



BSM



**BM&FBOVESPA
MARKET SUPERVISION**



Algorithmic and High Frequency Trading in the Brazilian market

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- BM&FBOVESPA - Single exchange (cash and derivatives)
 - ✓ 1 trading system for equities and derivatives (PUMA)
 - ✓ 1 trading system for fixed income securities
 - ✓ 1 trading system for government bonds
 - ✓ 4 CCPs under a single legal entity

Equities

(Stocks , BDRs, ETFs,
Options ...)

Derivatives

(Futures, Options,
Swaps ...)

Securities

(Government bonds ...)

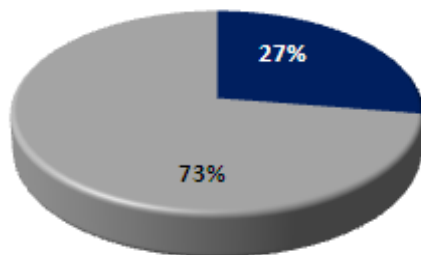
FX

(Foreign Exchange)

- Final beneficial owner identification required
 - ✓ For trading, settlement, collateral and depository
 - ✓ Centralized information at the level of the beneficial owner

BOVESPA Segment

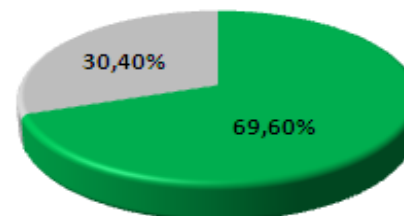
Quantity of Trades



■ HFT ■ Other Investors

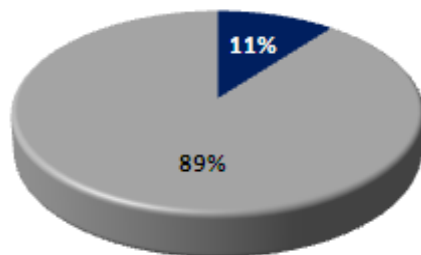
BM&F Segment

Quantity of Trades



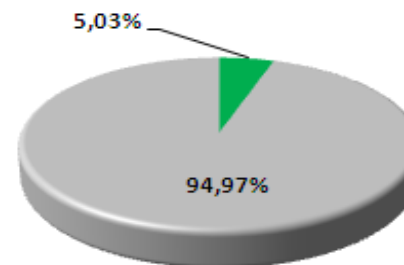
■ HFT ■ Other Investors

Financial Volume



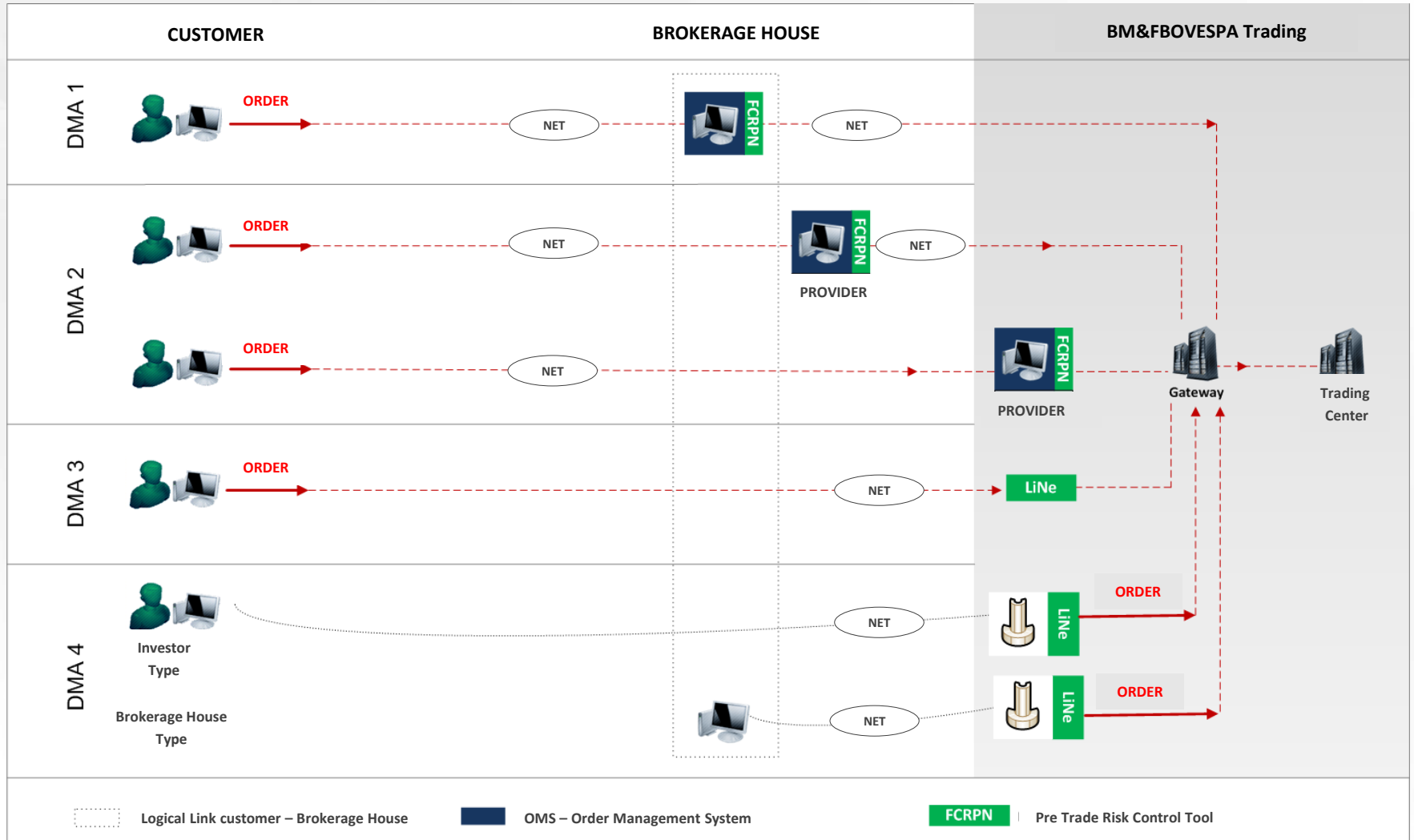
■ HFT ■ Other Investors

Quantity of Contracts



■ HFT
 ■ Other Investors

Approximately 75% of the HFT volume is done by co-location



HFT Classification Process

- An evaluation process is applied to define an investor as HFT
- Specific fee structure applicable to HFT
- High volume of messages sent to the trading system in short intervals may classify the DMA as an HFT
- Every 15 days, HFT eligibility maintenance is reevaluated
- BM&FBOVESPA notifies brokerage houses on meeting eligibility maintenance requirements

First round *(took place in March 2013)*

- 163 equities DMA and 162 derivatives DMA were classified as HFT
- Adopted Parameters for this classification
 - ✓ average of 1 msg / min
 - ✓ time interval among messages to the equities segment: 828 milliseconds
 - ✓ Time interval among messages to the derivatives segment: 2,296 milliseconds

Previous Model

- Pre-Trade Risk Control was done at the brokerage house and audited by BM&FBOVESPA
- Regardless of the DMA access model adopted, the brokerage house had to use a tool to control pre trade risk, whether provided by the Exchange (LiNe) or another tool that fulfills a similar role
- Although BM&FBOVESPA audited brokerage house risk controls, it was not possible to carry out online monitoring
- Mandatory use of LiNe for DMA 3 (Direct Connection) and DMA 4 (Co-location)
- Risk limits set by the brokerage house for each investor, subject to maximum values defined by BM&FBOVESPA
