

## BANK AVALANCHE

A bank avalanche occurs when more than one bank defaults at the same time.

## AGENT BASED MODEL

### Agents:

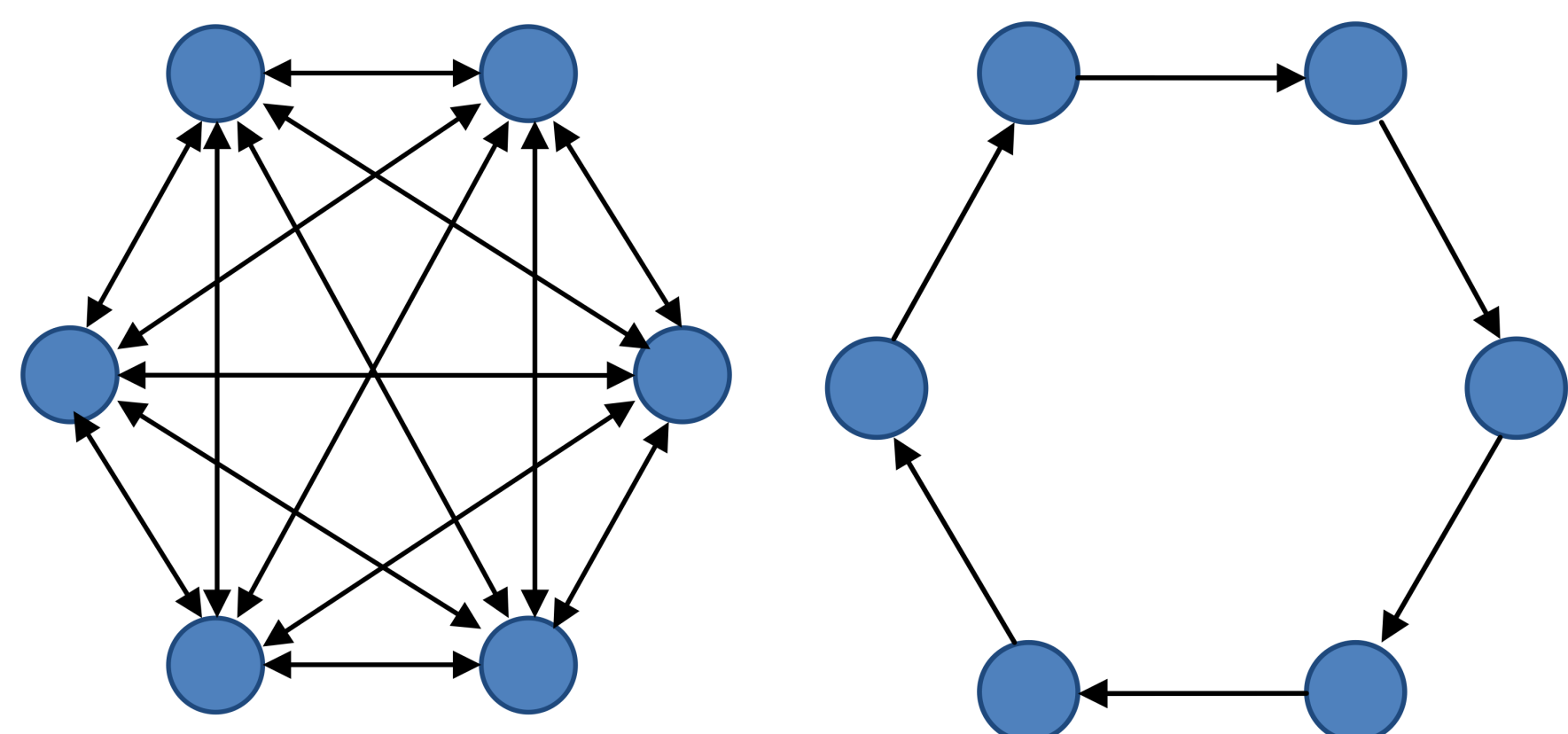
- Banks
- Non-Financial Transactors (NFTs)
- AIG-like Insurance Company

### Definitions:

- Deposits: NFT asset given to bank.
- Loans: bank asset given to NFT.
- Euroloans: interbank loans.
- Eurodeposits: interbank deposits.
- Reserves: money kept at bank.

## BANK NETWORKS

Banks make loans and accept deposits from other banks depending on the network type.



