

What would be the impact of internalization in Brazil?

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Executive summary

Internalization is a legacy structure from OTC markets. In some jurisdictions, when the market evolved to a central limit order book (CLOB), internalization was restricted for all orders to contribute to price formation. In some of those markets internalization was later re-introduced. In Europe, internalization was re-introduced to solve a problem that does not exist in Brazil. European authorities wanted to remove legacy national barriers to achieve regional integration and thus, allowed internalization by removing the “concentration rule”.

Internalization has proven to weaken price discovery by lowering incentives to provide liquidity in displayed, or lit, markets. Thus, spreads widen, lowering returns for investors and raising the cost of capital for issuers. In recent times, where internalization was implemented with low restrictions, like in USA and Europe, displayed liquidity on lit markets is declining and quoted bid-ask spreads are widening. Transaction costs increase for institutional investors and can also increase for retail investors as well.

Internalization creates conflicts of interest in execution and is prone to abuses. Regulators in USA, Canada and Europe have consistently found serious cases of abuse in order handling and best execution, conflicts of interest arising from payment for order flow, use of customer trading information, unlawful use or disclosure of confidential information, trading ahead of customers, and interposing and misrepresenting information. Regulators would need significant resources to conduct surveillance and enforce rules that mitigate the effects of internalization. We estimate that CVM would require mid-to-high eight figure US dollars per annum to mitigate conflicts and abuses related to internalization. Regulators would need to act in advance to prevent rule violations, misconduct and wrongdoing; but in many cases regulators have not been effective in preventing these acts. In fact, they usually act after the fact through audits, penalties and other sanctions.

Under fragmented markets, participants would incur in significant additional costs arising from compliance with the best execution obligation, including order routing, connectivity, market data, transaction costs analytics and audit costs.

In Brazil, we estimate that internalization could shrink volumes by 25% from retail, market makers providing less liquidity and foreigners trading shifting trading to ADRs. This would have an impact on quoted spreads, which would increase by 2.5bps in Bovespa Index components.

How does it work?

Strictly speaking, capital market regulators in USA, Canada and Europe define internalization as the practice of executing client orders internally. In this sense, the US Securities and Exchange Commission (SEC) says *“internalization occurs when the order routing firm routes its customer orders to its affiliated specialist”*¹ and, more informally, *“your broker may decide to send your order to another division of your broker's firm to be filled out of the firm's own inventory. This is called “internalization.”*² The Canadian Securities Administrators (CSA) and the Investment Industry Regulatory Organization of Canada (IIROC) considers that *“Internalization generally refers to trades that are executed with the same dealer as both the buyer and the seller, with the dealer either acting as an agent for its clients on both sides of the trade, or trading as principal and taking the other side of a client order.”*³ And the European Parliament refers to internalization as *“when integrated houses (broker-dealers) execute client orders internally.”*⁴ On MiFID, the European Parliament stated that a *““Systematic internalizer” means an investment firm which, on an organized, frequent and systematic basis, deals on own account by executing client orders outside a regulated market or an MTF”*⁵

As such, we note that the concept of executing a client’s order internally –internalization- would exclude routing orders to wholesalers for execution, either with or without payment for order flow (PFOF). On its study on Order Internalization of May 2024, based on a regulatory impact analysis (RIA) methodology, the CVM seems to adopt a different scope of internalization. Under paragraph II.2.5 – “Order execution by internalizers”, CVM notes that payment for order flow is not prohibited in Brazil and that intermediaries participating in B3’s RLP program can appoint another counterparty for the client’s order flow.⁶ CVM has a broader definition of internalization, which includes trades taken by intermediaries that would otherwise find different counterparties in the process of competition and price formation.⁷

For the remaining of this work we consider and refer to the broader concept of internalization adopted by CVM. We include in the analysis the portion of the order flow, primarily retail, that brokers route to “wholesalers” or, as in SEC terminology, *“third market makers”*⁸. We note that, also in Europe, the concept of Systematic Internalizers (SI) has transformed with many SI now acting as wholesalers, or

¹ SEC Special Study: Payment for Order Flow and Internalization in the Options Markets. December 2000

² SEC Investor Publications, Trade Execution: What Every Investor Should Know, Jan. 15, 2013

³ Joint CSA/IIROC Staff Notice 23-327 – Update on Internalization within the Canadian Equity Market

⁴ INVESTMENT SERVICES DIRECTIVE (2002). DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL ON INVESTMENT SERVICES AND REGULATED MARKETS AND AMENDING COUNCIL DIRECTIVES 85/611/EEC, 93/6/EEC and 2000/12/EC

⁵ MiFID: DIRECTIVE 2004/39/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 April 2004 on markets in financial instruments amending Council Directives 85/611/EEC and 93/6/EEC and Directive 2000/12/EC of the European Parliament and of the Council and repealing Council Directive 93/22/EEC

⁶ CVM INTERNALIZAÇÃO DE ORDENS Estudo a partir da metodologia de Análise de Impacto Regulatório – AIR AIR Parcial, Assessoria de Análise Econômica e Gestão de Riscos (ASA), May 2024.

⁷ Ibid.

⁸ SEC Investor Publications, Trade Execution: What Every Investor Should Know, Jan. 15, 2013

electronic liquidity providers (ELP SI), who make markets for retail brokers and institutional clients.⁹ ELP SIs operate beside bank SIs, which are relatively more likely to perform pure internalization of their clients' order flow, particularly for large orders.¹⁰

In EU, regulators allowed internalization by removing the “concentration rule”, embracing the idea that competition between trading venues would bring greater advantages for investors and would foster financial integration of the EU markets. EU wanted to remove legacy national barriers in order to achieve regional integration. Such an integration problem does not exist in Brazil. Instead, we may argue that price discovery weakened in Europe by information asymmetry issues and opaqueness problems.

a. Internalization Models

Internalization adopts different forms in different jurisdictions and for different asset classes. Specific rules, regulations and institutional details characterize each market, modeling particular market structures and leading to different results. A classification of markets can be performed by assessing aspects such as:

