MIFID II
LIQUIDITY RISK
MANAGEMENT
Fueling Pre Trade Analytics, Risk and Reg Measures with Post Trade Transparency Data
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LQA LIQUIDITY ASSESSMENT

MEASURING RISK (COST) OF EXECUTION
PRODUCT APPLICATION

Regulation
- PRUVAL (*):
- MPR (Margin Period of Risk) (*):
- HQLA: Active and sizable market
- Volcker: RENTD
- AIFMD
- MiFID II
- Time to Liquidation
- Security Level Liquidity (*)
- Liquidity Score (*)
- Portfolio Liquidity
- Liquidity Stress Test
- Pre Trade analysis
- Post Trade analysis

Risk Management
- Delivery

Trading
- Under test. Output to be defined
- Delivered
- 2016
- Fields delivered
The overall model is based on THREE components:

**Market Impact model**
- Market Impact model derived from literature
- We estimate price shift from a fair value (equilibrium) given a specific volume
- In the proposed framework the calibration can be extended to every asset class

**Machine Learning Engine**
- Problem: A lack of trade data gives < 100% coverage
- Solution: Cluster Analysis is used to identify comparable assets
- We also leverage NON-traditional information

**Market Normalization Factor**
- We want the model to react to market conditions
- We measure the quality of information in the market (Entropy)
- New concept of market indices

**Definition**: “PROBABILITY OF LIQUIDATING A GIVEN VOLUME AT A FAIR VALUE PRICE OR BETTER”

- Illiquidity (low probability of SELL) can be driven by
  - illiquidity of the bond (high cost of liquidation)
  - high uncertainty in the estimation due to poor market observation or low cluster quality
MARKET IMPACT DYNAMICS

Similarity/Weight driven by:
- Quantity and quality of direct market observation
- Difference in:
  - Duration, Coupon, Amount Outstanding, Rating, CDS, Sector Correlation, Country of Risk, Currency, Collateral Type etc. (20+ factors)
  - Additional features: Holder Type (HDS), News Sentiment Index, Central bank REPO eligibility
SIMILARITY FACTORS AND CLUSTER CONCEPTS

- **Traditional Approach**
  - Static: heuristic use of features like Rating etc.
  - Limited in terms of features involved
  - Not reactive enough to changes in market conditions

- **Our Approach**
  - Dynamic, non-heuristic clustering methodology
  - “Weighted Euclidean Distance” based on many features
  - Reactive to market conditions

### Example of distance function

<table>
<thead>
<tr>
<th>Feature</th>
<th>Weight</th>
<th>Description</th>
<th>Weight</th>
<th>Description</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>17.10%</td>
<td>Country of Risk</td>
<td>4.80%</td>
<td>Direct Observation Dispersion</td>
<td>1.80%</td>
</tr>
<tr>
<td>Rating</td>
<td>9.80%</td>
<td>Coupon Type</td>
<td>4.20%</td>
<td>Age</td>
<td>1.50%</td>
</tr>
<tr>
<td>Bid/Ask Spread</td>
<td>8.50%</td>
<td>Is Callable</td>
<td>3.80%</td>
<td>Collateral Type</td>
<td>1.20%</td>
</tr>
<tr>
<td>CDS rate</td>
<td>8.50%</td>
<td>Holder Type</td>
<td>3.70%</td>
<td>Central Banks Eligible</td>
<td>1.20%</td>
</tr>
<tr>
<td>Maturity</td>
<td>7.30%</td>
<td># of days to next call</td>
<td>3.20%</td>
<td>Issuer</td>
<td>1.20%</td>
</tr>
<tr>
<td>Currency Correlation</td>
<td>5.70%</td>
<td>Industry Correlation</td>
<td>2.40%</td>
<td># of Directs Observation</td>
<td>0.40%</td>
</tr>
<tr>
<td>Amount Outstanding</td>
<td>4.90%</td>
<td>Coupon</td>
<td>2.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>News Sentiment Index</td>
<td>4.90%</td>
<td>Option Delta</td>
<td>1.90%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- Price impact for selling 1% of AMT is -0.307 (USD) with uncertainty (st.dev.) of 0.210. The probability of execution at the bid is 47.61%.
- The max volume can be executed, with market impact not bigger than 0.31%, is 8.70 MM (USD).
- Given max volume and accepted market impact, the time to liquidation is 1.15 days (under linearity assumption in this release).
MIFID II
FUELING PRE TRADE ANALYTICS WITH POST TRADE TRANSPARENCY
BEST EXECUTION: SCOPE

**Venues**
- **RM**: Non-discretionary execution of equity and non-equity transactions operated by a market operator.
- **MTF**: Non-discretionary execution of equity and non-equity transactions operated by an investment firm/market operator.
- **OTF**: Discretionary execution of non-equity transactions.
- **SI**: Investment firm which deals on own account by executing client orders outside an RM, MTF or OTF without operating a multilateral system.

