DISCUSSION OF “ROBUSTNESS OF CREDIT RISK STRESS TEST RESULTS: MODELLING ISSUES WITH AN APPLICATION TO BELGIUM” BY STIJN FERRARI, PATRICK VAN ROY AND CHRISTINA VESPRO

Søren Korsgaard, Principal Stress Test Expert
Summary

• **Issue**: Credit risk remains the main type of risk addressed in stress tests

• **Question**: How robust are stress test results to alternative modelling choices? \( EL = PD \times EAD \times LGD \)

• **Approach**: Look at impact in concrete stress scenario of changing
  1. How credit risk is measured
  2. The level of data aggregation

• **Findings and message**: Results are highly sensitive to modeling choices. Need for harmonisation.
Important topic

• The paper addresses an important topic in stress testing
• It does a nice job of conveying practical issues in stress testing, in particular the role of data availability
• The results should be somewhat disconcerting to anyone doing stress testing
Potential modeling choices

Credit risk variables

- Non-performing loans
- Loan loss provisions
- Stocks and flows
- Bankruptcy rates

Level of aggregation

- Economy-wide
- Sectoral

**TABLE 1. Correlation among different credit risk variables, 1995Q1-2013Q4.**

<table>
<thead>
<tr>
<th></th>
<th>BR</th>
<th>FLLP ratio</th>
<th>LLP ratio</th>
<th>NPL ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>BR</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLLP ratio</td>
<td>0.56</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LLP ratio</td>
<td>0.76</td>
<td>0.70</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>NPL ratio</td>
<td>0.77</td>
<td>0.72</td>
<td>0.95</td>
<td>1.00</td>
</tr>
</tbody>
</table>

The figure shows bankruptcy rates.

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Empirical strategy

Data

Quarterly data for each variable
Belgium
Estimation period: 1995Q1 – 2013Q4
Stress test horizon: 2014Q1 – 2016Q4
EBA scenario

Estimation

Autoregressive distributed lag model
Credit risk variable regressed on:
- own lags
- lags of macro variables

Results

EL = PD x EAD x LGD
Calculate ΔEL based on:
- estimation
- stress scenario
- simulated errors
Then identify tier 1 impact
Finally, compare results!

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Results

## TABLE 5. The robustness of stress testing results.

### A. Impact on Tier 1 capital ratio of different credit risk variables

<table>
<thead>
<tr>
<th></th>
<th>BR</th>
<th>FLLP ratio</th>
<th>LLP ratio</th>
<th>NPL ratio</th>
<th>Average</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total EAD and REA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50th percentile</td>
<td>-0.48pp</td>
<td>0.28pp</td>
<td>-1.25pp</td>
<td>-0.80pp</td>
<td>-0.56pp</td>
<td>1.53pp</td>
</tr>
<tr>
<td>75th percentile</td>
<td>-1.64pp</td>
<td>0.08pp</td>
<td>-2.93pp</td>
<td>-2.31pp</td>
<td>-1.70pp</td>
<td>3.01pp</td>
</tr>
<tr>
<td>Corporate EAD and REA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50th percentile</td>
<td>-0.33pp</td>
<td>0.19pp</td>
<td>-0.84pp</td>
<td>-0.54pp</td>
<td>-0.38pp</td>
<td>1.03pp</td>
</tr>
<tr>
<td>75th percentile</td>
<td>-1.10pp</td>
<td>0.05pp</td>
<td>-1.97pp</td>
<td>-1.55pp</td>
<td>-1.14pp</td>
<td>2.02pp</td>
</tr>
</tbody>
</table>

### B. Impact on Tier 1 capital ratio for different levels of data aggregation using BR as the credit risk variable

<table>
<thead>
<tr>
<th></th>
<th>Economy-wide</th>
<th>Industrial sector</th>
<th>Firm size</th>
<th>Sector and Size</th>
<th>Average</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate EAD and REA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50th percentile</td>
<td>-0.33pp</td>
<td>-2.63pp</td>
<td>-0.31pp</td>
<td>-2.26pp</td>
<td>-1.38pp</td>
<td>2.32pp</td>
</tr>
<tr>
<td>75th percentile</td>
<td>-1.10pp</td>
<td>-3.58pp</td>
<td>-1.63pp</td>
<td>-3.86pp</td>
<td>-2.54pp</td>
<td>2.76pp</td>
</tr>
</tbody>
</table>

Robustness check with respect to lag structure
A reflection: A lot of the variation in the credit risk models is unexplained

Note: This is the model that give the strangest results! (previous slide)
Paper leaves questions unanswered...

- Paper identifies problem, but is silent about how to achieve robustness
- Authors suggest “a need to better harmonise the stress tests are conducted across institutions and supervisors” – but how?
  - ... difficult to get around data availability issue...
- Which credit risk measures and levels of aggregation should then be used?
  - Authors could perhaps conduct backtests, e.g. comparing model performance during financial crisis?
  - One potential approach: Averaging across models?
Robustness

• What exactly do we mean by “robustness”?

• Perhaps we can draw inspiration from literature on robust control
  • A set of plausible models
  • Fictitious “evil agent” chooses (e.g.) worst distribution
  • Good decision rules, even in bad cases?

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THANK YOU!