Update on Algorithmic Trading

ECB Bond Market Contact Group, 20th November 2019

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# Table of Contents

1. Execution Strategies in Fixed Income  
   3

2. Execution Strategies - Risk Management  
   8

3. Appendices  
   11
1. Execution Strategies in Fixed Income
### Where have automated strategies evolved?

#### January 2016 status

<table>
<thead>
<tr>
<th>EMEA</th>
<th>Dealer-to-Client</th>
<th>Dealer-to-Dealer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Matching</td>
<td>Central Limit Order Book (CLOB)</td>
</tr>
<tr>
<td></td>
<td>Main Venues</td>
<td>price-driven</td>
</tr>
<tr>
<td></td>
<td>Client Side</td>
<td>Tradeweb, Bloomberg, BondVision</td>
</tr>
<tr>
<td></td>
<td>Dealer Side</td>
<td>Brokertec, MTS Markets</td>
</tr>
<tr>
<td></td>
<td>Participant Types</td>
<td>Institutional clients mainly asset managers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dealers mainly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dealers only</td>
</tr>
<tr>
<td></td>
<td>Trade match automation</td>
<td>High touch, all manual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Some auto-response</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low touch, mostly automated</td>
</tr>
<tr>
<td></td>
<td>Degree of Automation</td>
<td>Automation focused on increased efficiency:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Order Management Systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Trading tools e.g. bid lists</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Post-trade processing of tickets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Automation focused on inquiry handling:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Certainty in mids</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Auto-responding</td>
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<tr>
<td></td>
<td></td>
<td>- Auto-hedging</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Others e.g. risk, credit</td>
</tr>
<tr>
<td></td>
<td>Speed</td>
<td>Low Speed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate Speed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High Speed</td>
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</table>

#### Since January 2016

- Significant evolution
- Moderate evolution
- Moderate evolution
Buyside automated execution strategies

**Buyside executions strategies ➔ All Venue-developed**

- **Auto-select Winning Dealer**
  - First generation execution strategy with basic “trade at best price” auto-selection
  - **Evolution**: Tie-break logic allowing clients to pre-determine order of dealer preference (UST)

- **List Trades**
  - Execution strategy allowing clients to group multiple in-comp inquiries e.g. eod re-balancing
  - **Evolution**: Formed basis for Swaps Compression Trading and ETF Portfolio Trading
  - Increased use led to multiple other execution strategies mentioned below

- **Auto-Select Dealers in an RFQ**
  - Execution strategy allowing clients to pre-determine order of dealer preference in an RFQ / List RFQs; earliest strategy was “static” by issuer and/or on “rotation” from a pre-set broker list
  - **Evolution**: Added a dynamic element by combining with a preferred weighting of:
    - Best prices in stack; Axe indications from dealers; Historical dealer performance

- **Auto-execute**
  - **Evolution**: Most sophisticated and most game-changing algorithmic execution strategy for clients
  - “No touch” direct RFQ submission from client OMS to Venue with auto-execution
  - Utilises existing execution strategies and adds two more to create one combined strategy

- **Process Trades**
  - **Evolution**: “Execution Strategy” allowing clients to add efficiency to their voice flows
  - MIFID2 assistance tool for reporting, best ex audit trail, record-keeping

For institutional use only
<table>
<thead>
<tr>
<th>Sellside Execution Strategies → All Proprietary Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Market Making</strong></td>
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<tr>
<td>- Earliest algorithmic strategy allowing dealers to fulfill quoting obligations on various D2D Bond/Swap TVs</td>
</tr>
<tr>
<td>- Evolution</td>
</tr>
<tr>
<td>- Has been moderately evolving, mostly around accuracy and speed</td>
</tr>
<tr>
<td>- Increased data available providing further confidence in price generation</td>
</tr>
<tr>
<td>- More sophisticated technology available to address latency</td>
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<tr>
<td>- D2C Market Making</td>
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<tr>
<td><strong>D2C Auto-response</strong></td>
</tr>
<tr>
<td>- Earliest execution strategy allowing dealers to focus on risk trades and increase hit rates in small tickets</td>
</tr>
<tr>
<td>- Evolution</td>
</tr>
<tr>
<td>- As etrading grew, increased size and extended to less liquid instruments, even corporates</td>
</tr>
<tr>
<td><strong>Auto-hedging</strong></td>
</tr>
<tr>
<td>- Rapidly growing execution strategy allowing dealers to deploy a hedge with more certainty, less basis risk and less market impact</td>
</tr>
<tr>
<td>- Evolution</td>
</tr>
<tr>
<td>- Increased use of “smarter hedge” algorithms to optimise macro risk exposure and cost outlay</td>
</tr>
<tr>
<td><strong>D2C Algo Trading</strong></td>
</tr>
<tr>
<td>- Rapidly growing execution strategy allowing dealers to fully automate and separately manage “algo size” client RFQs through a “no touch” process</td>
</tr>
<tr>
<td>- Evolution</td>
</tr>
<tr>
<td>- Extended scope significantly: 0% in Jan 2016 to &gt;40% EG e-tickets</td>
</tr>
<tr>
<td>- Utilises existing execution strategies and increased reliability/logic in indicative price streams</td>
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<tr>
<td><strong>Large Order Management</strong></td>
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<tr>
<td>- Evolution</td>
</tr>
<tr>
<td>- Leveraging current technology/data to suggest execution and risk management of large orders</td>
</tr>
<tr>
<td>- Ability to view multiple liquidity sources simultaneously, not possible by one trader</td>
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<tr>
<td>- Ability to substantially reduce information leakage and market impact</td>
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</table>
What can we expect next?

