Financial Contagion
Allen and Gale (JPE, 2000)

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Financial Networks at Tepper
Financial crisis
- Contagion must be driven by real shocks and real linkages between agents.

Why financial sector is so susceptible to shocks?
- Financial contagion: shocks to a few institutions spread by contagion to the rest of the sector
- Micro foundation in terms of market completeness
- Accidents that arise from the very nature of what financial intermediaries do
Model Overview

- Interbank market with Diamond and Dybvig (1983) banks
  - $t = 0, 1, 2$
  - complete information
  - deposit $\rightarrow$ (cash, assets), liquidity shocks
  - difference of liquidity shocks across banks

- Enough aggregate liquidity
  - Cross-holdings of deposit as risk-sharing tools

- Excess aggregate liquidity demand
  - financial linkage $\rightarrow$ contagion
  - degree: network completeness
Liquidity Shocks

- $t = 0$, $A, B, C, D$ are identical and decide $y$ cash, $x$ assets ($R$ at $t = 2$), $x + y = 1$

- $t = 1$, idiosyncratic shocks to liquidity demand ($c_1, c_2$), e.g. A at $S_1$, $c_1 * w_H$ at $t = 1$, $c_2 * (1 - w_H)$ at $t = 2$.

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<th>Regional Liquidity Shocks</th>
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<td>$S_1$</td>
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- Optimal allocation

\[
y = \frac{1}{2} (w_H + w_L) c_1
\]
\[
R_x = \left(1 - \frac{w_H + w_L}{2}\right) c_2
\]
Interbank Market

- \( t = 0 \), exchange deposits \( z \). \( t = 1 \), A, C have high liquidity need.

**Complete market**

- Deposit \( z = \frac{w_H - w_L}{2} \)

  \(
  A, C : (w_H + z)c_1 = y + 3 \times z c_1
  \)

  \(
  B, D : (w_L + 2 \times z)c_1 = y
  \)

**Incomplete market**

- Deposit \( z = (w_H - w_L) \)

  \(
  A, C : w_H c_1 = y + z c_1
  \)

  \(
  B, D : w_L c_1 = y - z c_1
  \)
Financial Fragility

- Excess liquidity shock: “perturb” the model $P(\bar{S}) = 0$

**Regional Liquidity Shocks with Perturbation**

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- All banks withdraw their deposits, A has to liquidate assets
- Shock $\epsilon$ is large enough $\rightarrow$ not enough left for consumers in $t = 2$ $\rightarrow$ bankrun $\rightarrow$ bankrupt $\rightarrow$ value of deposits at A $q^A$ falls
- Someone other than A has to get into trouble, the question is how many?
**Incomplete market**

- D: deposit loss $z(c_1 - q^A)$
  - liquidate large enough
  - D bankrupt
  - C, B bankrupt, domino effect.

**Complete market**

- B, C, D: deposit loss $\frac{z(c_1 - q^A)}{2}$
  - liquidate a little
  - all distressed but not bankrupt
Freixas, Parigi, and Rochet (2000): “coordination failure” causes gridlock equilibrium and payment system breaks down.

Leiner (2005): return links, optimal financial network as tradeoff from risk-sharing and system collapse

Acemoglu Ozdaglar Tahbaz-Salehi (2012): nonmonotonic effect of market completeness on systemic risk

Zawadowski (2013): OTC contracts, negative externality of not hedging counterparty risk results network inefficiency