Outline

- Research Question
- Motivation
- Previous Literature
- Bank Avalanche Model
- Calibration and Simulation
- Results
- Next steps
How can we understand the dynamic interconnectedness of the financial system?
Research Question

- How can we understand the dynamic interconnectedness of the financial system?
- How can we stabilize the system and keep it from collapse while still maintaining profitability?
Motivation

Janet Yellen speech January 4, 2013 American Economic Association
"Interconnectedness and Systemic Risk: Lessons from the Financial Crisis and Policy Implications"

[Diagram of interconnectedness and systemic risk]
Motivation
## Motivation

<table>
<thead>
<tr>
<th>Ticker</th>
<th>Short Name</th>
<th>Tot Assets</th>
<th>LTI</th>
<th>Rank (LTI/Tot Assets)</th>
<th>Market Cap</th>
<th>Price:D-1</th>
<th>P/E</th>
<th>Total Return YTD</th>
</tr>
</thead>
<tbody>
<tr>
<td>JPM</td>
<td>JPMORGAN CHASE</td>
<td>2.46T</td>
<td>1</td>
<td>1</td>
<td>202.85B</td>
<td>53.96</td>
<td>8.37</td>
<td>26.15</td>
</tr>
<tr>
<td>BAC</td>
<td>BANK OF AMERICA</td>
<td>2.13T</td>
<td>2</td>
<td>2</td>
<td>152.74B</td>
<td>14.32</td>
<td>10.08</td>
<td>23.63</td>
</tr>
<tr>
<td>C</td>
<td>CITIGROUP INC</td>
<td>1.90T</td>
<td>3</td>
<td>3</td>
<td>151.47B</td>
<td>49.94</td>
<td>10.10</td>
<td>26.35</td>
</tr>
<tr>
<td>WFC</td>
<td>WELLS FARGO &amp; CO</td>
<td>1.46T</td>
<td>4</td>
<td>4</td>
<td>224.98B</td>
<td>42.71</td>
<td>11.05</td>
<td>28.61</td>
</tr>
<tr>
<td>USB</td>
<td>US BANCORP</td>
<td>360.68B</td>
<td>5</td>
<td>5</td>
<td>69.55B</td>
<td>38.08</td>
<td>12.66</td>
<td>21.44</td>
</tr>
<tr>
<td>PNC</td>
<td>PNC FINANCIAL SE</td>
<td>308.60B</td>
<td>6</td>
<td>6</td>
<td>40.18B</td>
<td>75.52</td>
<td>10.58</td>
<td>32.83</td>
</tr>
<tr>
<td>BBT</td>
<td>BB&amp;T CORP</td>
<td>181.05B</td>
<td>7</td>
<td>7</td>
<td>23.71B</td>
<td>33.63</td>
<td>11.43</td>
<td>19.60</td>
</tr>
<tr>
<td>STI</td>
<td>SUNTRUST BANKS</td>
<td>171.78B</td>
<td>8</td>
<td>8</td>
<td>19.15B</td>
<td>35.72</td>
<td>15.65</td>
<td>27.01</td>
</tr>
<tr>
<td>FITB</td>
<td>FIFTH THIRD BANC</td>
<td>125.67B</td>
<td>9</td>
<td>9</td>
<td>17.67B</td>
<td>20.01</td>
<td>10.11</td>
<td>34.30</td>
</tr>
<tr>
<td>RF</td>
<td>REGIONS FINANCIA</td>
<td>116.86B</td>
<td>10</td>
<td>10</td>
<td>13.47B</td>
<td>9.78</td>
<td>12.40</td>
<td>38.22</td>
</tr>
<tr>
<td>KEY</td>
<td>KEYCORP</td>
<td>90.71B</td>
<td>11</td>
<td>11</td>
<td>11.67B</td>
<td>13.02</td>
<td>14.01</td>
<td>56.97</td>
</tr>
<tr>
<td>MTB</td>
<td>M&amp;T BANK CORP</td>
<td>84.43B</td>
<td>12</td>
<td>12</td>
<td>14.83B</td>
<td>113.87</td>
<td>12.82</td>
<td>17.92</td>
</tr>
<tr>
<td>CMA</td>
<td>COMERICA INC</td>
<td>64.67B</td>
<td>13</td>
<td>13</td>
<td>8.27B</td>
<td>45.20</td>
<td>15.41</td>
<td>50.98</td>
</tr>
<tr>
<td>HBAN</td>
<td>HUNTINGTON BANC</td>
<td>56.65B</td>
<td>14</td>
<td>14</td>
<td>7.49B</td>
<td>9.02</td>
<td>12.61</td>
<td>43.67</td>
</tr>
<tr>
<td>ZION</td>
<td>ZIONS BANCORP</td>
<td>55.19B</td>
<td>15</td>
<td>15</td>
<td>5.47B</td>
<td>29.64</td>
<td>13.14</td>
<td>38.95</td>
</tr>
<tr>
<td>NYCB</td>
<td>NY COMM BANCORP</td>
<td>45.76B</td>
<td>16</td>
<td>16</td>
<td>7.19B</td>
<td>16.30</td>
<td>15.04</td>
<td>33.35</td>
</tr>
<tr>
<td>FRC</td>
<td>FIRST REPUBLIC B</td>
<td>40.95B</td>
<td>17</td>
<td>17</td>
<td>6.74B</td>
<td>50.99</td>
<td>16.10</td>
<td>56.85</td>
</tr>
<tr>
<td>FNFG</td>
<td>FIRST NIAGARA FI</td>
<td>37.34B</td>
<td>18</td>
<td>18</td>
<td>3.93B</td>
<td>11.10</td>
<td>15.53</td>
<td>44.73</td>
</tr>
<tr>
<td>PBCT</td>
<td>PEOPLE'S UNITED</td>
<td>31.51B</td>
<td>19</td>
<td>19</td>
<td>4.50B</td>
<td>14.61</td>
<td>18.77</td>
<td>26.68</td>
</tr>
<tr>
<td>CYN</td>
<td>CITY NATL CORP</td>
<td>29.06B</td>
<td>20</td>
<td>20</td>
<td>4.14B</td>
<td>76.07</td>
<td>19.55</td>
<td>55.37</td>
</tr>
</tbody>
</table>
Motivation
Previous Literature

