Inspecting Basel III

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www.moneyandbanking.com
Banks: Activities & Externalities

- Credit transformation: too much risk
- Liquidity transformation: too little liquidity
- Maturity transformation: too big a duration mismatch
Banks: Activities, Externalities & Responses

- Credit transformation: too much risk
  ⇒ capital requirements

- Liquidity transformation: too little liquidity
  ⇒ liquidity coverage ratio

- Maturity transformation: too big a duration mismatch
  ⇒ net stable funding ratio
The Basel III Standards

1) Leverage Ratio (Lev)
2) Risk-Weighted Capital Ratio (Risk)
3) Liquidity Coverage Ratio (LCR)
4) Net Stable Funding Ratio (NSFR)
Purpose: Increase individual institution resilience and reduce moral hazard created by the combination of limited liability, deposit insurance and implicit government guarantees.

- **Risk weighted (Risk):**
  More risk requires bigger buffers.

- **Unweighted leverage ratio (Lev):**
  Potential underestimation of risk, require a minimum.
Liquidity Requirements: LCR

To promote short-term resilience of a bank’s liquidity risk profile, the Basel Committee developed the Liquidity Coverage Ratio (LCR). This standard aims to ensure that a bank has an adequate stock of unencumbered high quality liquid assets (HQLA) which consists of cash or assets that can be converted into cash at little or no loss of value in private markets to meet its liquidity needs for a 30 calendar day liquidity stress scenario.

The LCR has two components:

(a) the value of the stock of HQLA; and
(b) total net cash outflows,

and is expressed as:

\[
\frac{\text{Stock of HQLA}}{\text{Total net cash outflows over the next 30 calendar days}} \geq 100\%
\]
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\]

Loosely speaking:
Match runnable liabilities with liquid assets
9. The NSFR is defined as the amount of available stable funding relative to the amount of required stable funding. This ratio should be equal to at least 100% on an ongoing basis. "Available stable funding" is defined as the portion of capital and liabilities expected to be reliable over the time horizon considered by the NSFR, which extends to one year. The amount of such stable funding required ("Required stable funding") of a specific institution is a function of the liquidity characteristics and residual maturities of the various assets held by that institution as well as those of its off-balance sheet (OBS) exposures.

\[
\frac{\text{Available amount of stable funding}}{\text{Required amount of stable funding}} \geq 100\%
\]
Liquidity Requirements: NSFR

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\[
\frac{\text{Available amount of stable funding}}{\text{Required amount of stable funding}} \geq 100\%
\]

Loosely speaking:
Fund illiquid assets with stable funding
# Basel Committee on Banking Supervision reforms - Basel III

Strengthened microprudential regulation and supervision, and added a macroprudential overlay that includes capital buffers.

## All Banks

### Capital

<table>
<thead>
<tr>
<th>Capital</th>
<th>Risk coverage</th>
<th>Containing leverage</th>
<th>Risk management and supervision</th>
<th>Market discipline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality and level of capital</td>
<td>Securitisations Strengthen the capital treatment for certain complex securitisations. Requires banks to conduct more rigorous credit analyses of externally rated securitisation exposures.</td>
<td>Leverage ratio A non-risk-based leverage ratio that includes off-balance sheet exposures will serve as a backstop to the risk-based capital requirement. Also helps contain system wide build up of leverage.</td>
<td>Supplemental Pillar 2 requirements.</td>
<td>Revised Pillar 3 disclosures requirements.</td>
</tr>
<tr>
<td>Greater focus on common equity. The minimum will be raised to 4.5% of risk-weighted assets, after deductions.</td>
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</tr>
<tr>
<td>Capital loss absorption at the point of non-viability</td>
<td>Trading book Significantly higher capital for trading and derivatives activities, as well as complex securitisations held in the trading book. Introduction of a stressed value-at-risk framework to help mitigate procyclicality. A capital charge for incremental risk that estimates the default and migration risks of unsecured credit products and takes liquidity into account.</td>
<td>Leverage ratio A non-risk-based leverage ratio that includes off-balance sheet exposures will serve as a backstop to the risk-based capital requirement. Also helps contain system wide build up of leverage.</td>
<td>Supplemental Pillar 2 requirements.</td>
<td>Revised Pillar 3 disclosures requirements.</td>
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<tr>
<td>Contractual terms of capital instruments will include a clause that allows – at the discretion of the relevant authority – write-off or conversion to common shares if the bank is judged to be non-viable. This principle increases the contribution of the private sector to resolving future banking crises and thereby reduces moral hazard.</td>
<td>Counterparty credit risk Substantial strengthening of the counterparty credit risk framework. Includes more stringent requirements for measuring exposure; capital incentives for banks to use central counterparties for derivatives and higher capital for inter-financial sector exposures.</td>
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<tr>
<td>Capital conservation buffer Comprising common equity of 2.5% of risk-weighted assets, bringing the total common equity standard to 7%. Constraint on a bank’s discretionary distributions will be imposed when banks fall into the buffer range.</td>
<td>Counterparty credit risk Substantial strengthening of the counterparty credit risk framework. Includes more stringent requirements for measuring exposure; capital incentives for banks to use central counterparties for derivatives and higher capital for inter-financial sector exposures.</td>
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<td>Countercyclical buffer Imposed within a range of 0-2.5% comprising common equity, when authorities judge credit growth is resulting in an unacceptable build up of systematic risk.</td>
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### SIFIs

