehman

$NI_1$  $NI_2$  $NI_1$  $NI_2$

$\hat{D}_{12}^L$: Return to lender

$p(D_L W - D_W) \geq (1 - p) V_I$: Intermediation spread versus cost of failure
Evolution of Financial Network \((t = 0)\)

\[
\begin{align*}
\text{Wachovia} & \quad \text{Lehman} \\
Nl_1 & \quad Nl_2
\end{align*}
\]

\[
\begin{align*}
\text{Wachovia} & \quad \text{Lehman} \\
Nl_1 & \quad Nl_2
\end{align*}
\]

\[
\begin{align*}
D_{L2} & > \hat{D}_{12} \\
p(D_{LW} - D_{W1}) & \geq (1 - p) V_I \\
\text{Intermediation spread versus cost of failure}
\end{align*}
\]
Evolution of Financial Network \((t = 1)\)

\[
\text{Return to lender:}\quad p(D_{LW} - D_W) \geq (1 - p)V_I
\]

Intermediation spread versus cost of failure
Evolution of Financial Network \( (t = 2) \)

\[ \text{investment} \]

\[ \text{Wachovia} \rightarrow \text{Lehman} \]

\[ \text{NI}_1 \rightarrow \text{HH} \]

\[ \text{NI}_2 \rightarrow \text{HH} \]

\[ \text{Wachovia} \rightarrow \text{Lehman} \]

\[ \text{NI}_1 \rightarrow \text{HH} \]

\[ \text{NI}_2 \rightarrow \text{HH} \]

\[ \text{D} \rightarrow \hat{D}_{12}: \text{Return to lender} \]

\[ p (D_{W} - D_{W1}) \lesssim (1 - p) V_I: \text{Intermediation spread versus cost of failure} \]
Evolution of Financial Network \( (t = 2) \)

- \( D_{L2} > \hat{D}_{12} \): Return to lender
- \( p(D_{LW} - D_{W1}) \leq (1 - p)V_I \): Intermediation spread versus cost of failure
Misaligned Incentives

- Efficiency: scale of investment versus loss in the event of failure
  - *Efficient Intermediator*: impose minimal extra cost of failure
- Equilibrium: return versus loss of failure
  - *Intermediation spread* versus *cost of default*
  - *Equilibrium Intermediator*: offer highest rate of return
  - Does he minimize the cost?
General Result

Theorem

When intermediation rents are sufficiently high, all the equilibria consist of a subset of $I$ banks at the core, forming a digraph. Each $I$ bank at the core borrows from a subset of $NI$ banks, and lends to every $I$ bank outside the core. These equilibria are all inefficient.

(a) Equilibrium

(b) Efficient
Outline

1 Model

2 Equilibrium Intermediation

3 Concluding Remarks
Conclusion

- Core-periphery financial network
  - Banks who invest at the core
  - High gross and low net exposure at the core
- Inefficient intermediation (and dis-intermediation)
  - Voluntarily exposure to counterparty risk
- Policy
  - Cap on Number of Counterparties a bank can lend to
  - Central Clearing Party (CCP)
  - *Future work*: Bailouts and capital requirements?