- Whether internalization is conducted under the rules of a recognized marketplace, such as an exchange (like in Canada and Brazil) or not necessarily (USA, Europe, to some extent Australia)
- Whether customer segmentation, such as tagging retail order flow, is explicitly required, as in Brazil, or not, as in the other markets reviewed
- Whether the order flow interacts with the order book as in Brazil, Australia, Canada and RLP programs in Europe and USA, or not, as in USA and Europe beyond RLP.
- Whether price improvement is required (as in Australia and Canada), or not, (like in USA other than RLP and in the EU).
- Whether there is a minimum price improvement required for those trades that receive an improvement (like in Australia, Canada and Europe), or there is no such minimum (as in USA).
- Whether quantitative restrictions are imposed on internalized volume like in Brazil, or not.
- Whether payment for order flow is allowed, as in USA and Brazil, or not, like in Australia, Canada and Europe. In Europe, payment for order flow was banned in 2023 and will be completely phased out by June 2026).¹¹
- Whether pre-trade transparency applies (like for systematic internalizers in EU), or not.
- Whether the best execution criteria is based on total cost consideration (like in Australia for institutional orders and in Brazil and Europe for all orders) or best price (like in USA and Canada)
- Whether an order size threshold is imposed (like in Europe) or not

⁹ AMF, QUANTIFYING SYSTEMATIC INTERNALISERS' ACTIVITY: THEIR SHARE IN THE EQUITY MARKET STRUCTURE AND ROLE IN THE PRICE DISCOVERY PROCESS, IRIS LUCAS, MAY 2020

¹⁰ Ibid.

¹¹ Regulation (EU) of the European Parliament and of the Council of amending Regulation (EU) No 600/2014 as regards enhancing data transparency, removing obstacles to the emergence of consolidated tapes, optimizing the trading obligations and prohibiting receiving payments for forwarding client orders.

We reviewed the cases of internalization in Canada, Australia, Europe and USA. In the case of Canada and Australia the practice is more restricted due to a stricter set of regulations. In USA, regulations are favorable to internalization and the practice is widespread. In Europe, internalization used to be widespread but new regulations have been adopted in recent years that will likely be more restrictive to the practice. Table 1 (in the Data tables section) summarizes the main characteristics of internalization models in USA, Canada, Europe and Australia, and compares to the RLP program under review in Brazil.

Canada: Broker Preferencing Model

In Canada, internalization adopts the form of broker preferencing on a regulated marketplace. IIROC (currently CIRO) is the self-regulatory organization (SRO) in charge of overseeing all trading activity on Canadian equity marketplaces and performs surveillance over all participants, including those internalizing orders. By virtue of rule 6.4.(1) of the Universal Market Integrity Rules (UMIR) of the IIROC participants need to enter orders and conduct trades on a marketplace.¹² Internalization is then based on broker preferencing, which is a distinctive matching feature of Canadian exchanges and other marketplaces. Broker preferencing *“allows an incoming order sent to a marketplace to match and trade first with other orders from the same dealer, ahead of orders from other dealers that are at the same price and which have time priority.”*¹³ In those marketplaces with broker preferencing, orders are executed following a price / broker / time priority; so preferencing enables the broker handling the order to jump the queue at the best price and internalize the trade. Internalized trades, also called “crosses”, can be either intentional, when the client’s order is executed against its broker’s own account and inventory, or unintentional, when the order is executing against a contra-order from another client. Unintentional crosses of two opposing customer orders are frequent in Canada, particularly at large banks and brokers, due to preferencing.¹⁴ When an order is not internalized, it can then interact with other orders in the central limit order book (CLOB).

If the broker has no intention to internalize its client’s order, it can still route to a dark pool, which must be recognized as a marketplace, where the order can be executed most likely against the inventory or liquidity provided by a wholesaler. Marketplaces report the trades to the Information Processor administering the consolidated tapes. However, two pieces of regulation in Canada have prevented this market segment to grow faster than the others and to become predominant. First, payment for order flow is not allowed in Canada-listed securities and hence retail brokers find smaller incentives to route to a dark pool. And second, from October 2012, IIROC amended UMIR regulation requiring dark executions of orders smaller than 50 round lots or CAD 100,000, to be price-improved by at least one full tick, or be executed at midpoint.¹⁵ Orders larger than CAD 100,000 can be crossed without price improvement.

¹² IIROC Universal Market Integrity Rules (UMIR)

¹³ Joint CSA/IIROC Staff Notice 23-327 – Update on Internalization within the Canadian Equity Market

¹⁴ Ibid.

¹⁵ IIROC Universal Market Integrity Rules (UMIR)

There is yet no regulatory obligation for brokers in Canada to perform customer segmentation, by flagging retail and institutional orders.

Australia: Off-book Full Tick Price Improvement Model

In Australia, ASIC performs the surveillance of market participants. Based on ASIC Market Integrity Rules (MIR), trading must also be conducted under the rules of a recognized market (market operator). MIR Article 5.1AA.1 states that *“a Market Participant must not enter into a transaction in an Equity Market Product other than under the Rules of a Market.”*¹⁶

Based on ASIC Regulatory Guide 265, Paragraph 373, and subject to some exceptions, trades must be *“first pre-trade transparent on the order book of a licensed market.”*¹⁷ Exceptions to the pre-trade transparency requirement are trades with price improvements, block trades, large portfolio trades, pre-hours trades, post-hour and out of hours trades.¹⁸ So for small and mid size orders and during the time period the market is open, the only way to execute an order in the dark is with price improvement. RG 265 376 requires the minimum amount of price improvement to be 1 tick, with any trade executed in round ticks, not sub-penny increments with the exception of executions at midpoint, that are also allowed.¹⁹

Off book transactions, including blocks, off hours and trades with price improvement must be reported to a market operator, like ASX or Chi-X Australia (current CBOE Australia). Executions at midpoint are popular and occur on ASX’s dark execution facility CentrePoint.²⁰ In Australia, market participants comply with the best execution obligation for institutional orders following total consideration criteria. In the case of retail order flow, ASIC requires participants to focus on the best price minus transaction cost but gives them flexibility in terms of the treatment of implicit transaction costs.²¹

In Australia, both payment for order flow and exchange rebates are prohibited. Article 5.4B.1 of ASIC Market Integrity Rules explicitly bans payment for order flow: *“where a Market Participant handles or executes an Order as a result of an arrangement with another person to direct Orders to the Market Participant, the Market Participant must not, indirectly or directly, make a cash payment to the other person or an associate of the other person for the opportunity to handle or execute those Orders, if the cash payment is greater than the dollar value of the Market Participant’s Commission in relation to the Orders.”*²² ASIC banned payment for order flow on concerns that it poses serious conflicts of interest in the best execution obligation of market participants. Furthermore, ASIC notes that it can divert order

¹⁶ ASIC Market Integrity Rules (2017)

¹⁷ ASIC RG 265 373

¹⁸ ASIC RG 265 374

¹⁹ ASIC RG 265 376

²⁰ ASIC Equity Market Data, various reports.