**Geography**
All venues and firms operating in EU member states.

**Instruments**
- Equity + derivatives
- Commodities + derivatives
- Bonds + derivatives
- Other derivatives
- ETFs

**Firms**
- Retail
- Professional
Huge potential to feed post-trade transparency data into pre-trade analysis

More accurate liquidity analytics to estimate transaction cost and related risk and regulatory measures
REGULATORY REQUIREMENTS VS MARKET LIQUIDITY

BIG PICTURE
MIFID II THRESHOLDS
TRADE COST OPTIMIZATION
Liquidity has become omnipresent in regulation and prudential requirements

- Capital charges under Prudent Valuation reflect the liquidity of instruments;
- ‘Liquidity Horizons’ under FRTB will impact the Risk-weighted assets of securities.

Sellside Financial Institutions need to overlay that to assess the full impact of a trade on the balance sheet and regulatory reporting obligations.

This is one of the drivers changing the market environment and increasing cost of trading which in turn makes pre trade analysis significantly more important.

Bloomberg will provide LQA and ALLR on the terminal.
MiFID II THRESHOLDS vs. MARKET LIQUIDITY

Bond liquid classes under MiFID will not match with real market liquidity

Disclosure requirements are determined by liquidity classification:

<table>
<thead>
<tr>
<th>Trade size</th>
<th>Disclosure</th>
<th>Trading Illiquid security</th>
</tr>
</thead>
</table>
| > LIS (block trade) | No pre trade disclosure  
Post trade disclosure with 2 days delay | 😊                         |
| < LIS, > SSTI       | No pre trade disclosure  
Post trade disclosure                     | 😊                         |
| < SSTI + Liquid     | Pre trade disclosure  
Post trade disclosure                     | 😊                         |
| < SSTI + Illiquid   | No pre trade  
Post trade disclosure with 2 days delay | 😊                         |

Optimizing the TOP 1000 MOST liquid bonds we end up with 523 constituents with similar Yield and much higher liquidity score.
## Portfolio Summary

<table>
<thead>
<tr>
<th>TTL AIMFD</th>
<th>Time to liquidation (days)</th>
<th>Avg. Simulated SELL Volume</th>
<th>Avg. Bid/Ask spread</th>
<th>Avg Market Impact</th>
<th>% of Total Number of Records along Table (Down)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 day or less</td>
<td>0.11</td>
<td>995,533</td>
<td>0.29</td>
<td>-0.33%</td>
<td>0.16</td>
</tr>
<tr>
<td>2 – 7 days</td>
<td>1.56</td>
<td>2,071,053</td>
<td>0.38</td>
<td>-0.04%</td>
<td>0.33</td>
</tr>
<tr>
<td>8 – 30 days</td>
<td>7.45</td>
<td>3,913,202</td>
<td>0.51</td>
<td>-1.26%</td>
<td>0.59</td>
</tr>
<tr>
<td>Grand Total</td>
<td>0.16</td>
<td>1,034,366</td>
<td>0.29</td>
<td>-0.34%</td>
<td>0.17</td>
</tr>
</tbody>
</table>

