Managing liquidity risk under regulatory pressure

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Impact of the new Basel III regulation on the liquidity framework
Liquidity and business strategy alignment

79% of respondents felt that the new regulatory rules for liquidity are expected to have a strong impact on business operations and strategy of organisations.

77% of respondents felt that the board & senior management have a thorough understanding of the roles of liquidity and funding risks in shaping the business strategy.

Bar chart showing:
- Significant impact: 42%
- Somewhat of an impact: 37%
- Little impact: 13%
- No impact: 8%

Bar chart showing:
- Thorough and complete understanding: 23%
- Good understanding: 54%
- Little understanding: 23%
Liquidity and business strategy alignment: going forward

70% of organisations have seen changes implemented to their liquidity risk tolerance due to Basel III requirements.

94% expect their liquidity risk tolerance to change further as a result of Basel III requirements.

Thus far:

- Complete overhaul: 3%
- Significant change: 20%
- Minimal change: 47%
- No change: 30%

Going forward:

- Complete overhaul: 9%
- Significant change: 48%
- Minimal change: 36%
- No change: 6%
And yet, the alignment between strategy and processes is unclear

76% of respondents are unclear how the new rules have been incorporated into their organisation’s key business processes and pricing.

Has the impact of the new liquidity rules on profitability been factored into key business processes and pricing?

- Yes (24%)
- No (26%)
- Don’t know (50%)

72% of respondents do not feel fully confident that their organisation’s liquidity position is well understood.

Are you satisfied that your organisation currently understands its liquidity position in sufficient detail and knows where the stress points are?

- Very satisfied (28%)
- Somewhat satisfied (39%)
- Not satisfied (13%)
- Don’t know (20%)
**Liquidity: seeing the full picture**

61% of respondents are unsure whether the new liquidity measures are sufficient in providing a holistic view of liquidity. Is the liquidity regulation is too simplistic as only two key ratios are being introduced?

- **Yes** (35%)
- **No** (40%)
- **Don’t know** (26%)

» Compliment regulatory requirements with additional measures to give a full picture of liquidity and funding positions

» Ensure that there is a close dialogue between strategy / risk / treasury / finance

» Understand the impact of strategy on day-to-day operations and processes and focus on top-down / bottom-up communication
**Modeling and data/infrastructure are recurrent pain points**

<table>
<thead>
<tr>
<th>Description of Activities</th>
<th>Scope of stress testing</th>
<th>Regulatory only</th>
<th>Business-specific: Group/LOB ST</th>
<th>Risks to stress: credit, liquidity, interest rates/FX, performance..</th>
<th>Define the risk factors: credit (PD, LGD, rating, EAD), liquidity (ownership), ALM operational..</th>
<th>Governance of stress testing (ownership, contributions, frequency of tests, reporting process, reporting lines..)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Yearly</th>
<th>Yearly / Quarterly</th>
<th>Yearly / Quarterly</th>
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<table>
<thead>
<tr>
<th>Output</th>
<th>Scope and governance rules of ST programme</th>
<th>Data input into models and/or platforms</th>
<th>Stressed PD, EAD, LGD: from quarterly to yearly</th>
<th>Stressed liquidity risk parameters, stressed cash-flows and financials: monthly</th>
<th>Stressed capital and leverage ratio: quarterly to yearly</th>
<th>Stressed cash-flows: monthly ²</th>
</tr>
</thead>
</table>

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<tr>
<th>Reporting</th>
<th>Reporting and disclosed information (internally and externally)</th>
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1 Sources of Liquidity Risk (FSA): Wholesale secured and unsecured funding risk, Retail funding risk, Intra-day liquidity risk, Intra-group liquidity risk, Cross-currency liquidity risk, Off-balance sheet liquidity risk, Franchise viability risk, Marketable assets risk, Non-marketable assets risk, and Funding concentration risk

2 Sources of risk from ALM perspective: client’s behavior, funding risk, facility utilization, prepayments, runoff

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**Credit risk**
- Model the impact of the scenarios on the incidence of default by borrowers (by individual balance sheets and by portfolios)
- Define infrastructure requirements
- Data sourcing: (financial internal, macro/ default /market data...)
- Compilation and data formatting
- Data audit