²¹ REGULATORY GUIDE 223 Guidance on ASIC market integrity rules for competition in exchange markets, May 2015

²² ASIC Market Integrity Rules (2017)

flow from lit markets, increasing adverse selection costs and concentrating the order flow in a few wholesalers.²³

Europe: Systematic Internalizer and Best of Book Models

In Europe, an investment firms may execute a client's order in equities on either a Regulated Market (RM), a Multilateral Trading Facility (MTF) or against the inventory of a Systematic Internalizer (SI). Beyond the three types of venues, a participant can also execute OTC.²⁴ Investment firms comply with best execution by identifying the best possible result based on the total consideration criteria. Total consideration is the price of the financial instrument and the costs related to execution, and may include transaction *"fees, speed, likelihood of execution and settlement, the size and nature of the order, market impact and any other implicit transaction costs."*²⁵ In Europe, investment firms are regulated by national securities regulators that apply EU directives in each country.

MiFID II requires Systematic Internalizers (SI) to make public, pre-trade transparent firm quotes to clients.²⁶ SI need to publish prices that reflect prevailing market conditions for the financial instrument based on quotes of equivalent sizes on the most relevant market in terms of liquidity.²⁷ ESMA may amend Article 10 of Delegated Regulation (EU) 2017/58 to add that quoted prices need to respect the minimum price increments corresponding to the tick sizes in the market, specified in Article 2 of Commission Delegated Regulation (EU) No 2017/588. Only a full tick price improvement can be offered by SIs; they cannot provide, for example sub-tick price improvement. SIs need publish quotes reflecting the standard market size (SMS), which is determined on the basis of the average value of transactions for each financial instrument. Trades by Systematic Internalizers are reported respecting the format of Approved Publication Arrangements (APA) to facilitate consolidation of market data.

Similar to Australia and Canada, the European Union has recently banned payment for order flow. PFOF will be completely phased out by June 2026.²⁸ Amended Article 39.a of Regulation (EU) No 600/2014 reads: *"Investment firms acting on behalf of (...) clients shall not receive any fee or commission or non-*

²³ ASIC Consultation Paper 347: Proposed amendments to the prohibition on order incentives in the ASIC market integrity rules

²⁴ MiFID: DIRECTIVE 2004/39/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 April 2004 on markets in financial instruments amending Council Directives 85/611/EEC and 93/6/EEC and Directive 2000/12/EC of the European Parliament and of the Council and repealing Council Directive 93/22/EEC

²⁵ CESR/07-320 Best Execution under MiFID

²⁶ MiFID: DIRECTIVE 2004/39/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 April 2004 on markets in financial instruments amending Council Directives 85/611/EEC and 93/6/EEC and Directive 2000/12/EC of the European Parliament and of the Council and repealing Council Directive 93/22/EEC

²⁷ Delegated Regulation (EU) 2017/58, Article 10

²⁸ Regulation (EU) of the European Parliament and of the Council of amending Regulation (EU) No 600/2014 as regards enhancing data transparency, removing obstacles to the emergence of consolidated tapes, optimising the trading obligations and prohibiting receiving payments for forwarding client orders

monetary benefits from any third party for executing orders (...). The first subparagraph shall not apply to rebates or discounts on the transaction fees of execution venues.”²⁹

Orders executed by systematic internalizers do not interact with the order book of a lit market. But the trading of SIs is not the only form of internalization in practice in Europe; exchange operators such as and Euronext, Deutsche Boerse and Boerse Berlin offer “Best of Book”-like retail liquidity provider programs subject to the rules of an exchange, and linked to the order book.

Euronext Best of Books (ENX BoB). Best of Books is a best execution service for retail orders whereby dedicated liquidity providers offer price improvement for the retail flow.³⁰ Retail Member Organization need to flag retail orders as such, for the orders to potentially interact with RLP orders. RLP quotes are firm orders and execute in direct competition with the Euronext Central Order Book. These quotes are at, or better than the European Best Bid and Offer (EBBO). Price improvements must be provided in full ticks, not sub-ticks, to comply with EU regulations. RLP orders do not have priority over an identically priced order in the central order book; hence pure price-time priority applies.”³¹ Broker clients connecting to the service receive best execution reports, so that investors can measure the quality of the order execution and price improvements. Retail liquidity providers receive fee discounts on Euronext based on the amount of liquidity and competitiveness of the quotes maintained on the central limit order book as market makers.³² Trades are reported by the exchange.

Deutsche Boerse offers Xetra Retail, a new execution service to offer price improvements based on the current Central Limit Order Book (CLOB) and based on the competing quotes of dedicated Retail Liquidity Providers (RLPs). Xetra segregates retail flow in the order book (aggressive and passive) with preferred execution of the retail orders against RLPs ensuring reference top of book matching with a price improvement option. Price improvements are provided in full ticks, not sub-ticks, to comply with EU regulations. Retail orders are matched against all available orders in the order book and all available RLP quotes. The RLP quote is treated as fully integrated in the order book. However, different from ENX BoB, for the execution of retail orders, a price/ retail / time priority for the RLP quote applies. RLP quotes cannot match against each other. Transaction fees for the execution of retail orders are also reduced. RLP quotes are not displayed and trades are reported by the exchange.

US Equities: Off-exchange Wholesaler Model

In USA, conditions for internalization are very flexible, which results in widespread adoption of the practice, particularly predominant in the case of retail order flow. Wholesalers making markets in equity securities for retail order flow are regulated by FINRA and trade almost totally off-exchange. Six wholesalers including Citadel, Virtu Financial, Jane Street, G1 Execution Services, Two Sigma and UBS,

²⁹ Ibid.

