Contagion of Counterparty Risk

The Likelihood of Systemic Failures (Bank Defaults)

The Project:

<table>
<thead>
<tr>
<th>-k</th>
<th>z_i</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>t=0</td>
<td>t=1</td>
<td>t=2</td>
</tr>
<tr>
<td>Liquidation value = 0</td>
<td>X</td>
<td></td>
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Returns:

<table>
<thead>
<tr>
<th>1</th>
<th>money hoarding</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td>outside financiers</td>
</tr>
<tr>
<td>R_{ij}</td>
<td>interbank loans</td>
</tr>
</tbody>
</table>
$\gamma$-convex combination

$z_t \in [a, a - \epsilon)$, where $a > v$
$\epsilon \in (a - v, a)$

**Utilitarian** social surplus:

$$u = (n - \text{default}) A + na - mc.$$

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### t=1 payment of $j$ to creditor $i$:

$$x_{ij} = \frac{y_{ij}}{y_j} \left[ \min \left\{ y_j, e_j + \sum_{s \neq j} x_{js} \right\} \right]^+$$

**Definition 1.** Given cash holdings $\{e_i\}$, the face value of the bilateral interbank contracts $\{y_{ij}\}$, and the realizations of the shocks $\{z_j\}$, the interbank payments $\{x_{ij}\}$ form a payment equilibrium if they simultaneously solve (1) for all $i$ and $j$. 

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**Networks and Payment Equilibrium**

1) The ring financial network

2) The complete financial network

Figure 1: The ring and the complete financial networks
Overview of Results

Two types of shock absorbers:

1) Excess liquidity of non-distressed banks

2) Senior creditors outside (the $\nu$)

<table>
<thead>
<tr>
<th>$\epsilon &gt; \epsilon^*$</th>
<th>$\epsilon &lt; \epsilon^*$</th>
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<tbody>
<tr>
<td>$Y &gt; y_m^*$ Complete is the best</td>
<td>$Y &lt; y_m^*$ Ring and Complete are the worst</td>
</tr>
<tr>
<td>but large</td>
<td>Ring can use outside financiers more efficiently</td>
</tr>
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All other Results:

1) Contingent debt contracts $\Rightarrow$ Financial Network externality rather than simple bilateral externality. Central planner would suggest hoarding.

2) Double Ring problem, insufficiently dense networks

3) Pledgeability of $A$ increase the region where no banks default for a small shock and no contagion happens.