**Liquidity risk**
- Model the impact of scenarios on key liquidity risk parameters
  - Market risk
    - Model market risk to estimate the impact on P&L

**Market risk**
- Enter stressed inputs into software and run the calculations to obtain:
  - Credit (capital)
  - Regulatory capital ratio (total RWA, RWA ratio)
  - Stressed net income
  - Economic capital ratio
  - "Book" capital ratio
  - Liquidity (cash-flows)
    - Liquidity gap and liquidity ratios (buffer)

**Market**
- Stressed VAR
- Leverage ratio
- Aggregate and validate results

**Consolidation of ST results (capital and liquidity)**
- Formatting and auditing
- Internal reporting to management (within Risk/Treasury/ALM)
- Periodic reporting to Board, ALCO, and other Committees
- Public disclosures to local regulator or other bodies (EBA, FMI...)
- ICAAP & ILAA

**Management actions**
- Calculate risk exposure and compare with risk appetite (modify planning and limits, reduce concentration..)
- Liquidity planning and asset growth limits adjustments
- Contribute to contingency funding plan

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**Moody’s Analytics**

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Basel III and best practices for Asset & Liability Management
ALM within a regulatory framework

- Who is in Charge?
- The most important constraint is…
The ALM/Treasury point of view
- Different sources of funding are available
- Which one is the less expensive?

Stress tests for ALM
- Data is available in the Bank
- Scenarios and behaviors

How to
- Build plausible scenarios
- Link all the liquidity risk drivers
Liquidity management and liquidity risk
ALM scenarios are not Stress Tests

- Stress test calculation for Liquidity
  - Stressing market data
  - Behavioral models (data is needed)
  - Cash flow generation

- Adding the impact of the Contingency Funding Plan
  - See how the Bank will behave during the crisis
  - Estimate the cost

Stress Test for liquidity management
- sensitivity analysis

Stress Test for liquidity RISK management
- Crisis scenario

Best practices
Economic scenario generation and calculation techniques
Overall Roadmap

Global Macro Scenarios

Financial Inputs: FX, IR and Yields

Credit Inputs: Rating Migrations, PDs, LGDs and Correlations

Average One Year Rating Migration Rates for Sovereigns (All Available Years - Duration Based Approach)

AAA 97.42% 0.01% 0.00% 0.01% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00%
AA 4.48% 94.02% 0.03% 0.56% 0.02% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00%
A 0.40% 3.46% 93.32% 2.75% 0.06% 0.00% 0.00% 0.00% 0.30% 0.00% 0.00% 0.00%
BAA 0.02% 0.45% 6.72% 89.30% 3.38% 0.12% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00%
BA 0.00% 0.02% 0.26% 6.99% 86.23% 5.93% 0.12% 0.40% 0.00% 0.00% 0.00% 0.00%
B 0.00% 0.00% 0.00% 0.00% 0.84% 89.04% 3.41% 0.00% 0.00% 0.00% 0.00% 0.00%
CAA-C 0.00% 0.00% 0.00% 0.00% 0.00% 75.65% 14.99% 2.23% 0.00% 0.00% 0.00% 0.00%
D 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 100.00% 0.00% 0.00% 0.00%
NR 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 100.00% 0.00% 0.00%

Portfolio Composition

Simulations

Portfolio Values

Expected Losses

Calculations

Baseline  EM Slowdown  Sovereign Shock

Holding Amount  10,000,000,000  10,000,000,000  10,000,000,000

Value  10,000,024,316  9,963,273,473  9,913,169,121

Loss in value  -  36,750,843  -  86,855,195

Expected liability value  10,174,140,435  10,146,942,361  10,122,714,617

0.1% Value at Risk  754,991,765  867,030,010  1,025,607,795

0.5% Value at Risk  399,133,060  513,646,579  632,609,276

1% Value at Risk  306,991,073  368,525,104  426,653,699

2% Value at Risk  232,324,292  281,828,600  331,718,611

Moody’s Analytics
Financial Models: Money Market Rates

3-month Libor, EUR

ECB policy rate

Moody's Analytics
Financial Models: CDS Spreads

Index CDS Spread - Investment Grade Bonds

Financial Corporations

Baseline
Market Wide
Market Shock
Combined
Key Output Vectors of Econometric Model