³⁰ <https://www.euronext.com/en/media/1818/download>

³¹ AMF, Analysis of the execution of retail investors' orders in the first months of the COVID-19 crisis, March 2022

³² See link:

https://www.euronext.com/sites/default/files/202407/Market%20Maker%20Liquidity%20Provider%20Trading%20Fee%20Guide%20Euronext%20Cash%20Markets_Effective%2001JUL2024_01AUG2024.pdf

collectively cross an overwhelming majority of the retail order flow. Payment for order flow is allowed and is actually the most common practice. Price improvements can be offered but cannot be guaranteed. Sub-penny price improvement is allowed and also the most common practice. Executions are required to be in most cases at or better than the National Best Bid and Offer (NBBO).

Trading is not pre-trade transparent; only trades, not quotes, must be reported to Trade Reporting Facilities (TRFs). Trades must be reported as soon as possible after the trade, in no more than ten seconds. Broker dealers must report, on a quarterly basis, Rule 605 and 606 disclosure reports on order handling practices including volumes, order routing quantities, amount of payment for order flow, amounts of exchange rebates received and fees paid.

US Options: Exchange Market Maker Model

In stock options, internalization is conducted by wholesalers registered as market makers on options exchanges. OCC centrally clears listed options and hence, liquidity providers need to register as market makers on an exchange. Market makers such as Citadel, Susquehanna, Wolverine, Dash/IMC, Morgan Stanley and others hold Designated Market Makers (DMM) seats allowing them to internalize a significant portion of the order flow.³³ Another way to internalize is to launch price improvement auctions that also give the initiator a privilege in the execution.³⁴ Payment for order flow is allowed and widespread.³⁵ The group of wholesalers with more DMM seats can pay the highest for order flow and end up concentrating execution, primarily for retail orders.

Impact of internalization on issuers and on investors

Internalization of retail orders enables trading firms to profitably interact with uninformed order flow with very low adverse selection cost. Evidence shows the price impact of retail orders is significantly below that of other –professional– flow.³⁶ Hence crossing retail orders enable wholesalers to capture the bid-ask spread without taking significant risk. Data collected by SEC (2022) for the USA, shows that the price impact of trades on the order book is 3.5 times higher than trades of retail orders off-exchange.³⁷ In particular, retail off-exchange trades have a price impact of 1.26 basis points, while exchange trades show a 4.40 basis point price impact.³⁸ For a market maker, the probability of incurring a loss when

³³ Ernst and Spatt, Payment for Order Flow And Asset Choice, July 2022

³⁴ Ernst and Spatt, Payment for Order Flow and the Retail Trading Experience, 2023

³⁵ See SEC Rule 606

³⁶ See, for example: Easley, Kiefer and O'Hara, Cream-Skimming of Profit-Sharing? The curious role of purchased order flow, The Journal of Finance, VOL. LI No 3, July 1996

- Bruno Biais & Didier Davydoff, *Internalization, investor protection and market quality*. Working Paper (2002)
- Grammig and Theissen, *Is Best Really Better? Internalization in Xetra Best*. CFR WP 05-06 (2005)
- SEC "Release No. 34-96495, "Order Competition Rule", 2022

³⁷ SEC "Release No. 34-96495, "Order Competition Rule", 2022

³⁸ Ibid.

trading against an order at the exchange is much higher than that for off-exchange trades against a retail order.

For wholesalers, making markets for segmented retail orders is profitable enough to simultaneously i) pay for the order flow of retail brokers, ii) provide a price improvement to the customer, compared to NBBO and iii) keep a positive trading gain. The average price improvement of retail orders in USA is 24% of the quoted spread.³⁹ And the wholesaler keeps the majority of the spread as its trading gain.⁴⁰ Furthermore, in markets where payment for order flow (PFOF) is allowed, like USA, retail brokers send most of the orders to wholesalers paying for such flow, as shown in Chart 1 in the Charts section.

We reviewed the impact of internalization in USA, Europe, Australia and Canada and focus on the impact on liquidity, volume, market share and spreads on the lit markets. As described above, each jurisdiction adopted a different framework for the practice, leading to different results. Overall, evidence shows that internalization in USA and Europe:

a. Increases adverse selection cost in lit markets by shifting “cherry picked” retail orders off-exchange

Internalization of retail orders enables trading firms to “skim the cream” of uninformed order flow with very low adverse selection cost. In fragmented markets asset managers shift to closing auctions and dark pools, so the liquidity left on the book is thin and its price impact is much higher than off-exchange.

b. Drives up transaction costs to investors by discouraging liquidity in lit markets

Without a portion retail order flow, market makers refrain from sending resting limit orders to the CLOB and spreads widen. In the US, spreads have widened as shown below in this section, driving institutional transaction costs higher. Then, price improvement is a fraction of the wider quoted spread as orders matching off-exchange are not competing at the NBBO to contribute to a tighter spread. In Europe, bid ask spreads have also been widening and the retail even gets poorer execution.

c. Discriminates access

Only few large wholesalers can interact with retail flow - not accessible to all investors in public markets.

d. Creates an environment prone to abuse

Regulators found several cases of abuse in retail order internalization. Regulators found some brokers misrepresent and omit information on order handling and risk, failing to seek best execution and front-running their orders.

e. Free rides price discovery

Off-exchange dark orders do not contribute to form the best bid and offer, but they use it to comply with the best execution obligation.

³⁹ Dyhrberg, Shkilko and Werner, The Retail Execution Quality Landscape, December 2023. Available from the American Economic Association, <https://www.aeaweb.org/>

⁴⁰ Ibid. See also BestEx Research, The Good, The Bad and The Ugly of Payment For Order Flow, Hitresh Mittal and Kathrin Berkow, May 2021.

As a result of higher transaction costs, issuers face a higher cost of capital and receive lower valuations.

Impact of internalization in USA under the off-exchange wholesaler model

In US equity markets, internalization can take place off exchange at sub-penny price increments. Payment for order flow is also allowed. In effect, most retail clients' orders trade off-exchange without contributing to price discovery. Retail trading on exchanges almost disappeared as brokers sell most of the order flow to trading firms. For example, Chart 1 shows that four of the largest online retail brokers, namely Charles Schwab, Robinhood, E*Trade and Fidelity sell virtually all their order flow to a small group of wholesalers that include Citadel, Virtu, G1, Jane Street, Two Sigma, Morgan Stanley and UBS.⁴¹ The wholesaling business is highly concentrated, with two firms capturing two thirds of the share volume executed by wholesalers.⁴²

Thus, natural order flow is taken away from exchanges. On one side, retail order flow is internalized almost completely. On the other side, buy and hold asset managers, now predominantly passive, execute a significant portion of their trades at the closing auction. Also, blocks are sent to crossing networks or dark pools. In addition, some other asset manager execute against trading firms providing liquidity, primarily in ETFs. Hence, the order flow left on the central limit order book (CLOB), including high frequency traders, becomes "toxic", with higher adverse selection costs. As a result, only 40% of volume now takes place on the lit order book of exchanges, compared to around 80% before Regulation NMS became effective in late August 2005. As shown on Chart 2, the remaining 60% of executed volume now takes place in the dark.