## LQA Score (1=Illiquid, 100=Liquid) vs Market Impact

<table>
<thead>
<tr>
<th>Run Date</th>
<th>Task Name</th>
<th>LSCORE (bin)</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
<th>Gran.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-02-13</td>
<td>IG NORTH AMERICA (18)</td>
<td>1,217</td>
<td>1,488</td>
<td>1,229</td>
<td>1,273</td>
<td>1,266</td>
<td>956</td>
<td>1,256</td>
<td>1,113</td>
<td>774</td>
<td>739</td>
<td>541</td>
<td>11,412</td>
<td></td>
</tr>
<tr>
<td>HY NORTH AMERICA (21)</td>
<td>796</td>
<td>843</td>
<td>484</td>
<td>348</td>
<td>306</td>
<td>242</td>
<td>76</td>
<td>26</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2,482</td>
<td></td>
</tr>
<tr>
<td>IG EUR (42)</td>
<td>810</td>
<td>1,125</td>
<td>1,119</td>
<td>1,207</td>
<td>1,118</td>
<td>854</td>
<td>1,107</td>
<td>854</td>
<td>726</td>
<td>371</td>
<td>6</td>
<td>5,424</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HY EUR (49)</td>
<td>627</td>
<td>397</td>
<td>208</td>
<td>223</td>
<td>160</td>
<td>26</td>
<td>20</td>
<td>20</td>
<td>6</td>
<td>6</td>
<td>1,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015-03-20</td>
<td>IG NORTH AMERICA (18)</td>
<td>1,252</td>
<td>1,116</td>
<td>851</td>
<td>686</td>
<td>1,431</td>
<td>1,515</td>
<td>1,365</td>
<td>1,024</td>
<td>1,316</td>
<td>1,127</td>
<td>193</td>
<td>11,936</td>
<td></td>
</tr>
<tr>
<td>HY NORTH AMERICA (21)</td>
<td>718</td>
<td>224</td>
<td>241</td>
<td>303</td>
<td>423</td>
<td>240</td>
<td>51</td>
<td>8</td>
<td>5</td>
<td>4</td>
<td>2.34</td>
<td>2,062</td>
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</tr>
<tr>
<td>IG EUR (42)</td>
<td>720</td>
<td>527</td>
<td>779</td>
<td>707</td>
<td>1,320</td>
<td>1,443</td>
<td>1,248</td>
<td>933</td>
<td>1,310</td>
<td>731</td>
<td>13</td>
<td>5,739</td>
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<td></td>
</tr>
<tr>
<td>HY EUR (49)</td>
<td>831</td>
<td>306</td>
<td>197</td>
<td>50</td>
<td>179</td>
<td>88</td>
<td>4</td>
<td>13</td>
<td>6</td>
<td>1,701</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015-04-10</td>
<td>IG NORTH AMERICA (18)</td>
<td>1,416</td>
<td>1,335</td>
<td>1,149</td>
<td>1,150</td>
<td>741</td>
<td>1,305</td>
<td>1,361</td>
<td>1,040</td>
<td>1,020</td>
<td>1,444</td>
<td>193</td>
<td>12,167</td>
<td></td>
</tr>
<tr>
<td>HY NORTH AMERICA (21)</td>
<td>812</td>
<td>819</td>
<td>520</td>
<td>243</td>
<td>194</td>
<td>178</td>
<td>39</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2.39</td>
<td>2,069</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IG EUR (42)</td>
<td>1,137</td>
<td>1,518</td>
<td>1,306</td>
<td>952</td>
<td>510</td>
<td>992</td>
<td>1,192</td>
<td>1,086</td>
<td>923</td>
<td>67</td>
<td>19</td>
<td>5,965</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HY EUR (49)</td>
<td>1,133</td>
<td>323</td>
<td>125</td>
<td>87</td>
<td>37</td>
<td>75</td>
<td>50</td>
<td>15</td>
<td>4</td>
<td>1,824</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand Total</td>
<td>11,613</td>
<td>9,930</td>
<td>8,370</td>
<td>7,493</td>
<td>7,540</td>
<td>7,746</td>
<td>7,704</td>
<td>6,136</td>
<td>6,046</td>
<td>4,509</td>
<td>526</td>
<td>77,733</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusions

• Liquidity has become omnipresent in regulation and prudential requirements

• Financial Institutions need to stay on top of that, not only in finance but as well in risk and front office. To give an example: a firm needs to overlay a variety of regulatory measures of liquidity such as LCR HQLA, Prudent Valuation AVAs, FRTB Liquidity Horizons, …, with MiFID II classifiers (Liquidity thresholds, LIS, SSTI) to assess the full impact of a trade on the balance sheet and regulatory reporting obligations

  This is one of the drivers changing the market environment and increasing cost of trading which in turn makes pre trade analysis significantly more important

• MiFID II will shift the quantity and quality of available transaction data towards USD TRACE Levels. We see a large potential to feed post-trade transparency data into pre-trade analysis as this will improve the availability and accuracy of liquidity analytics

• Bloomberg will source and preprocess this new wealth of MiFID II transaction data and fuel its breakthrough liquidity solution “LQA” with it. This will be beneficial for cost efficient trading and related measures in risk management and regulatory reporting