Cross-Border Issues in Stress-Testing

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Washington DC, 2-3 May 2006

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Outline

- Cross-border issues
  - where do we stand
  - concepts and evidence of risks and contagion

- Macro stress-testing cross-border risks by DNB
  - scenarios
  - liquidity risk
  - group-wide approach
1. Increased financial integration

- Internationalization financial markets
- Globalisation financial institutions
- Cross-border payments systems
- Consolidation exchanges and clearing and settlement systems
2. Financial integration: evidence

Cross-border transactions in bonds and equity
Per cent of GDP, source: BIS
3. CB risks in macro-prudential analysis

“there is still insufficient attention in many FSAPs to global and regional linkages” (IMF IEO, 2005)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Mean score</th>
<th>Percentage of ratings indicating some problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent of incorporation of regional /global risks into analysis</td>
<td>1.84</td>
<td>28</td>
</tr>
<tr>
<td>Balance of development and stability issues</td>
<td>1.88</td>
<td>16</td>
</tr>
<tr>
<td>Integration of standard and codes in overall assessment</td>
<td>1.84</td>
<td>20</td>
</tr>
<tr>
<td>Coverage of overall financial sector</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Clarity and candor of findings</td>
<td>1.88</td>
<td>12</td>
</tr>
<tr>
<td>Importance and consequence well explained</td>
<td>1.94</td>
<td>20</td>
</tr>
<tr>
<td>Clarity of recommendations</td>
<td>1.82</td>
<td>8</td>
</tr>
<tr>
<td>Usability of recommendations</td>
<td>1.96</td>
<td>16</td>
</tr>
<tr>
<td>Prioritisation of recommendations</td>
<td>2.46</td>
<td>44</td>
</tr>
<tr>
<td>Degree of alignment of FSAP and FSSA</td>
<td>1.42</td>
<td>0</td>
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1 IEO assessors rated each of the FSAPs for the 25 countries in depth with respect to the above criteria. Each aspect was rated on a four point scale (with 1 being the highest). source: IMF
4. Cross-border risks and contagion

Concepts of systemic risk (De Bandt and Hartmann, 2000)
- idiosyncratic: domino effects from single failure
- systematic: simultaneous effects from widespread shock

Cross-border propagation mechanisms
- direct contagion (cross-border balance sheet linkages: interbank contagion models)
- indirect contagion (exogenous global shock: global risk scenarios)
5. Direct contagion: evidence

Between institutions

- Research: support for interbank market as important contagion channel
  (Gropp and Vesala, 2004 / Hartmann et al, 2005)

Within financial groups

- Joint Forum: LCFIs face cross-border liquidity risk
- Dutch bank: dry run revealed forex complication
6. Indirect contagion: historical evidence

Global financial system as mechanism for transmission and amplification of shocks

- **Historical scenarios**: 1987 stock market, 1994 bond market, 1998 emerging markets / LTCM, 2005 credit derivative market

**Typical features**

- Interaction global risk factors
- Key role liquidity (hard to internalise in micro stress-tests)
7. CB issues in the Netherlands

Cross-border issues highly relevant
- small open economy
- internationally integrated financial system
- LCFIs and large institutional investors (IC, PF)

**Cross border assets insurance companies and pension funds**
In percentage of total assets

**Dutch banks: non-Dutch contributions to profits**
In percentage of total profits

Source: DNB.
8. DNB well positioned for CB issues

<table>
<thead>
<tr>
<th></th>
<th>Systemic stability</th>
<th>Prudential</th>
<th>Conduct of business</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>DNB</td>
<td>A</td>
</tr>
<tr>
<td>Banks</td>
<td></td>
<td></td>
<td>F</td>
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<tr>
<td>Securities</td>
<td></td>
<td></td>
<td>M</td>
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<tr>
<td>Insurance pensionfunds</td>
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</table>

DNB = De Nederlandsche Bank
AFM = Authority for Financial Markets
9. Macro stress-testing by DNB

DNB’s macro stress-testing framework is a combination of bottom-up and top-down methods.

- **Bottom-up**
  - regular exercise including banks, PF and IC
  - DNB designs scenarios and instructs institutions, they run their internal models, DNB aggregates the results

- **Top-down**
  - credit and interest rate risk of banks (reduced form models)
  - interbank risk (interbank contagion model)
  - market risks PF/IC (structural models)
10. Stress-testing cross-border issues

Three ways to address cross-border issues in stress-tests

- **scenario** design (systemic shock ⇒ indirect contagion)
- **liquidity** risk, key role (systemic and idiosyncratic shocks ⇒ indirect and direct contagion)
- **group-wide** approach
11. Global risk drivers in scenarios

Scenario analyses DNB

(Overview of Financial Stability in the Netherlands, OFS)

- tool for macro-prudential monitoring
- hypothetical macro scenarios modelled by macro economic model
- global factors main risk drivers
- interaction of global risk factors over multi-year horizon
12. CB transmission in macro scenarios

In the recent macro scenarios of DNB...

- Malaise
- Global correction

...the transmission to the domestic system mainly runs through international interest rate movements

Global correction scenario affects financial sector:

- Financial contagion ⇒ market risk (worldwide rise of risk aversion, declining asset prices, currency losses on foreign assets)
- Transmission to economy by wealth effects and trading channel ⇒ credit risk
13. Impact macro scenarios on banks

Banks most vulnerable for global correction scenario (worldwide exposures)

European malaise: impact on total credit portfolio
Probability distribution of credit losses, horizon 3 yrs

Global correction: impact on total credit portfolio
Probability distribution of credit losses, horizon 3 yrs
14. Impact macro scenarios on PF

IC, PF most vulnerable for European malaise scenario (interest rate sensitivity due to negative duration gap)

Funding ratio of pension funds in scenarios
Funding ratio, per cent, with shocks in interest rate and stock price index according to scenarios (effects after 3 years)

Explanation: the lines "Malaise" and "Base scenario" nearly coincide and show that the impact of a positive stock market shock coincides in both scenarios. The line "Global correction" shows the impact of various interest rates at the negative stock market shock in this scenario. Source: DNB.
15. Liquidity risk in stress-testing

Liquidity risk hard to model...
...but key in systemic risk

Liquidity risk of banks addressed by
- scenarios for bottom-up stress-testing
- interbank contagion model
- liquidity supervision at the level of the institutions (also based on scenarios)
16. Global liquidity scenario

Liquidity scenario in bottom-up stress-tests of DNB

Market crisis (systemic shock)...
- drying up interbank market euro area
- shut down CD, CP market
- falling asset prices, rising interest rates and spreads

...options: outright sales of assets, posing additional collateral at central bank

Indicators
- liq assets / liq liabilities ratio
- time to default
17. DNB interbank contagion model

DNB interbank model to test direct contagion of idiosyncratic shock (top-down)

Conclusions simulation

- main risks for Dutch banks have cross-border nature (losses from foreign regions have stronger impact than failure of other Dutch banks). Due to global nature of banks exposures
- In particular foreign subsidiaries and/or branches are vulnerable to shocks originating in the parent company region
18. Liquidity supervision

DNB’s liquidity risk supervision

- Stress-test based tool (scenario mix)
- fixed weights for hair cuts on assets and withdrawal rate of liabilities
- useful for macro prudential analysis

Liquidity position based on stressed conditions
Monthly period Average surplus ratio

<table>
<thead>
<tr>
<th>Average surplus ratio*</th>
<th>Number of banks</th>
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<tbody>
<tr>
<td>0-10</td>
<td>15</td>
</tr>
<tr>
<td>10-20</td>
<td>10</td>
</tr>
<tr>
<td>20-30</td>
<td>5</td>
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<tr>
<td>30-40</td>
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<tr>
<td>40-50</td>
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<tr>
<td>50-100</td>
<td>10</td>
</tr>
<tr>
<td>100-150</td>
<td>15</td>
</tr>
<tr>
<td>150-200</td>
<td>10</td>
</tr>
<tr>
<td>&gt;200</td>
<td>25</td>
</tr>
</tbody>
</table>

* Average surplus as % of average liquidity requirement (average over the period 06/03 - 09/03)
19. Importance group-wide approach

Group-wide approach of stress-tests, covering both domestic and foreign activities (LCFIs with cross-border operations)...

...to capture risks and identify potential spill-overs among business areas within the group
20. Group-wide approach DNB (1)

Liquidity supervision

- Group-wide reporting of liquidity data, incl. material branches and subsidiaries abroad
- Inclusion of liquidity surplusses abroad only permitted if no liquidity deficit in foreign entity and if convertible currency

Bottom-up stress-testing

- Reporting break-down of results by business unit
21. Group-wide approach DNB (2)

Top-down stress-testing
- modelling consolidated balance sheets
- separate credit risk models for domestic vs. total exposures

\[
\lambda \left( \frac{\text{LLP}_\text{dom}}{\text{CRED}_\text{dom}} \right)_{i,i} = \text{fixed effects}_i + \beta_1 \ \text{GDP}_\text{NL}_i + \beta_2 \text{RL}_i + \beta_3 \lambda(\text{Defaultrate}_\text{NL})_i
\]

\[
\lambda \left( \frac{\text{LLP}_\text{total}}{\text{CRED}_\text{total}} \right)_{i,i} = \text{fixed effects}_i + \beta_1 \ \text{GDP}_\text{EU}_{i,i} + \beta_2 \text{RL}_{i,i} + \beta_3 \lambda(\text{Defaultrate}_\text{world})_{i,i}
\]
22. Cross-border approach ESCB

ESCB/BSC/WGMA Task Force on Stress Testing

to explore ways to extend macro stress-tests with 
cross-border inter-linkages

Possibly by adding European dimension to national 
stress-tests
23. Conclusions

- Cross-border risks important, but usually neglected in macro stress-tests

- Cross-border issues could be incorporated by:
  - scenario analyses
  - focus on liquidity
  - group-wide approach
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