The systemic implications of bail-in: 
A multi-layered network approach

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September 8th, 2016
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→ Is bail-in possible without the **risk of contagion**?
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Four layers: Equity, Subordinated debt, Senior unsecured debt, Secured debt.

Beyond the network of 26 banks, also able to capture the impact of a bail-in at one of these banks on individual euro area banking sectors.
Potential contagion channels from bank 1 to its counterparties

Note: Block sizes are not to scale.
Preview of simulation results

Simulate **bail-in** at each of the 26 banks in turn.
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Effect on network topology
How the bail-in at one bank leads to the rewiring of links within the banking sector.
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**Effect on network topology**
How the bail-in at one bank leads to the **rewiring of links** within the banking sector.
→ The bank under resolution becomes more central within the equity network layer after the bail-in.
Literature contribution

Financial networks literature

- **Contagion model that respects the creditor hierarchy**: Elsingher (2009).
- **Empirical studies of multi-layer networks**: Aldasoro and Alves (2015); Bargigli et al. (2014); Langfield et al. (2014); Molina-Borboa et al. (2015); Montagna and Kok (2013).
- **Policy simulations in interbank networks**: Aldasoro et al. (2015); Gai et al. (2011); Hałaj and Kok (2015); Nier et al. (2007).
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Literature on resolution regimes and bail-in

- **ABM**: Klimek et al. (2015).
- **Theory**: Faia and di Mauro (2015).
- **Empirical**: Schäfer et al. (2016); Conlon and Cotter (2014).
Data

ECB Securities Holdings Statistics by Group (SHSG)

- Quarterly data on security-by-security holdings of debt securities and listed equity shares covering the largest 26 euro area banking groups by total assets.
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For all the results displayed below we use data for Q1 2015.
Descriptive statistics of banks’ balance sheets

**Table:** Average funding structure of the banks in the sample in percent of total funding for Q1 2015 (in%)

<table>
<thead>
<tr>
<th></th>
<th>Average bank</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Secured debt</strong></td>
<td>24.33</td>
</tr>
<tr>
<td><strong>Deposits</strong></td>
<td>57.18</td>
</tr>
<tr>
<td><strong>Senior unsecured debt</strong></td>
<td>11.1</td>
</tr>
<tr>
<td><strong>Subordinated unsecured debt</strong></td>
<td>1.68</td>
</tr>
<tr>
<td><strong>T2</strong></td>
<td>1.07</td>
</tr>
<tr>
<td><strong>AT1</strong></td>
<td>0.22</td>
</tr>
<tr>
<td><strong>CET1</strong></td>
<td>4.42</td>
</tr>
</tbody>
</table>
Topology

Table: Network measures for the individual layers for Q1 2015

<table>
<thead>
<tr>
<th></th>
<th>Mean Geodesic</th>
<th>Av. Degree</th>
<th>Density</th>
<th>Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td>Inf</td>
<td>16.38</td>
<td>0.33</td>
<td>Inf</td>
</tr>
<tr>
<td>Subordinated unsecured debt</td>
<td>Inf</td>
<td>15.15</td>
<td>0.3</td>
<td>Inf</td>
</tr>
<tr>
<td>Senior unsecured debt</td>
<td>1.4</td>
<td>30.92</td>
<td>0.62</td>
<td>3</td>
</tr>
<tr>
<td>Secured debt</td>
<td>1.34</td>
<td>34.69</td>
<td>0.69</td>
<td>3</td>
</tr>
<tr>
<td>Total cross-holdings</td>
<td>1.2</td>
<td>40</td>
<td>0.8</td>
<td>2</td>
</tr>
</tbody>
</table>
Loss exposure of the holding bank

Potential loss a holder $j$ faces if an issuer $i$’s equity or debt is written down relative to $j$’s total assets.

<table>
<thead>
<tr>
<th></th>
<th>min</th>
<th>mean</th>
<th>max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Senior unsecured debt</strong></td>
<td>0</td>
<td>0.02</td>
<td>1.15</td>
</tr>
<tr>
<td><strong>Subordinated unsecured debt</strong></td>
<td>0</td>
<td>0</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Equity held</strong></td>
<td>0</td>
<td>0.0029458</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Note: This is index $I_6$ in the paper.
Baseline scenario: Stylized example

Step 1: 5% shock to total assets.

Note: Block sizes are not to scale. For ease of exposition, AT1 and T2 capital have been omitted.
**Baseline scenario: Stylized example**

**Step 2:** All equity and some sub. debt written down. Bank needs recapitalization.

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Baseline scenario: Stylized example

**Step 3**: The bank is recapitalized to 10.5% CET1 via a debt-to-equity conversion.

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Baseline scenario: Stylized example

Step 4: Bank fulfills the prudential requirements again.

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3. ... of the **lack of data on risk weights**.
   - RWAs are updated using a rule-of-thumb.
   - Resulting equity ratios are likely to underestimate their true decrease following asset losses at a bank.
Baseline results: Effect on network topology

Figure: Distribution of the density of network layers after bail-in (blue stars) for the 26 simulations (red line represents initial density)
Baseline results: Balance sheet effect

**Figure**: Percentage loss in the most senior layer affected at the bank under resolution after bail-in
Baseline results: Contagion effects

Figure: Decrease in CET1 ratios at the counterparties of the bank under resolution in the baseline scenario

Note: Boxplots display 10th and 90th percentiles, interquartile distribution and median.
Baseline results: Contagion effects

**Figure:** Decrease in CET1 ratios in euro area banking sectors after the bail-in of a bank in the baseline scenario

Note: Boxplots display 10th and 90th percentiles, interquartile distribution and median. RWAs (denominator of the equity ratio) are kept constant.
Adverse scenario

Common shock

- Shock distribution calibrated to match the two first moments of the CET1 capital loss of SSM banks in the adverse scenario in the October 2014 Comprehensive Assessment.
- Common shock hits banks at the same time, but with different magnitudes.
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The procedure is repeated a 1000 times for each of the 26 banks.
Adverse scenario: Results

Figure: Percentage point decrease in CET1 ratios at counterparties in the adverse scenario (averaged across the 1000 simulations)

Note: Boxplots display 10th and 90th percentiles, interquartile distribution and median. Blue line represents the average impact of the common shock.
Adverse scenario: Results

**Figure**: Percentage point *decrease in CET1 ratios in euro banking sectors* in the 5th percentile after the bail-in of bank $i$ in the adverse scenario.
Direct contagion effects within the network are small due to low cross-holdings of bank bail-inable debt within the network.
Summary and policy implications

1. **Direct contagion effects within the network are small** due to low **cross-holdings** of bank bail-inable debt within the network.
   - Effectiveness of low interbank cross-holdings of bail-inable debt in limiting contagion (TLAC,MREL,...).
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   - Underpins the BCBS considerations to limit smaller international banks’ holdings of GSIB TLAC instruments.
References I