High dark fragmentation is associated with lower market quality. Studies are coincidental that dark fragmentation weakens price discovery and market efficiency. For example, Weaver (2014), finds *"strong support for the existence of a negative relationship between the degree of internalization and market quality,"* and concludes that *"investors [are] paying \$3,890,624 more per stock per year due to internalization."*⁴³ In 2013, the SEC stated that the majority of studies concluded that dark trading affects price discovery and *"weakens the quality of the price discovery mechanism on the lit markets"*⁴⁴. The SEC staff highlights that Weaver (2011) examines trading in more than 4,000 U.S. stocks and finds that increased dark trading is associated in a linear fashion with wider spreads and higher volatility.⁴⁵ Further, the CFA Institute (2012) examines dark venue trading in 450 U.S. stocks stratified across market

⁴¹ See SEC Rule 606 disclosures of each of the retail broker dealers mentioned.

⁴² SEC "Release No. 34-96495, "Order Competition Rule", 2022

⁴³ The Trade-At Rule, Internalization, and Market Quality, 3 (Apr. 17, 2014)

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1846470.

⁴⁴ SEC Equity Market Structure Literature Review - Part I: Market Fragmentation (2013)

⁴⁵ Weaver, Daniel, 2011, *Internalization and market quality in a fragmented market structure*, working paper.

capitalization. They also separately analyze the effect of broker-dealer internalization and dark pools. They find that some levels of dark venue trading are beneficial for quoted spreads, but estimate levels of activity at which internalization and dark pool trading become harmful.⁴⁶ Hatheway, Kwan, and Zheng (2017) examine a sample of 116 US stocks and find that non-block dark trading volume is associated with higher market-wide transaction costs, but only when controlling for the level of informed trading on a particular day.⁴⁷

In markets different from USA, researchers also found evidence of dark fragmentation affecting market quality. Aramian and Norden (2023) find that higher the volume executed by Systematic Internalizers in Europe leads to a reduction in depth and an increase in effective spreads on the primary exchange⁴⁸. Comerton-Forde and Putnins (2012) examine the 500 largest Australian stocks and conclude that informational efficiency deteriorates when dark trading of less than block size exceeds 10% of total volume.⁴⁹ ASIC (2013), examines the 300 most active Australian stocks and reaches a similar conclusion regarding the 10% threshold for when non-block dark trading leads to harmful effects on quoted spreads and quoted depth.⁵⁰ Degryse, de Jong, and van Kervel (2011) examine Dutch mid- and large-cap stocks during a time period when dark trading in those stocks represented 37% of total volume. After controlling for the level of visible fragmentation and other factors, they find that an increase in dark trading of one standard deviation in a stock reduces liquidity by 9%.⁵¹ And Gresse (2012) examines dark trading in UK and French stocks and concludes that dark volume could be harmful for quoted spreads.⁵²

Dark fragmentation, including internalization, drives up transaction costs by discouraging liquidity in lit markets. Without natural order flow and liquidity providers, quoted spreads have been increasing. Back in 2015, at a SEC Market Structure Advisory Committee, US institutional investors confirmed findings that after Regulation NMS, compression in bid ask spreads stalled. Matt Lyons, Vice President at The Capital Group, testified to the SEC that *"after RegNMS there has been no material decrease in spreads, and even at the lower market cap range spreads have actually widen."*⁵³ Lyons presented evidence of bid-ask spreads built on data from ITG, as shown in Chart 3.⁵⁴ IEX CEO Brad Katsuyama confirmed decimalization tightened spreads long before Regulation NMS market structure reforms.

⁴⁶ CFA Institute, 2012, *Dark pools, internalization, and equity market quality*

⁴⁷ Hatheway, Frank, Amy Kwan and Hui Zheng, 2017, *An empirical analysis of market segmentation on U.S. equities markets*, Journal of Financial and Quantitative Analysis, 2017, vol. 52, issue 6, 2399-2427.

⁴⁸ Aramian, Fatemeh and Nordén, Lars L., Costs and Benefits of Trading with Stock Dealers: The Case of Systematic Internalizers (August 2, 2023). European Financial Management, Open Access: <https://doi.org/10.1111/eufm.12430>, Available at SSRN: <https://ssrn.com/abstract=3409878> or <http://dx.doi.org/10.2139/ssrn.3409878>

⁴⁹ Comerton-Forde, Carole and Talis J. Putnins, 2012, *Dark trading and price discovery*, working paper.

⁵⁰ Australian Securities & Investments Commission ("ASIC"), 2013, Report 331: *Dark liquidity and high-frequency trading*

⁵¹ Degryse, Hans, Frank de Jong and Vincent van Kervel, 2013, *The impact of dark trading and visible fragmentation on market quality*, working paper.

⁵² Gresse, Carole, 2012, *Effects of lit and dark trading venue competition on liquidity: the MiFID experience*, working paper.

⁵³ Matt Lyons, The Capital Group SVP and global equity trader, on the Failure of Regulation NMS. SEC Market Structure Advisory Committee hearing 09/27/2015

⁵⁴ Ibid.

