HSBC Algorithms: Making FX Execution Smarter

Richard Anthony

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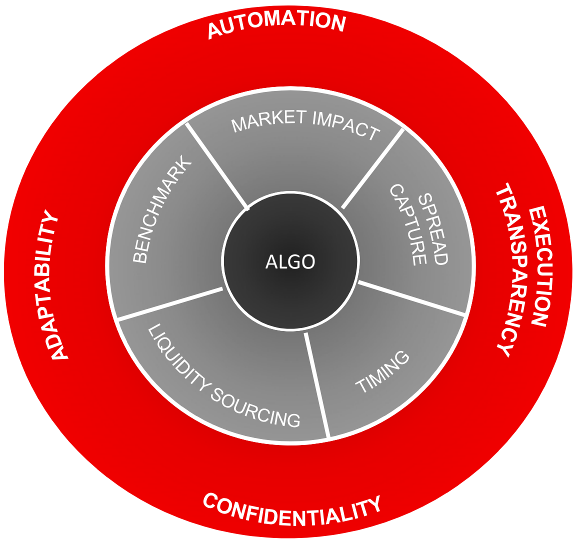
Why use FX Execution Algorithms?

- Powerful solutions providing **Automation**, **Transparency**, **Confidentiality**, **Adaptability**
- Satisfying a variety of **client's execution objectives** without a need to invest into infrastructure:
  - **Market Impact control**
  - **Spread capture**
  - **Performance benchmarks**
  - **Liquidity sourcing**
  - **Opportunity cost /Volatility risk as a factor**



What are FX Execution Algorithms risks?

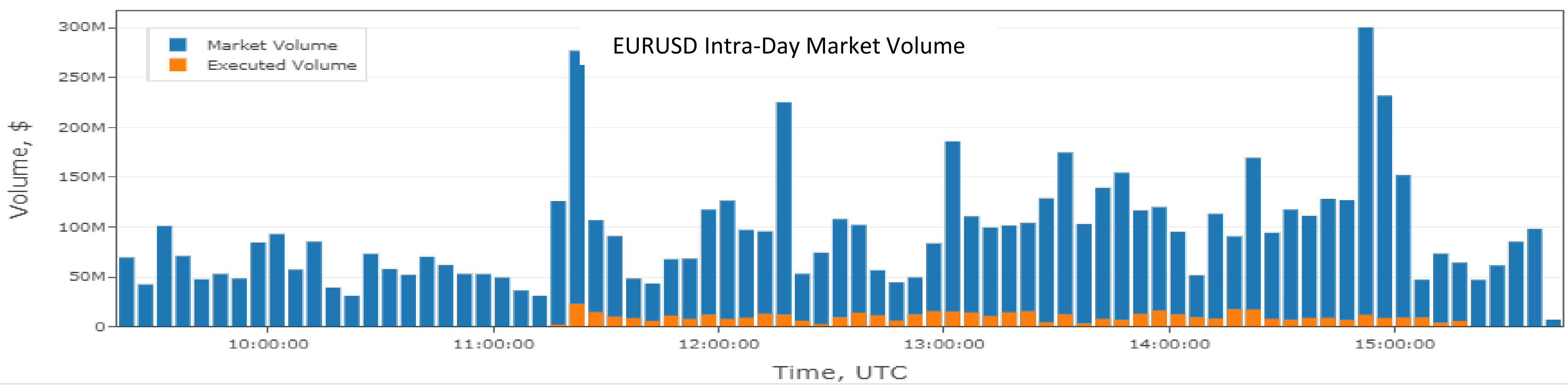
Clients own the FX Execution risk

- **Full order execution by the order expiry time is not guaranteed**. Several factors can impact full completion:
  - Strategy objective (liquidity sourcing, TWAP, market impact mitigation)
  - Market liquidity vs impact risk/reward
  - Limit price
- **The execution price is also not guaranteed** :
  - The aggregate rate is dependant on market moves during the execution window
  - Circuit Breakers are implemented due regulatory requirements, in order to mitigate risk of market disintegration.