- Consumption of the investor limits monitored online
- BM&FBOVESPA and the brokerage house could block an investor's access by setting its limits to zero (red button)

Previous Model Issues

Issues were identified in the monitoring of pre-trade risk controls held by brokers

- *Competitive pressure* – different latency due to the use of different tools to carry on pre-trade risk controls
- *Absence of Limits* – weak pre-trade risk control due to lack of pre-registered limits by the broker for the HFT
- *Too High Limit Setting* - lack of accurate risk analysis to determine appropriate limits for each investor
- *Disabled Features* - deficiencies in the functionality of the tool to control pre trade risk used by brokers
- *Absence of audit logs* – lack of compliance on traceability requirements

Current Model

- Since March 2013, all DMA orders have been subject to pre trade risk control (mandatory)
- Pre trade risk control is centralized at the exchange (as mentioned, previously it was done by brokerage house)
- The appropriate limit for each investor is registered by the brokerage house and analyzed by BM&FBOVESPA based on pre-established risk profile
- LiNe Parameters
 - ✓ Maximum sizes of buy and sell orders by instrument
 - ✓ Maximum bought and sold positions by instrument on trading date
 - ✓ Maximum bought and sold positions by Group of instrument on trading date
 - ✓ Remaining orders in the order book are used to calculate the maximum positions (previous two items)
- Model and types of limits are simple
- Orders that violate one or more risk limits are rejected and are not inserted into the exchange order book
- Limit appropriateness, consumption and reset are monitored online by BM&FBOVESPA
- Setting limits beyond the investor's risk profile generates alerts with BVMF
- Additional control: P/L of the investor's trades

Rejection Bandwidth

- Used to prevent order registration where asset price variations are beyond predefined values
- Applied throughout the trading phase, except when the instrument is in reserved state, pre opening phase, or closing call
- Prior to the first trade, the bandwidth center is the closing price
- Orders to market are evaluated taking as a base the price for the best recorded order at the opposite side of the market
- The bandwidth center is dynamic, i.e., updated according to the price of the last trade recorded in the instrument
- The order is rejected when:

**Buy Order Price \geq Upper Limit
or
Sell Order Price \leq Lower Limit**

Intraday Limit

- Used to control the price variation on an asset's predefined values
- Applied throughout the trading phase based on price of recorded orders
- The bandwidth center is static, i.e., not updated according to the price of the last trade recorded
- The breadth of the band can be changed by the Exchange during the trading session
- Valid Buy/Sell Orders are validated only against upper/lower limit
- Valid Day Orders are validated against both limits
- If the theoretical price of the auction is off limits, the auction does not close and the instrument goes to pause mode
- The order is rejected when:

Order Price > Upper Limit
or
Order Price < Lower Limit

Quantity Bandwidth

- Used to trigger the auction procedure automatically when asset violates its limit
- Calculated on basis of (i) the average amount traded in the last 30 trading days and (ii) amount in relation to the share capital of the issuer, considered the lowest among them
- Not applied during the auction procedures, including the pre opening auction and closing call
- Trades that reach the quantity bandwidth automatically trigger the auction procedure in the trading system

Auction Bandwidth

- Used to trigger an auction when trading rules are violated
- Applied throughout the trading phase, except when the instrument is in reserved status, pre opening phase, or closing call
- The auction bandwidth is dynamic, i.e., updated according to the price of the last trade recorded
- The trade is subject to auction when:

Trade Price \geq Upper Limit
or
Trade Price \leq Lower Limit

Static Limit Bandwidth

- Used to restrict percentage variations to the price of an instrument relative to the price established at the beginning of the trading session
- Applied throughout the trading phase, except when the instrument is in reserved state, pre opening phase, or closing call
- The bandwidth center is the closing price until the first business of the day (opening price)
- All auctions carried out due to static limit violation update the center of the bandwidth after completion
- The trade is subject to auction when:

**Trade Price \geq Upper Limit
or
Trade Price \leq Lower Limit**

Volatility Bandwidth

- Used to restrict percentage variations in the price of an instrument in a short interval of time
- The bandwidth center is the weighted average price of the instrument every X seconds (VWAP)
- Applied throughout the trading phase, except when the instrument is in reserved state, pre opening phase, or closing call
- Exclusion of trade in the past does not recalculate the bandwidth
- The trade is subject to auction when:

Trade Price \geq Upper Limit
or
Trade Price \leq Lower Limit

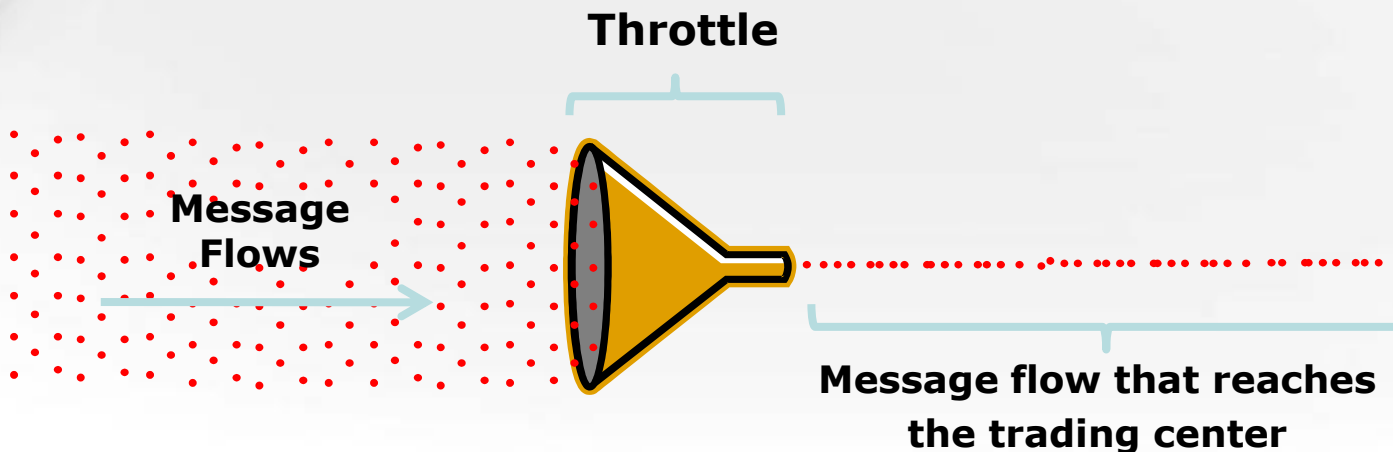
Throttle

Definition

Tool that limits the entry of a large number of messages per second (mps) in one trading session to protect the integrity of the system

BM&FBOVESPA Monitoring

By daily reports, BM&FBOVESPA limits and monitors session connectivity, allowing control and identification of pattern changes in the use of sessions for participants





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