**Constant Prepayment Rate (CPR)**

**Severity of Losses (LGD)**

**Probability of Default (PD)**

Moody’s Analytics
All asset classes are correlated: Importance of measuring correlations & concentrations
Econometric model: System of equation model using panel data regression techniques to account for latent pool quality

<table>
<thead>
<tr>
<th>Lifecycle component</th>
</tr>
</thead>
<tbody>
<tr>
<td>» Dynamic evolution of vintages as they mature</td>
</tr>
<tr>
<td>» Nonlinear model against “age”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vintage-specific quality component</th>
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<tbody>
<tr>
<td>» Vintage attributes (LTV, asset class/collateral type, geography, etc.) define heterogeneity across cohorts</td>
</tr>
<tr>
<td>» Early arrears serve as proxies for underlying vintage quality</td>
</tr>
<tr>
<td>» Economic conditions at origination matter</td>
</tr>
<tr>
<td>» Econometric technique accounts for time-constant, unobserved effect</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Business cycle exposure component</th>
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</thead>
<tbody>
<tr>
<td>» Sensitivity of performance to the evolution of macroeconomic and credit series</td>
</tr>
</tbody>
</table>

Time series performance for a given vintage of loans $= f$
Performance of Future Loans

Performance History

Forecasted Performance of Existing Loans

June 2004 - June 2008
Mortgage Market Performance under Baseline Economic Scenario

Stress Testing of Retail Portfolios

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Performance History

Forecasted Performance of Existing Loans
Managing the Basel III ratios
Two effects of the prepayment option

The borrower’s option to prepay results in two adverse effects to the lender:

1. Loss of potential income – when the borrower prepays in favorable credit states
   Captured by the option spread component of the FTP
2. Asset-liability mismatch – the funding cost is quoted for a fixed maturity loan whereas the client loan can terminate prematurely
   Captured by the funding liquidity component of the FTP
Funding cost: computing spread in a one-period model

<table>
<thead>
<tr>
<th>Borrower</th>
<th>Cash Flow to Bank Shareholder</th>
</tr>
</thead>
<tbody>
<tr>
<td>ND</td>
<td>$1 + r_{Borrower} - 1$</td>
</tr>
<tr>
<td>D</td>
<td>$(1 - LGD_{Borrower}) - 1$</td>
</tr>
</tbody>
</table>

$$V_{BankShareholder} = \Pr^Q \{ ND_{Borrower} \} (1 + r_{Borrower}) + \Pr^Q \{ D_{Borrower} \} (1 - LGD_{Borrower}) - 1$$

break even rate $r_{Borrower} \approx PD^Q_{Borrower} \cdot LGD_{Borrower}$
Funding cost: what if the bank faces default risk?

<table>
<thead>
<tr>
<th>Bank</th>
<th>Borrower</th>
<th>Cash Flow to Shareholder</th>
</tr>
</thead>
<tbody>
<tr>
<td>ND</td>
<td>ND</td>
<td>((1+r_{Borrower})-(1+r_{Bank}))</td>
</tr>
<tr>
<td>ND</td>
<td>D</td>
<td>((1-LGD_{Borrower})-(1+r_{Bank}))</td>
</tr>
<tr>
<td>D</td>
<td>ND or D</td>
<td>0</td>
</tr>
</tbody>
</table>

\[
V_{BankShareholders} = \Pr^Q\{ND_{Bank}\} \left[ \Pr^Q\{ND_{Borrower}\}(1+r_{Borrower}) + \Pr^Q\{D_{Borrower}\}(1 - LGD_{Borrower}) - (1 + r_{Bank}) \right]
\]

Break even rate \( r_{Borrower} \approx PD^Q_{Borrower} \cdot LGD_{Borrower} + r_{Bank} \)

Funding liquidity premium (captured by the funding cost) is encapsulated in the client rate.
Multi-period setting: prepayment option

- In general, a pre-payable loan should have a higher fee to offset the value of the option – a prepayment premium.
- With the funding liquidity premium priced in, the likelihood of prepayment increases.
- The lattice valuation model facilitates the modeling of credit-contingent cash flows, which include loan prepayment, dynamic utilization of revolving lines, and grid pricing.
Data Management: Unification of data at transaction level

- Imports from Contract Systems, Risk Systems, GL
- KRI (Basel II / E-Cap)
- Cost / Income (Source Systems / GL)
- Contracts (Source System)
- FTP (GL / ALM)
- Transaction Level (Allocation)
- KPI Computation
- Scenario Analysis & Forecasting
- Business Intelligence Layer (Aggregation & Drill Down)
- Output Analysis Axis

Moody’s Analytics
## Liquidity coverage ratio (LCR) – example

### Assets

<table>
<thead>
<tr>
<th>Assets</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>50</td>
</tr>
<tr>
<td>Gov. Bonds</td>
<td>100</td>
</tr>
<tr>
<td>Financial Institution Bonds</td>
<td>50</td>
</tr>
<tr>
<td>Loans</td>
<td>270</td>
</tr>
</tbody>
</table>

### Liabilities and Equity

<table>
<thead>
<tr>
<th>Liabilities and Equity</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable retail deposits</td>
<td>100</td>
</tr>
<tr>
<td>Less stable retail deposits</td>
<td>100</td>
</tr>
<tr>
<td>Unsecured Wholesale Funding (Non fin. Corporate with no operational relationship)</td>
<td>170</td>
</tr>
<tr>
<td>Equity</td>
<td>100</td>
</tr>
</tbody>
</table>

### Stock of high quality liquid assets

- Cash: 50
- Stock of high quality liquid assets: 150

### Net outflows

<table>
<thead>
<tr>
<th>Run-off factor</th>
<th>Outflows*</th>
<th>Inflows**</th>
<th>Net outflows</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.50%</td>
<td>7.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15%</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75%</td>
<td>127.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ \text{Run-off factor} \times \text{Net outflows} \]

### LCR

\[ \frac{\text{Net outflows}}{\text{Inflows**}} = 115\% \]

* Additional requirements are also considered as outflow (e.g. 100% of outstanding liquidity facilities to non fin. Corporate, etc)

** 100% of planned inflows from performing assets
Higher costs… and a better allocation

Cost of holding these assets:

\[ C = X\% \text{ per year} \times 150 \]

<table>
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<tr>
<th>Stable retail deposits</th>
<th>100</th>
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<td>Corporate with no operational relation)</td>
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<tr>
<td>Equity</td>
<td>100</td>
</tr>
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</table>

\[ \text{Run-off factor} \begin{array}{c|c}
7.50\% & 7.5 \\
15\% & 15 \\
75\% & 127.5 \\
\end{array} \]

\[ \text{Outflows} \]

\[ \text{C is allocated depending on the outflows generated by the instrument} \]
Cost allocation at a transaction level

Most of the indicators – capital, income, cost are not available at contract granularity.

RAPM uses allocation rules to allocate indicators from higher granularity to contracts.
Overview of the FTP process
Using the stress test scenarios

<table>
<thead>
<tr>
<th>SCENARIO</th>
<th></th>
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<tbody>
<tr>
<td>BL</td>
<td>Baseline</td>
</tr>
<tr>
<td></td>
<td>Current</td>
</tr>
<tr>
<td>S2</td>
<td>Deeper</td>
</tr>
<tr>
<td></td>
<td>Recession</td>
</tr>
<tr>
<td></td>
<td>Weaker</td>
</tr>
<tr>
<td></td>
<td>Recovery</td>
</tr>
<tr>
<td>S3</td>
<td>Prolonged</td>
</tr>
<tr>
<td></td>
<td>Credit Squeeze</td>
</tr>
<tr>
<td></td>
<td>Very Severe</td>
</tr>
<tr>
<td></td>
<td>Recession</td>
</tr>
<tr>
<td>S4</td>
<td>Complete</td>
</tr>
<tr>
<td></td>
<td>Collapse</td>
</tr>
<tr>
<td></td>
<td>Depression</td>
</tr>
</tbody>
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MoodysEconomy.com scenarios
Conclusion
Next steps

- Liquidity Risk has been underestimated in many countries
- Basel III provides an efficient framework for liquidity management
- Include Senior management in the project
- Reconcile P&L and risk and having a longer term strategy
Contacts

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