“Decimalization and technology, both contributed to the lowering of spreads long before,” he said on a hearing of the Senate Subcommittee on Investigations in June 2014.⁵⁵

Since 2015, bid-ask spreads have widened even more; in US S&P500 Index components, and after adjusting for the effect of volatility, bid-ask spreads increased 40%, according to NASDAQ,⁵⁶ as shown in Chart 4. Further, NASDAQ also reported that, for mid and small caps stocks components of the Russell 2000 Index, bid-ask spreads have increased by around 50% in the period.⁵⁷ In addition, the size available at the best bid and offer has been decreasing constantly since 2010.⁵⁸ Nasdaq shows that the size available at the National Best Bid and Offer (NBBO) has dropped by more than 80% only in the last decade.⁵⁹

BestEx Research calculates that if retail order flow moves on to exchanges, the quoted bid-ask spread would be reduced by over 25%.⁶⁰ To arrive to that conclusion, BestEx Research first estimates the relationship between NBBO spread and adverse selection on exchanges and finds that adverse selection explains 60% of the spread. Then, it calculates the weighted average of adverse selection if retail volume moved to exchanges and calculates the corresponding reduction in NBBO spread. Further, it calculates that the real price improvement statistics by retail brokers are overestimated by at Least 8% of the NBBO Spread as the NBBO does not consider available displayed-type liquidity such as odd lots and actionable indications of interest. Finally, it concludes that if order flow moved on to exchanges, the retail execution quality would be around the same as the price improvement it currently receives off-exchange. As the study concludes, *“if retail trading moved to a public forum the NBBO itself would decline dramatically [25%], eclipsing the 15% difference between what is currently available on exchanges and what wholesalers offer in the form of price improvement.”*⁶¹

The BestEx Research study also notes that *“Institutional investors—who often represent retail investors—do not receive the discount and pay the new, higher price for the item, as do retail limit orders”*.⁶² In fact, institutional traders have also pointed to a deterioration of liquidity and increment in transaction costs. At a US House Committee on Financial Services Hearing, Sal Arnuk, Partner/Co-Founder of institutional broker Themis Trading LLC, said *“market impact costs are higher and spreads are wider”*. Further, he considers that *“PFOF increases transaction costs for all investors including pension funds”* as it *“provides disincentives to displayed limit orders on exchanges.”* Further, he points to *“Toxic order flow on exchanges.”* In addition, he believes *“price improvement calculation is flawed”* as it

⁵⁵ Hearing of Senate Permanent Subcommittee on Investigations. Conflicts of Interest, Investor Loss of Confidence, and High Speed Trading in U.S. Stock Market, June 17, 2014

⁵⁶ Nasdaq, Optimizing Markets for Today and Tomorrow: A Framework for U.S. Equities Market Reform, February 2022.

⁵⁷ Nasdaq, Chief Economist Phil Mackintosh, Have Spreads Changed over Time?, October 2021

⁵⁸ Wellington Managers, “Why fragility is the new reality for the stock market”, November 2021.

⁵⁹ Nasdaq Chief Economist Phil Mackintosh, *Tick Sizes Are a Trade-off*, September 17, 2024.

⁶⁰ BestEx Research, The Good, The Bad and The Ugly of Payment For Order Flow, Hitresh Mittal and Kathrin Berkow, May 2021.

⁶¹ Ibid.

⁶² Ibid.

is based slower SIP quotes, NBBO does not include odd lots and is influenced by the same market makers that provide liquidity off exchange.⁶³

Retail trading now accounts for one third of total volume and, as mentioned before, is overwhelmingly executed by wholesalers. The inaccessible portion of the market challenges those institutional traders with large order sizes that want to maintain low participation rates to avoid information leakage. As a result, Babelfish shows that in stock with higher retail participation, where the inaccessible portion of the market is higher, slippage cost is higher.⁶⁴ In the same direction, Virtu's data on transaction costs for large institutional orders shows compression in slippage costs stalled around 2015, as shown in Chart 5.⁶⁵

In North America and Europe, liquidity on exchange is now mainly provided by HFTs seeking rebates. HFTs benefit from passive rebates they can achieve if they post liquidity on the book for just a third of the time, or even less in some cases. That is much easier than the 80%-90% two way quoting obligation which has been the standard for recognized market makers on global exchanges. In Europe, the AMF⁶⁶ shows that Supplemental Liquidity Providers (SLPs) seek to quote competitively to receive a rebate. Euronext SLPs receive a rebate if they quote at the best bid and offer at least 30% of the time.⁶⁷ Similarly, the London Stock Exchange pays rebates under its Liquidity Provider Scheme for FTSE 100 securities.⁶⁸ Participants receive the rebate if they set the BBO a minimum 5% of the time. In US exchanges, such as the Nasdaq, liquidity providers receive a higher rebate if they quote at the NBBO 25% of the time. To attract market makers, exchanges have to pay more as rebates and require easier obligations.

Impact of internalization in Europe under the Systematic Internalizer (SI) model

In Europe, the Investment Services Directive⁶⁹ and MiFID⁷⁰ recognized the practice of internalization, off-exchange. With the previous concentration rules, lit markets of incumbent exchanges used to handle 90% of volumes, but now all lit markets collectively represent less than 30% of volume as shown in Chart 2. MiFID II requires Systematic Internalizers (SI) to make public, pre-trade transparent firm quotes to

⁶³ Sal Arnuk Testimony before the US House Committee on Financial Services Hearing: Game Stopped? Who Wins and Losses When Short Sellers, Social Media, and Retail Investors Collide, Part II, March 18, 2021

⁶⁴ Babelfish, Meme Stocks: Inaccessible Trading Share, Trading Cost, and Risk, May 2021

⁶⁵ Virtu Financial, Global Cost Review 4Q2021

⁶⁶ AMF, Study of the behavior of high frequency traders on Euronext Paris, January 2017.

⁶⁷ Euronext market maker and liquidity provider trading fee guide.

⁶⁸ LSE trading price list for October 2024

⁶⁹ INVESTMENT SERVICES DIRECTIVE (2002). DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL ON INVESTMENT SERVICES AND REGULATED MARKETS AND AMENDING COUNCIL DIRECTIVES 85/611/EEC, 93/6/EEC and 2000/12/EC

⁷⁰ MiFID: DIRECTIVE 2004/39/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 April 2004 on markets in financial instruments amending Council Directives 85/611/EEC and 93/6/EEC and Directive 2000/12/EC of the European Parliament and of the Council and repealing Council Directive 93/22/EEC

clients.⁷¹ Orders executed by systematic internalizers do not interact with the order book of a lit market. SIs need to publish prices that reflect prevailing market conditions for the financial instrument based on quotes of equivalent sizes on the most relevant market in terms of liquidity.⁷² Only a full tick price improvement can be offered by SIs cannot provide, for example sub-tick price improvement. The European Union banned payment for order flow in 2023; PFOF will be completely phased out by June 2026.⁷³

With internalization and other types of dark fragmentation, in the last decade, bid-ask spreads have widened by 37%, as reported by the ESMA, as shown in Chart 6.⁷⁴ Volumes on lit exchanges have been declining in recent years across Europe. In particular, volumes have been declining fast on the continuous central limit order book of exchanges and multilateral trading facilities.⁷⁵ In part because of lower displayed liquidity in the continuous CLOB, and part as a result of the global trend towards passive asset management, the proportion of volumes at the closing auction have been increasing fast. The French regulator AMF shows it now accounts for 41% of Euronext Paris, and more than 30% in several European exchanges such as Xetra, BME and Borsa Italiana.⁷⁶ Institutions usually trade at the closing auction to avoid information leakage, execute sizes with and obtain high fill rates.

Impact of internalization in Australia and Canada

In Australia and Canada, executions need to be on exchange, with some exceptions. Internalization happens under the rules of an exchange, facilitated by broker preferencing. Payment for order flow is not allowed. Australia's trade-at rule amended ASIC's Market Integrity Rules of (ASIC) and became effective on 26 May 2013. The amended rule required trades below block size and exempt from pre-trade transparency requirements to provide one full tick of price improvement. Executions at mid point are allowed (CentrePoint). Australia restricted internalization by requiring significant price improvement limiting impact on price discovery. In Canada, a trade at rule has also been implemented in 2012. As a result dark fragmentation has not gone as far as in USA and Europe. As shown in Chart 2, dark trading accounts for 51% in Australia and 40% in Canada.

Unlike USA and Europe, in Australia, where internalization is restricted, quoted bid ask spreads on the lit markets reported by the Australian regulator ASIC declined 26% in the last decade, as shown in Chart

⁷¹ MiFID: DIRECTIVE 2004/39/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 April 2004 on markets in financial instruments amending Council Directives 85/611/EEC and 93/6/EEC and Directive 2000/12/EC of the European Parliament and of the Council and repealing Council Directive 93/22/EEC

⁷² Delegated Regulation (EU) 2017/58, Article 10

⁷³ Regulation (EU) of the European Parliament and of the Council of amending Regulation (EU) No 600/2014 as regards enhancing data transparency, removing obstacles to the emergence of consolidated tapes, optimising the trading obligations and prohibiting receiving payments for forwarding client orders

⁷⁴ See ESMA TRV Report 2, 2024, Statistical Annex and previous editions of the semiannual ESMA TRV Reports for the period depicted.

⁷⁵ See CBOE European equities market share and Federation of European Stock Exchanges (FESE).

⁷⁶ Frank Raillion of AMF, growing importance of the closing auction in share trading, 2019

7.⁷⁷ Similarly, in Canada, the introduction of restrictions on internalization increased displayed liquidity. Comerton-Forde and Malinova (2016) examined the introduction of a price improvement rule that has imposed restrictions on dark trading in the Canadian equity market. The rule eliminated intermediation of retail orders in the dark and shifted retail orders onto the lit market with the lowest fee. Intermediaries shifted liquidity supply to this market leading to increased displayed liquidity. The study finds that the fraction of retail volume on the displayed market doubled to 30% after the rule from 15% before it became effective. Simultaneously, the traders that had been acting as market makers in the dark pool increased the provision of liquidity on the lit market. Further, the displayed dollar depth on the lit market experienced a statistically significant increase after the rule change.

Why intermediaries advocate for internalization

Intermediaries in markets that allow internalization seek opportunities to cross their clients' orders to provide a price improvement, comply with the best execution obligation and obtain a trading profit. The gain on providing liquidity services by internalizers and wholesalers is derived from the quoted spread. Retail order flow poses very low risk to liquidity providers in terms of market impact of trades. Hence, intermediaries advocate for segmentation and internalization of retail order flow.

What is a compromise between market makers and brokers?

With higher adverse selection cost on exchange, market makers refrain from providing displayed liquidity. As shown on Chart 8, the number of market makers on the Nasdaq dropped in the decade following decimalization in April 2001 as bid ask spreads shrank. From 2010, however, market makers continued to depart from the exchange even when spreads increased. Now there are 70 market makers on the Nasdaq, down from 170 in 2010.⁷⁸ Certain market makers do not provide liquidity in markets with internalization.

How do regulators approach internalization in other jurisdictions?

Regulators in markets where internalization is allowed have adopted different frameworks regarding a) best execution rules, b) payment for order flow and c) dark pools.

a. What are the best execution rules in jurisdictions where internalization is allowed?

⁷⁷ ASIC June 2024 Equity Market Statistics. In Australia, ASX auctions represent 24.7% of the consolidated market volume. This compares with 36.6% of ASX on order book and 9.6% CBOE on order book

⁷⁸ Nasdaq

We review best execution rules in Australia, Canada, USA and the European Union. As explained below, obligations differ in aspects such as the best execution principle, protected quotes and the possibility of trade throughs, and the need for trading venues to be interlinked in compliance with the BestEx rules. A summary of main characteristics is depicted on Table 2.

Australia:

In Australia, the best execution criteria differ for retail and institutional clients. For retail clients, best execution of (non-directed) orders means best total consideration, which participants may interpret as best price plus/minus transaction costs.⁷⁹ Transaction costs include execution, clearing and settlement fees, broker's commissions⁸⁰. It might also include implicit opportunity costs resulting from differences in speed, likelihood of execution or liquidity, as well as market impact.⁸¹ However, ASIC considers as guideline for best execution that the *"best price will be simpler for market participants to fulfill and simpler for retail clients to monitor."*⁸²

For institutional (or "wholesale") clients, a wide range of factors may be relevant. Beyond prices and explicit costs, transaction costs may include implicit factors including impact, speed, and certainty in execution. In extension, the list of factors that a market participant will look at includes price, execution fees and rebates, clearing and settlement fees, membership fees, connectivity fees, software costs, market impact, speed of execution, fill rates, liquidity and volume.⁸³

A market participant must document and disclose policies and procedures for complying with its best execution obligations.⁸⁴ Small orders in liquid products may be suited to an automated, high-volume process and not order by order. For those orders, the participant could program a smart order router with specific parameters and decision rules. In contrast, large orders in some products may require a case-by-case assessment. Participants must identify the order books and matching mechanisms it uses and disclose how the best execution obligation affects the handling and execution of client orders.⁸⁵ Further, participants may specify under which conditions an order would be internalized.⁸⁶

Canada:

In Canada, best execution must address broad factors including price, speed, certainty of execution and the overall cost of the transaction.⁸⁷ The overall cost of the transaction includes trading fees, any fees charged between dealers to provide trading access and settlement costs. Further, more specific

⁷⁹ ASIC RG 265: Guidance on ASIC market integrity rules for participants of securities markets Paragraph 135

⁸⁰ RG 265.136

⁸¹ RG 265.137

⁸² RG 265.140

⁸³ RG 265.150

⁸⁴ RG 265.195 to 199

⁸⁵ RG265.183, 184 and 185

⁸⁶ RG 265.183

⁸⁷ IIROC Rule 3100 Part C - *Best Execution of Client Orders*

elements such as order size, reliability of quotes, liquidity, market impact and opportunity cost may also be considered; dealers are expected to include all material considerations.⁸⁸ Client orders must not be sent in bulk to a foreign intermediary without considering other liquidity sources within Canada. Dealers should ensure that they comply with section 6.7 of the Trading Rules and that the condition in subsection (3) of UMIR 6.4 is satisfied prior to executing on a foreign organized regulated market.⁸⁹

But best execution of a client order for a listed security is subject to compliance with the Order Protection Rule under Part 6 of the Trading Rules by either the Marketplace on which the order is entered, or the Dealer Member, if the Dealer Member has marked the order as a directed-action order in accordance with Universal Market Integrity Rule 6.2.⁹⁰ The Order Protection Rule defined in National Instrument 23-101 requires marketplaces to prevent trade-throughs.⁹¹ Limit orders at a better price must be filled before orders with inferior prices, regardless of the marketplace where the order is entered. But dealers can circumvent the order protection rule by exploiting Directed Action Orders (DAO), a type of order that admits trade-through. DAO orders trade or book without any attempt to protect better-priced orders on away markets. Under National Instrument 23-101 Rule 6.4.(1) responsibility to prevent trade-throughs for orders considered DAO is assumed by the participant.

Dealers must provide order handling disclosures explaining the factors they consider to achieve best execution, describing how they route orders throughout the day and after hours and what rules would the smart order router (SOR) follow. Dealers need to identify the marketplaces and types of intermediaries to which they might route orders for handling or execution. They also need to clarify whether marketplace trading fees and/or rebates are passed on to clients.⁹²

Europe:

In Europe, MiFID requires investment firms to seek to obtain the best possible result for their clients, taking into account price, costs, speed, likelihood of execution and settlement, size, nature and other.⁹³ Investment firms need to define a clear policy on best execution. The policy should identify the key steps in the procedure how they enable the firm to obtain the best possible result. The policy should also the weight of key factors in best execution, the venues that the investments firm accesses and other intermediaries that it uses. The obligation is not to obtain the best possible result for each individual order but in accordance with the policy.⁹⁴

⁸⁸ Guidance on Best Execution, December 31, 2021

⁸⁹ IIROC Rule 3100 Part C - *Best Execution of Client*

⁹⁰ IIROC Rule 3100 Part C - *Best Execution of Client Orders* - 3128

⁹¹ National Instrument 23-101, Rule 6.1.(1)

⁹² IIROC Rule 3100 Part C - *Best Execution of Client* and Guidance on Best Execution, December 31, 2021

⁹³ MiFID Article 21. DIRECTIVE 2004/39/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 April 2004 on markets in financial instruments amending Council Directives 85/611/EEC and 93/6/EEC and Directive 2000/12/EC of the European Parliament and of the Council and repealing Council Directive 93/22/EEC

⁹⁴ Ibid.

The best execution arrangement may vary depending of the type of client (professional and non-professional) and the asset class. Investment firms comply with best execution for both professional and retail by following a total consideration criterion. But the particular arrangement and the weight of each factor do depend on the type of client and asset class. Total consideration is the price of the financial instrument and the costs related to execution, and may include transaction *“fees, speed, likelihood of execution and settlement, the size and nature of the order, market impact and any other implicit transaction costs.”*⁹⁵

USA:

In USA, FINRA’s Rule 5320 prohibits trading ahead of customer orders.⁹⁶ Rule 5310 requires broker-dealers to “ascertain the best market” for the customer’s order so that the resultant price is as favorable as possible. Among the factors considered are⁹⁷:

- (A) the character of the market for the security including volatility and liquidity
- (B) the size and type of transaction;
- (C) the number of markets checked;
- (D) accessibility of the quotation; and
- (E) the terms and conditions of the order which result in the transaction.

A broker-dealer that routes customer orders for execution as well as one that internalizes the flow, must conduct, on a quarterly basis, rigorous reviews of the quality of the executions if it does not conduct an order-by-order review. The review must be conducted on a security-by-security and type-of-order basis. A broker-dealer should consider the following factors⁹⁸:

- (1) price improvement opportunities or differences in price dis-improvement
- (2) the likelihood of execution of limit orders;
- (3) the speed of execution;
- (4) the size of execution;
- (5) transaction costs;
- (6) customer needs and expectations; and
- (7) the existence of internalization or payment for order flow arrangements.

But FINRA’s **best execution is subject to SEC Rule 611 on Order Protection**.⁹⁹ SEC Rule 611, or Order Protection Rule (OPR) or “Trade-through Rule”, requires inter-market price protection by restricting “trade-throughs” – the execution of trades on one venue at prices that are inferior to publicly displayed quotations on another venue. Venues or “Trading Centers”, including exchanges, ATSS, off-exchange market makers, and internalizers need cannot match the order internally and need to route it away to

⁹⁵ CESR/07-320 Best Execution under MiFID, Questions and Answers, May 2007

⁹⁶ FINRA Rule 5320

⁹⁷ FINRA Rule 5310

⁹⁸ Ibid.

⁹⁹ SEC Rule 611 of Regulation NMS

the venue with the protected quote. To be protected, the quotation must be the best bid or best offer of a national securities exchange or association, be immediately and automatically executable and be disseminated in the consolidated market data feeds.¹⁰⁰ Price priority is required but time priority is not across venues. Venues are free to execute trades at prices that are equal to or better than a protected quotation regardless of the time the limit orders were entered on each venue. Exceptions to the order protection rules include the so called Inter-market Sweep Orders (ISOs), which execute against the full size of all protected quotations with prices better than the price of the ISO. