Discussion of “Network Hazard and Bailouts”
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Reduced-Form Model: Threshold Contagion + Network Formation

- A collection of firms, banks, etc., of various types interacting over a network
- Each entity can either “survive” or “fail”
- **Threshold contagion:** a la Granovetter (1978), failure occurs if the number of failing neighbors exceeds a certain threshold.
- **Network formation:** the network of interactions is endogenous in the sense that agents need to be interacting in a “stable” network.

**Key questions:**

(1) What are the stable networks in the presence of threshold contagion?
(2) How does the set of stable networks change with intervention?
Threshold Contagion

- A subset of agents are exposed to some shock, pushing them into failure

- Entity $i$ fails if

\[
\# \text{ failing neighbors} \geq R_i(d_i, \gamma_i)
\]

- payoffs:
  - survival: $P(f_i, d_i, \gamma_i)$
  - failure due to a bad shock: $P_B(d_i, \gamma_i)$
  - failure due to contagion: $P_G(d_i, \gamma_i)$.

- It matters how $i$ fails, but not the “margin” of failure
Network Stability

- Pairwise linkages are determined endogenously, in the sense that the network of interactions has to be stable.

- Solution concept: Pareto strong stability (Jackson & van den Nouweland, 2005).

- A deviation by $N' \subseteq N$ is feasible if agents in $N'$ can
  
  (i) add or delete any link between themselves
  (ii) delete any link with agents in $N \setminus N'$

- A network is PSS if there are no feasible deviations by any $N' \subseteq N$ such that all agents in $N'$ are weakly better off, with at least one strictly better off.
Reduced-Form Insights and Result

- Conditional on a fixed degree $d$, agents want to reduce second-order counterparty risk (SOCPR): risk due to contagion from neighbors of neighbors.

- Thus, star network is the ideal configuration for any agent $i$ of a given degree.

- But if agents are all symmetric, the star network is as good as the complete network: in any state of the world in which a peripheral’s failure leads to another peripheral’s failure, the center fails anyways.

- The equilibrium network is a union of cliques of identical agents (no SOCPR).

- Ex post interventions (rescue) break the above argument: agents are no longer worried about SOCPR.

- This can lead to more interconnected structures ← Network Hazard
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From the Reduced-Form to the Structural Model

- Multiple applications, but main focus on interbank networks
  
  agents $\rightarrow$ banks
  
  agent type $\rightarrow$ bank size/deposit level
  
  linkages $\rightarrow$ credit lines for future lending/borrowing
  
  shock $\rightarrow$ shock to operating costs
  
  failure $\rightarrow$ if operating cost > continuation value

- Forming and maintaining credit lines are costly.
- Surviving banks use the credit lines to channel their excess deposits to banks with investment opportunities. But funds can only travel over one link.
- This means banks draw benefits from establishing direct credit lines to others.
Comment: Failure Mechanism

- Each bank can only survive if it can cover its operational costs.
- Banks obtain higher profits by lending their excess cash to banks with investment opportunities.
- Value of credit lines: the more direct linkages I have, the more money I can lend (at a profit) to my counterparties.

**Failure mechanism:**

\[ i \text{'s counterparts go under} \rightarrow i \text{ cannot lend its excess cash} \]

\[ \text{default} \quad \leftarrow \quad \text{not enough profits to cover operational costs} \]

- In other words, \( i \) defaults because it has too much idle cash that it cannot invest!
- Not sure if this maps to reality: at least when it comes to large banks, defaults happen because they cannot raise sufficient cash.
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- Bear Stearns’ liquidity pool (in $ billions) in the days before it was acquired by J.P. Morgan in 2008

![Bar chart showing liquidity pool in February and March]

Source: Testimony by SEC Chairman Chris Cox (Duffie, 2010)

- The distinction may not matter for the mechanics of threshold contagion, but may matter for network formation incentives.

- Do I form links to raise funds or to lend?
Comment: Spillover Mechanism

- The model implies that the shock “passthrough” is either 0 or 100%.
- An artifact of (i) interactions on the extensive margin and (ii) threshold contagion.

- In financial markets, lenders/borrows can also adjust the intensive margin (both quantities and prices)
- These can lead to intermediate passthrough of the shocks, with qualitatively important effects for SOCPR and hence the equilibrium network.

- E.g., the equivalence between complete and star networks may break down.
  - In the threshold contagion/extensive margin model, those shocks propagate to the center via multiple channels if and only if the center would have failed without them \(\rightarrow\) cliques obtain minimal SOCPR.
  - With intermediate passthrough, shocks to peripherals can propagate to the center via multiple channels \(\rightarrow\) interaction between peripherals matter for the center.
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  - In the threshold contagion/extensive margin model, those shocks propagate to the center via multiple channels if and only if the center would have failed without them → **cliques obtain minimal SOCPR**.
  - With intermediate passthrough, shocks to peripherals can propagate to the center via multiple channels → **interaction between peripherals matter for the center**.
Summary

• Useful (reduced-form) framework to allow for endogenous networks in the presence of threshold contagion

• Breaks new ground by allowing for endogenous response of the network architecture to intervention policies

• Key insights:
  (1) entities endogenously eliminate SOCPR by forming cliques
  (2) interventions that remove SOCPR would induce more interconnected networks (core-periphery)

• Comment: bringing the model closer to that of financial crises
  • failure mechanism
  • how far can one push the insights on SOCPR to a world with intermediate passthrough?