Dealers
- Expect speed and automation efforts to increase
- Expect Hedge Funds to increase use of systematic trading strategies
- Expect emphasis on automation of voice flows
- Will there be in-house/off-Venue implementation of current execution strategies?
  ▪ Increasingly utilising “EMS-style” functionality evidenced through increased demand for direct pipes containing dealer streamed pricing and axe indications
  ▪ Could future execution strategies include “smart selection of Venue”?
    ▪ Currently client’s Venue choice is sticky – TVx for Rates, TVy for Credit

Clients
- Expect increased use of and demand for firm pricing (growing share of UST market)
- Expect some form of laddered pricing to be introduced alongside greater use of firm pricing capability
- Will this result in the creation of an executable order book?
2. Execution Strategies - Risk Management
**Unprecedented emphasis** on risk management of algorithmic trading strategies compared to Jan-2016

- External requirements: MIFID2, NCA-specific (e.g. FCA/PRA, BAFIN…)
- Regulatory objective has been to
  - Mandate transparency of all “black boxes” and their intentions
  - Make firms accountable for the risk management of algos – risk assessment, risk controls, change procedures

**Typical Dealer Framework for automated strategies:**

- **Governance**
  - Algo Senior Risk Management Committee
  - Algo Policies
  - Algo Business/Product Governance

- **Product-specific Algo Control environment**
  - Contains mandatory min controls, conduct risk, business risk, testing, systems controls etc

- **Algo Risk and Compliance**
  - Monitors compliance of “algo” controls; acts as first line escalation

- **Internal Audit**
  - Dedicated to automated strategies, cross asset
  - e.g. Algo Policy: Min. standards for use, supervision, maintenance, testing, monitoring.
  - Algo Conduct Risk Policy = standards to identify potential Conduct Risks associated with material changes to existing, or creation of new apps & trading strategies
  - Maintenance and change management / Embedded in New Product process

**Ideal outcome:** Deeply embedded within the firm so becomes self-regulating

- Undeniably increased awareness e.g. asymmetric last look, spoofing, front-running
  - …despite criticism that controls are disproportionate for some types of algorithms e.g. RFQ-related

Will this heightened risk management LOWER the frequency of market disruption/malpractice?
Examples

<table>
<thead>
<tr>
<th>Automated Strategy</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2D Market Making</td>
<td>Volatility, Position Limits</td>
</tr>
<tr>
<td>Auto-response</td>
<td>Repeat Execution</td>
</tr>
<tr>
<td>Auto-hedging</td>
<td>Position Limits; Frequency of Orders; PNL/Risk reconciliation</td>
</tr>
</tbody>
</table>

Triggers “Kill Switch” halting the relevant algo and any related algos
3. Appendices
What has changed since Jan 2016?

Electronic trading has grown every year since 2016 and looks set for the largest growth this year*.

*Euro Govt Bonds used as example (similar trends seen in Credit, with some nuances as expected)
What has not changed since Jan 2016?

- The fixed income market structure has largely remained intact, whereby majority of bond trading is still:
  - Principal
  - Name give-up
  - Institutional participants
  - Institutional size
  - Voice-negotiation significant, though to a lesser degree
  - Bifurcated Inter-dealer (D2D) and dealer-to-client (D2C) markets
  - Firm price order book in D2D electronic markets
  - Indicative pricing and RFQs in D2C electronic markets
  - Conducted on the same Trading Venues (TVs)
Increased e-trading: cause and effect

**eTrading growth accelerated by:**

- MiFID2
  - Clear Regulatory Objective
  - Trading mandates
  - Incentives (reporting)
  - Easier than voice to record-keep/evidence best ex
- Cost Pressures
  - Cheaper than voice
  - Competition strengthened
  - No choice but to increase efficiency

**Increased eTrading exposed inefficiencies:**

- Buyside
  - Required more consistent service from sellside:
    - Demanding speed
    - Demanding reliability in pricing, heightened with Hedge Fund use of systematic trading strategies
    - Demanded automated tools from Trading Venues
- Sellside
  - Evident and necessary to:
    - Increase quote rate
    - Decrease time to quote
    - Increase pricing accuracy of “indicative” price streams
    - Decrease slippage
    - Competitive pressure esp. in liquid bonds

**Result?** Increased use of automated execution strategies or “algos”

*Note: Evolution in Fixed Income execution reflects the current market structure, merely allowing participants to deploy execution strategies that automate an existing set of processes and rules. So no agency-style TWAP / VWAP references just yet….**
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