- Diamond and Dybvig (1983)
- Allen and Gale (2002)
- Caballero and Simsek (2011)
- Gai, Haldane, and Capadia (2011)
- Acemoglu, Ozdaglar, Tahbaz-Salehi (2013)
- Friedman (1998) and (2013)
Agents: NFTs, Banks, and AIG
Agents: NFTs, Banks, and AIG

NFT: Deposit, Loan, Withdraw, Default, Payback
Agents: NFTs, Banks, and AIG
NFT: Deposit, Loan, Withdraw, Default, Payback
Bank actions: Euroloan, Eurodeposit
Agents: NFTs, Banks, and AIG
NFT: Deposit, Loan, Withdraw, Default, Payback
Bank actions: Euroloan, Eurodeposit
Bank Avalanche
Agents: NFTs, Banks, and AIG
NFT: Deposit, Loan, Withdraw, Default, Payback
Bank actions: Euroloan, Eurodeposit
Bank Avalanche
AIG: Buy and sell insurance (CDS)
Run the simulation in Netlogo
Complete network (without and with AIG)

- Bank Lifespan
  - Mean lifespan: 19.66
  - Standard deviation: 19.86

- Profitability
  - Mean profit over all runs: 30.61
  - Standard deviation: 6.53

- Avalanche Size
  - Mean avalanche size: 2.82
  - Standard deviation: 1.11

- Avalanches per run
  - Mean avalanche count: 1.73
  - Standard deviation: 1.11

- Bank Lifespan
  - Mean lifespan: 19.52
  - Standard deviation: 19.82

- Profitability
  - Mean profit over all runs: 30.34
  - Standard deviation: 6.32

- Avalanche Size
  - Mean avalanche size: 2.73
  - Standard deviation: 1

- Avalanches per run
  - Mean avalanche count: 1.72
  - Standard deviation: 1.13
Incomplete network (without and with AIG)
Results

- Financial network structure
- Economic conditions: good times, bad times, good to bad times
- Complete network more profitable but less stable, system lasts longer in bad times than in good times
- Introduce AIG and evolutionary dynamics
Next steps

- Introduce evolutionary game theory dynamics
- Have agents respond to the behavior of other agents
- Measure the contagion effect
- Determine various market equilibrium outcomes