In addition to meeting the Basel III requirements, global systemically important financial institutions (G-SIFIs) must have higher loss absorbency capacity to reflect the greater risks that they pose to the financial system. The Committee has developed a methodology that includes both quantitative indicators and qualitative elements to identify global systemically important banks (G-SIBs). The additional loss absorbency requirements are to be met with a progressive Common Equity Tier 1 (CET1) capital requirement ranging from 1% to 2.5%, depending on a bank’s systemic importance. For banks facing the highest SIB surcharge, an additional loss absorbency of 1% could be applied as a discretionary increase materially their global systemic importance in the future. This consultative document was published in cooperation with the Financial Stability Board, which is coordinating the overall set of measures to reduce the moral hazard posed by global SIFIs.

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**BRANDEIS INTERNATIONAL BUSINESS SCHOOL**

[brandeis.edu/global]
Source: Basel III capital standards.
Source: Basel III liquidity coverage ratio.
Source: Basel III net stable funding ratio.

brandeis.edu/global
The Basel III Standards

1) Leverage Ratio (Lev)
2) Risk-Weighted Capital Ratio (Risk)
3) Liquidity Coverage Ratio (LCR)
4) Net Stable Funding Ratio (NSFR)

Do we need all four?
Which ones matter when and for which banks?
How can we compare them?

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A_1$</td>
<td>$L_1$</td>
</tr>
<tr>
<td>$A_2$</td>
<td>$L_2$</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>$A_n$</td>
<td>$L_k$</td>
</tr>
</tbody>
</table>

Also there are off-balance sheet “exposures” $[OBS_j, \ldots, OBS_j]$
All four requirements can be written as:

\[ \sum a_i A_i + \sum b_j OBS_j \quad \Box \quad \sum c_k L_k + dE \]

(The OBS can appear on either side of the balance sheet)

Weighted Average of Assets \[ \geq \] Weighted Average of Liabilities
All four requirements can be written as:

\[ \sum a_i A_i + \sum b_j OBS_j \leq \sum c_k L_k + dE \]

(The OBS can appear on either side of the balance sheet)

Lev: \[ \sum A_i + \sum b_{1j} OBS_j \leq \frac{1}{\lambda} E \]

Risk: \[ \sum a_{1i} A_i + \sum b_{2j} OBS_j \leq \frac{1}{\rho} E \]
Notice all four requirements can be written as:

\[ \sum a_i A_i + \sum b_j OBS_j \leq \sum c_k L_k + dE \]

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Lev: \[ \sum A_i + \sum b_{1j} OBS_j \leq \frac{1}{\lambda} E \]

Risk: \[ \sum a_{1i} A_i + \sum b_{2j} OBS_j \leq \frac{1}{\rho} E \]

LCR: \[ \sum a_{2i} A_i - \sum b_{3j} OBS_j \geq \sum c_{1k} L_k \]

NSFR: \[ \sum a_{3i} A_i + \sum b_{4j} OBS_j \leq \sum c_{2k} L_k + E \]
Notice all four requirements can be written as:

\[ \sum a_i A_i + \sum b_j OBS_j \quad ? \quad \sum c_k L_k + dE \]

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NSFR: \[ \sum a_{3i} A_i + \sum b_{4j} OBS_j \leq \sum c_{2k} L_k + E \]

BS Identity \[ \sum A_i = \sum L_k + E \]
## Capital Requirements: Simplest Case

<table>
<thead>
<tr>
<th>Assets (A)</th>
<th>Liabilities</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safe Assets</td>
<td>Debt</td>
<td>Equity</td>
</tr>
<tr>
<td>Risky Assets = ( \phi A )</td>
<td></td>
<td></td>
</tr>
</tbody>
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**OBS Exposure:**

- Total \( = \theta A \)
- Risky \( = \psi A \)