Main User Defined Inputs and Characteristics

- **Inputs available via UI / Bespoke configuration:**
  - **Instrument:** current offerings typically include G10, a wide variety of EM currencies and their crosses, spot and forwards
  - **Size / Sid:** parent order is credit checked and verified against pre-set agreed maximum per client per algo per currency pair
  - **Strategy:** aggressive, passive opportunistic, schedulers or hybrids
  - **Liquidity Pool:** typically high-level choice or market liquidity and/or internalisation
  - **Price controls:** limit price, trigger price, etc.
  - **Liquidity Pool:** bespoke set of venues, selected liquidity providers within a venue
  - **Internalisation type:** mid tracking or limit order book
  - **Other controls:** any internal controls can usually can be configured per client

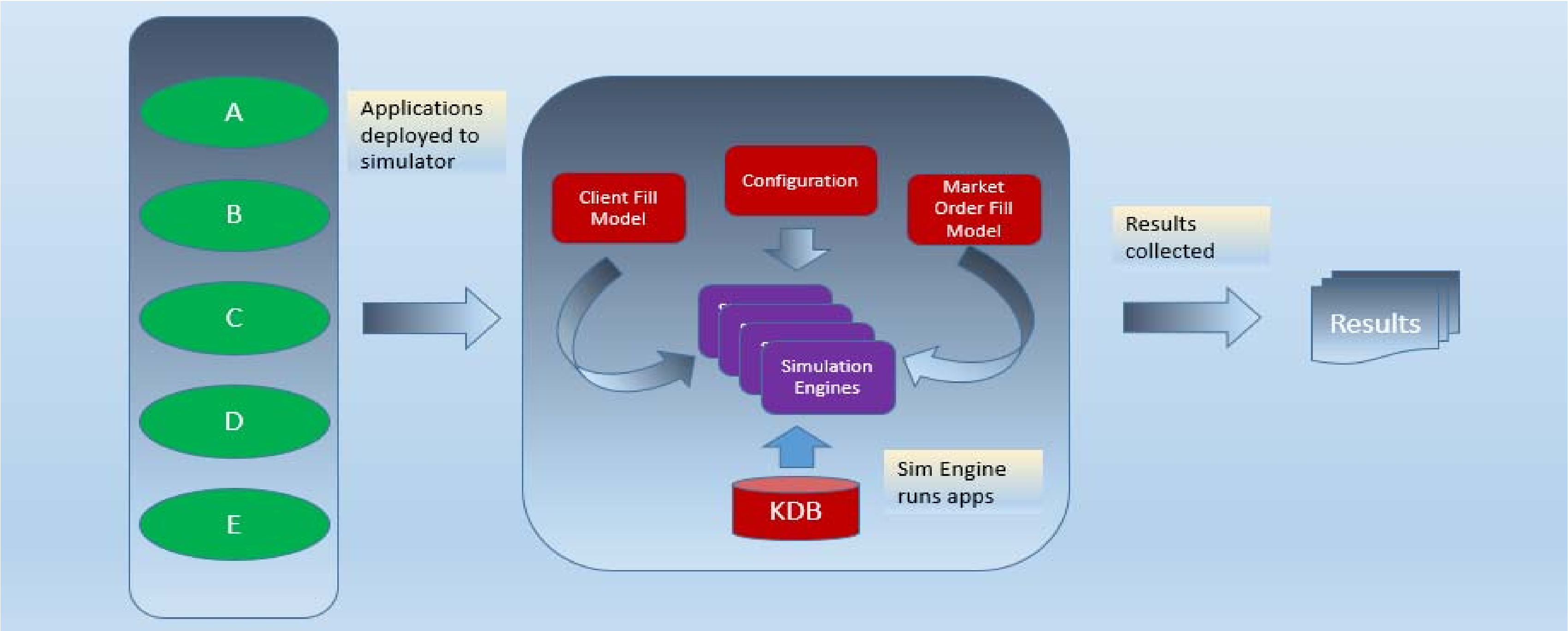
- **Benchmarks (internally calculated and third-party)**
  - Risk Transfer Price, Arrival Mid Price
  - TWAP (mid and taker), VWAP *(not as important as in equities due to data uncertainty)*
  - Last market mid price, reversion profile
  - MTM profile



FX Execution Algorithms optimisation/parameterization

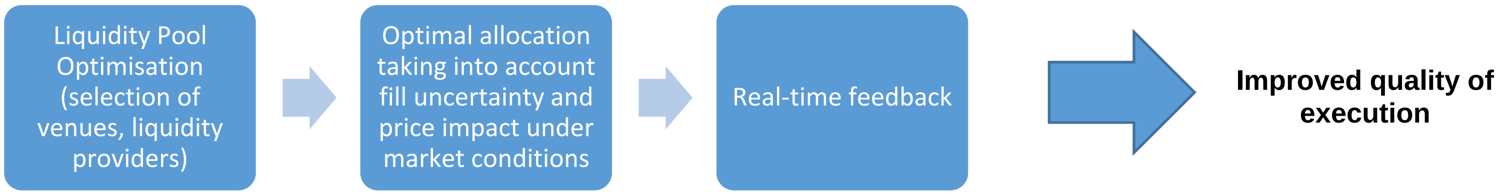
- **Simulation environment**
  - A framework scaled across many CPU's for hosting and running in-house applications in accelerated time and in parallel.
  - Version control, production-like, deterministic, market or simulated data
  - Automation of regression testing, functional testing, stress testing; reproduction and diagnostics of production issues
  - Model calibration and performance evaluation against benchmarks, learning framework
  - Scenario analysis and pre-trade analytics for algorithmic execution

Large scale simulation is the primary method to optimise algo behaviour. Such general behaviour is then customised to match their alpha horizon based on the feedbacks and post-trade analytics.

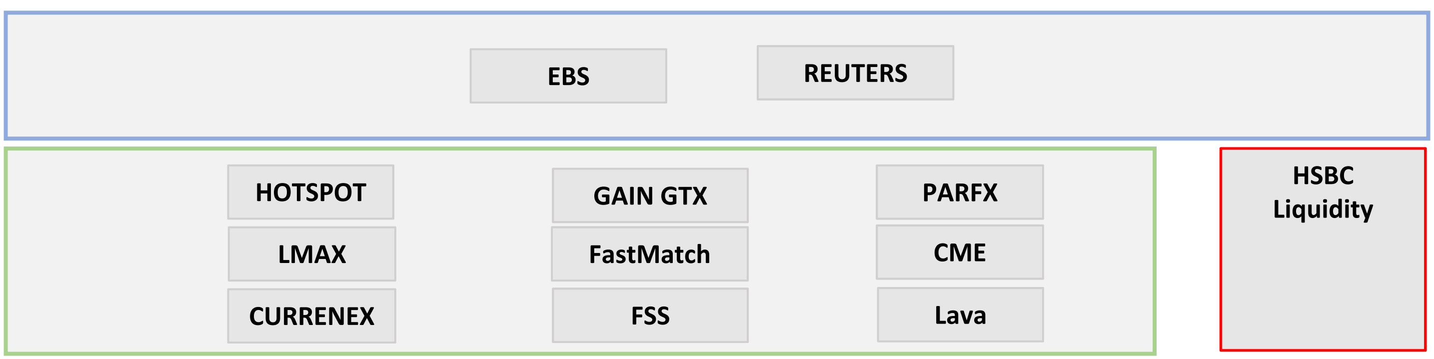


FX Liquidity Landscape: What You See Is Not What You Get

Given the increased fragmentation within the FX markets, liquidity can be uncertain, due to:



- **De-centralization:** multiple liquidity sources around the globe
  - Technological requirements for liquidity providers; co-location in several centres
  - Natural geographical **latency**
- **Firm and non-firm liquidity:**
  - Firm liquidity venues serve as market reference
  - Non-firm venues allow for **last-look** practice
- **Throttling**:
  - Certain data feeds are throttled
  - Credit screened feeds are slow
- **Specifics of Liquidity Sources**
  - On / Off Sef: Liquidity type may change during the day
  - Mid books, post trade compensation practice
  - Indirect Liquidity: CME futures
- **Volume uncertainty**:
  - Connecting to all sources unfeasible
  - Historical and real-time volume information is incomplete
- **Internalisation**
  - Algo providers leverage from their FX franchise to minimise market footprint



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