Banking Systems under Network Theory

Case: Venezuela, 1998–2013
(in process)

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The 2008 financial crisis proved we need new ways to think about systemic risk
  ◦ “Too big to fail” became “Too interconnected to fail”
  ◦ Current regulation stresses the health of the banks, i.e. nodes, but not of the network, i.e. the financial system, as a whole

Network theory helps expose the effect of connections between banks that can often lead to cascading failures not accounted for by traditional regulations
Questions

- Can we predict the next financial crisis?
- Can we prevent the next financial crisis?
- Can we influence new financial regulations?
To describe the topology of the Venezuelan banking system based on Network Theory models
To explore and show the transformation of the system during the period 1998–2013 and better understand the effects of historical changes to bank laws
To simulate shock scenarios and evaluate their impacts
Data & Method

Data:
Balance Sheet information of each of the institutions of the banking system in monthly basis, from 1998–2013

Method:
Modeling a Bipartite Network: Assets–Banks
Simulation of shock scenarios
Edges only exist across two subsets of nodes
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Cascading Failure Model

\[ w_{i,m} = \frac{B_{i,m}}{B_i} \]

\[ s_{i,m} = \frac{B_{i,m}}{A_m} \]

- \( B_i \): Total asset of bank \( i \).
- \( B_{i,m} \): The amount of asset \( m \) that bank \( i \) owns.
- \( A_m \): Total market value of asset \( m \).

 fail when asset < liability

\[ \alpha B_{i,m} \]

1-\( p \): initial shock to an asset
\( \alpha \): liquidity parameter

describes market’s reaction to bank failure

Images Courtesy of Xuqing Huang
SECURITY CLASS NETWORK

June 2005

December 2013