**Circle network:** banks trade interbank deposits and loans with neighbors.

**Complete network:** all banks trade interbank deposits and loans.

**Unconnected network:** banks cannot trade interbank deposits and loans.

**Star network:** centrally cleared transactions of interbank deposits and loans.

## REFERENCES

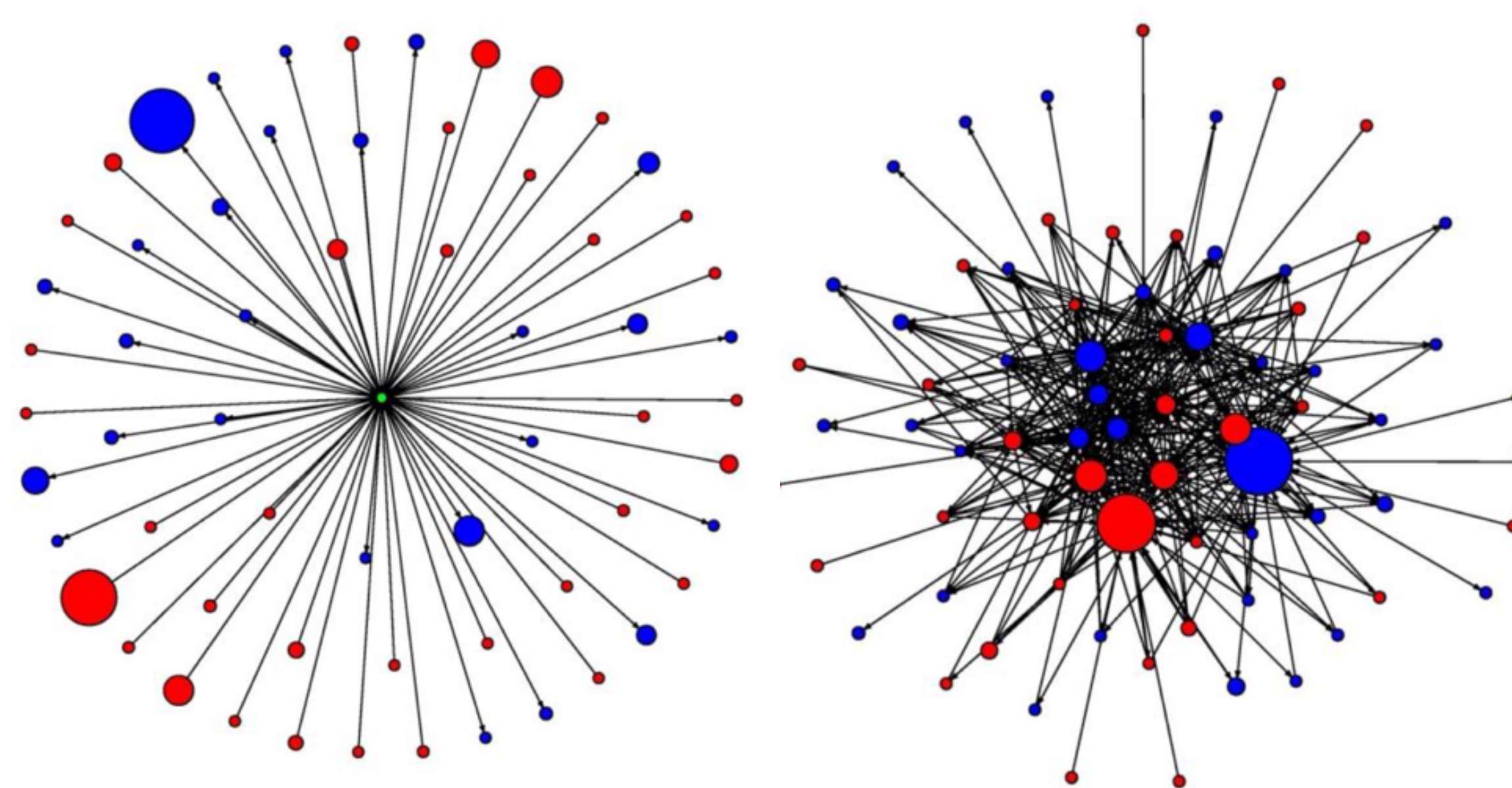
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## RESEARCH QUESTIONS

- How does systemic risk build up in the financial system?
- Can systemic risk be characterized using an agent based model?
- How does insurance impact financial system stability?
- What regulatory policies mitigate build up of systemic risk?

## MOTIVATION

- Efficient banking system facilitates economic transactions.
- Complex links in financial markets are the hallmark of modern finance.
- Bank runs occur when rational agents expect bank failure.
- Insurance on mortgages and bank failures traded in financial system.
- Interconnectedness of institutions, high indebtedness, and contagion explain the global impact of the financial crisis in the United States.



## NETLOGO SIMULATION

NetLogo is an agent based model (ABM) software developed at Northwestern University. Bank Avalanche Model of Systemic Risk in NetLogo:

(1) Setup  
 Bank-Network-Type: Complete  
 Number-Of-Banks: 10

(2) Run  
 a) "Setup" builds the model;  
 b) "Run" starts and stops the model;  
 c) "Reset" clears the model.

(3) Adjust  
 Bank parameters:  
 a) Bank loan rate to applicant (NFT): 0.6  
 b) Percentage of bank assets in reserves: 0.4

Non-financial transactor (NFT) parameters:  
 c) Rate NFT makes deposit to bank: 0.3  
 d) Rate NFT withdraws bank deposit: 0.2  
 e) Rate NFT repays loan: 0.1  
 f) Rate NFT defaults on bank loan: 0.17

(4) Simulation  
 ticks: 5  
 Number of Simulations: 1000  
 Simulation Count: 354.88

(5) Interpret  
 Bank Lifespan: Mean Lifespan 10.78  
 Profitability: Mean Profits Over All Simulations 0.78  
 Avalanche Size: Mean Avalanche Size 3.84  
 Avalanches per Simulation: Mean Avalanche Count 0.1

(6) AIG-like Insurance Company Options  
 AIG-like insurance company parameters:  
 a) Run simulation with AIG-like on or off: On  
 b) AIG-like initial assets at setup: 10  
 Additional bank parameters:  
 c) Rate bank buys AIG-like insurance: 0.6  
 d) Rate bank leverages balance sheet: 9

## RESEARCH OBJECTIVES

- Compare financial stability of various bank networks.
- Examine increases in likelihood of firesale and bank avalanche.
- Compare networks with and without insurance company.
- Test effectiveness of various regulatory measures.