Each is a fraction of total on-balance-sheet assets.
Capital Requirements: Simplest Case

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OBS Exposure: Total = \( \theta A \)  
Risky = \( \psi A \)  
Each is a fraction of total on-balance-sheet assets

\[
E \geq \lambda (A + \theta A) = \lambda (1 + \theta) A \\
E \geq \rho (\phi A + \psi A) = \rho (\phi + \psi) A
\]

Lev: \( E \geq \) fraction of total exposure  
Risk: \( E \geq \) fraction of RWA
Lev binds when:

\[ \lambda > \rho \frac{(\phi + \psi)}{(1 + \theta)} \]

i.e., \( \lambda > \rho \frac{\text{Total Risk Weighted Assets}}{\text{Total Leverage Exposure}} \)

<table>
<thead>
<tr>
<th>Bank Type</th>
<th>( \phi ) RWA TA</th>
<th>( \theta ) OBS Total</th>
<th>( \psi ) OBS Risky</th>
<th>Break-even Lev if ( \rho = 12 )</th>
<th>Break-even ( \rho ) if Lev = 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment banking</td>
<td>0.49</td>
<td>2.23</td>
<td>0.41</td>
<td>3.35</td>
<td>10.76</td>
</tr>
<tr>
<td>Retail/commercial banking</td>
<td>0.26</td>
<td>0.13</td>
<td>0.09</td>
<td>3.72</td>
<td>9.68</td>
</tr>
<tr>
<td>Specialized lender</td>
<td>0.42</td>
<td>0.10</td>
<td>0.06</td>
<td>5.24</td>
<td>6.87</td>
</tr>
<tr>
<td>Universal banking (retail/commercial and investment banking)</td>
<td>0.35</td>
<td>0.44</td>
<td>0.17</td>
<td>4.30</td>
<td>8.38</td>
</tr>
<tr>
<td>Building Societies (ex Nationwide)</td>
<td>0.26</td>
<td>0.05</td>
<td>0.03</td>
<td>3.24</td>
<td>11.11</td>
</tr>
</tbody>
</table>
1) Only one of the ratios will bind at a time
2) Lev will bind for banks with:
   - low risk weights (ϕ)
   - large off balance sheet assets exposures (θ)
3) OBS positions sticky, but ϕ can jump in stress tests
   ➔ A bank can move from Lev to Risk binding, but not vice versa
1) Only one of the ratios will bind at a time
2) Lev will bind for banks with:
   o low risk weights (\( \phi \))
   o large off balance sheet assets exposures (\( \theta \))
3) OBS positions sticky, but \( \phi \) can jump in stress tests
   ➔ A bank can move from Lev to Risk binding, but not vice versa
4) Can a bank use financial engineering to alter \( \phi \)?
   Does that make the leverage ratio bind?
1) Only one of the ratios will bind at a time
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   o large off balance sheet assets exposures (θ)
3) OBS positions sticky, but ϕ can jump in stress tests
   ➔ A bank can move from Lev to Risk binding, but not vice versa
4) Can a bank use financial engineering to alter ϕ?
   Does that make the leverage ratio bind?
5) Liquidity stress tests don’t change any of this (ϕ,θ,ψ)
### Liquidity Requirements: Special Case

1) no off balance sheet exposures  
2) assets either perfectly liquid or illiquid  
3) liabilities either totally runnable or stable

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
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<tr>
<td>Liquid</td>
<td>Runnable</td>
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<tr>
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</table>

LCR: Liquid Assets \( \geq \) Runnable Liabilities
NSFR: Illiquid Assets \( \leq \) Stable Liabilities
Rewriting Liquidity Regulations

- LCR  Liquid – Runnable \( \geq 0 \)
- NSFR  Stable – Illiquid \( \geq 0 \)

- Identity  Total Assets = Total Liabilities \( \Rightarrow \)
  Liquid + Illiquid  = Runnable + Stable
Rewriting Liquidity Regulations

- LCR  Liquid – Runnable  ≥ 0
- NSFR  Stable – Illiquid  ≥ 0

Identity  Total Assets = Total Liabilities \[\Rightarrow\]
Liquid + Illiquid = Runnable + Stable

\[
\text{Liquid} - \text{Runnable} = \text{Stable} - \text{Illiquid}
\]

\[\text{LCR} \quad \text{NSFR}\]

In this special case the LCR & NSFR are identical!
### Liquidity Requirements: General Case

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid (cover runnable) (H)</td>
<td>Runnable (D)</td>
</tr>
<tr>
<td>Illiquid (require stable) (R)</td>
<td>Stable (B)</td>
</tr>
<tr>
<td>Equity</td>
<td></td>
</tr>
</tbody>
</table>

Other Assets \(OA\) Other Liabilities \(OL\)

Off-balance sheet exposures: \(\text{OBS}_L\) and \(\text{OBS}_N\)
# Liquidity Requirements: General Case

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</tr>
<tr>
<td>Other Assets ((OA))</td>
<td>Equity ((E))</td>
</tr>
<tr>
<td>Other Liabilities ((OL))</td>
<td></td>
</tr>
</tbody>
</table>

Off-balance sheet exposures: \(\text{OBS}_L\) and \(\text{OBS}_N\)

**LCR:** \(H \geq D + \text{OBS}_L\)

**NSFR:** \(B + E \geq R + \text{OBS}_N\)
Recall the balance sheet identity:

\[ H + R + OA = D + B + E + OL \]

\[ \Rightarrow H - D + (OA - OL) = B + E - R \]

**LCR:** \[ H - D \geq OBS_L \]

**NSFR:** \[ H - D \geq OBS_N + OL - OA \]

**LCR binds if and only if:**

\[ OBS_L + OA \geq OBS_N + OL \]
What are *Other Assets* (OA) and *Other Liabilities* (OL)?

**OA:** assets that are neither fully HQLA nor fully require stable funding
- recourse mortgages
- loans w/ risk weight < 35%
  count as 0 for the LCR and 0.65 for the NSFR

**OL:** liabilities that are neither completely runnable nor entirely available as stable funding
- unsecured wholesale funding with 1 to 6 month maturity
  count 0 for LCR & provide 0 stable funding in the NSFR
# Example 1: LCR binds

## Assets

<table>
<thead>
<tr>
<th></th>
<th>LCR</th>
<th>NSFR</th>
<th>OA Weight</th>
<th>OA</th>
</tr>
</thead>
<tbody>
<tr>
<td>HQLA</td>
<td>15</td>
<td>100%</td>
<td>5%</td>
<td>-5%</td>
</tr>
<tr>
<td>Mortgages</td>
<td>85</td>
<td>0</td>
<td>65%</td>
<td>35%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>15</td>
<td>56</td>
<td></td>
</tr>
</tbody>
</table>

## Liabilities

<table>
<thead>
<tr>
<th></th>
<th>LCR</th>
<th>NSFR</th>
<th>OL Weight</th>
<th>OL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand Deposits</td>
<td>60</td>
<td>5%</td>
<td>95%</td>
<td>0%</td>
</tr>
<tr>
<td>Wholesale</td>
<td>30</td>
<td><strong>40%</strong></td>
<td>0%</td>
<td><strong>60%</strong></td>
</tr>
<tr>
<td>Equity</td>
<td>10</td>
<td>0</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>15</td>
<td>57</td>
<td></td>
</tr>
</tbody>
</table>

**LCR just met (100%) & NSFR slack (102%)**

(large mortgage book & modest wholesale funding)
## Example 2: NSFR binds

### Assets

<table>
<thead>
<tr>
<th></th>
<th>LCR</th>
<th>NSFR</th>
<th>OA Weight</th>
<th>OA</th>
</tr>
</thead>
<tbody>
<tr>
<td>HQLA</td>
<td>25</td>
<td>100%</td>
<td>5%</td>
<td>-5%</td>
</tr>
<tr>
<td>Mortgages</td>
<td>75</td>
<td>0</td>
<td>65%</td>
<td>35%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>25</td>
<td>50</td>
<td>25</td>
</tr>
</tbody>
</table>

### Liabilities

<table>
<thead>
<tr>
<th></th>
<th>LCR</th>
<th>NSFR</th>
<th>OL Weight</th>
<th>OL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand Deposits</td>
<td>20</td>
<td>5%</td>
<td>95%</td>
<td>0%</td>
</tr>
<tr>
<td>Wholesale</td>
<td>60</td>
<td>40%</td>
<td>0%</td>
<td>60%</td>
</tr>
<tr>
<td>Equity</td>
<td>20</td>
<td>0</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>25</td>
<td>39</td>
<td>36</td>
</tr>
</tbody>
</table>

LCR just met (100%) & **NSFR binding (78%)**

(large wholesale funding)
Implications of OA and OL

- Large mortgage businesses means large OA:
  \[ OA > OL \implies LCR \text{ binds} \]
Implications of OA and OL

• Large mortgage businesses means large OA:
  OA > OL  $\Rightarrow$  LCR binds

• Large wholesale funding > 30 days means large OL:
  OL > OA  $\Rightarrow$  NSFR binds

(Can’t compute OL & OA from publicly reported data)
What about OBS Exposures?

- $OBS_L$ comes from the net cash inflows and outflows over the next 30 days
  - Big outflows are committed lines of credit, derivative outflows (from downgrades of collateral or valuation changes)
  - Inflows are derivative receipts, funds from collateral swaps
What about OBS Exposures?

- \( \text{OBS}_L \) comes from the \textit{net} cash inflows and outflows over the next 30 days
  - Big outflows are committed lines of credit, derivative outflows (from downgrades of collateral or valuation changes)
  - Inflows are derivative receipts, funds from collateral swaps
- \( \text{OBS}_N \) comes from required stable funding associated with OBS exposures
  - Undrawn credit lines to non-financial entities weights <100%
  - Net unmargined derivatives
What about OBS Exposures?

• **OBS\(_L\)** comes from the *net* cash inflows and outflows over the next 30 days
  - Big outflows are committed lines of credit, derivative outflows (from downgrades of collateral or valuation changes)
  - Inflows are derivative receipts, funds from collateral swaps

• **OBS\(_N\)** comes from required stable funding associated with OBS exposures
  - Undrawn credit lines to non-financial entities weights <100%
  - Net unmargined derivatives

• Conjecture that the OBS not fully independent of OL & OA
  - Large wholesale funding might naturally be found along with lots of credit lines
## Calibrating $\text{OBS}_L + \text{OA}$ vs. $\text{OBS}_N + \text{OL}$

<table>
<thead>
<tr>
<th>Small set of UK banks</th>
<th>Universal Banks</th>
<th>Building Societies</th>
</tr>
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<tbody>
<tr>
<td>$\text{OBS}_L$ outflows</td>
<td>5.7%</td>
<td>3.4%</td>
</tr>
<tr>
<td>$\text{OBS}_L$ inflows</td>
<td>(0.9%)</td>
<td>(0.0%)</td>
</tr>
<tr>
<td>OA</td>
<td>23.0%</td>
<td>22.0%</td>
</tr>
<tr>
<td>$(\text{OBS}_L \text{ net}) + \text{OA}$</td>
<td>27.8%</td>
<td>25.4%</td>
</tr>
<tr>
<td>$\text{OBS}_N$</td>
<td>4.0%</td>
<td>1.0%</td>
</tr>
<tr>
<td>OL</td>
<td>13.7%</td>
<td>7.0%</td>
</tr>
<tr>
<td>$\text{OBS}_N + \text{OL}$</td>
<td>17.7%</td>
<td>8.0%</td>
</tr>
<tr>
<td>NSFR Reporting Coverage (diff)</td>
<td>94.8%</td>
<td>98.1%</td>
</tr>
<tr>
<td>$\text{OL'} = \text{OL} + (1-\text{diff})$</td>
<td>18.9%</td>
<td>8.9%</td>
</tr>
<tr>
<td>$\text{OBS}_N + \text{OL'}$</td>
<td>22.9%</td>
<td>9.9%</td>
</tr>
</tbody>
</table>

| 27.8% > [17.7, 22.9] | 25.5% >> [8.0, 9.9] |
Calibrating $\text{OBS}_L + \text{OA}$ vs. $\text{OBS}_N + \text{OL}$

<table>
<thead>
<tr>
<th>Small set of UK banks</th>
<th>Universal Banks</th>
<th>Building Societies</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{OBS}_L$ outflows</td>
<td>5.7%</td>
<td>3.4%</td>
</tr>
<tr>
<td>$\text{OBS}_L$ inflows</td>
<td>(0.9%)</td>
<td>(0.0%)</td>
</tr>
<tr>
<td>OA</td>
<td>23.0%</td>
<td>22.0%</td>
</tr>
<tr>
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<td>9.9%</td>
</tr>
</tbody>
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27.8% > [17.7, 22.9] 25.5% >> [8.0, 9.9]

For these cases: LCR binding implies NSFR binding
1) LCR seems to bind, but for different reasons for different types of banks.
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2) Liquidity stress tests change LCR run-off rates. This can’t make the NSFR bind (reduces OL).
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2) Liquidity stress tests change LCR run-off rates. This can’t make the NSFR bind (reduces OL).

3) Conditions governing LCR vs NSFR distinct from those governing Lev vs Risk.

Liquidity & capital regulations are separate.
Conclusions

1) Only 2 of 4 ratios bind at a time
   NSFR may not be doing what was envisaged

2) Stress tests can flip which capital requirement binds,
   but not which liquidity requirement binds

3) Separation principle appears to hold for
   the capital and liquidity requirements
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Is this what we want?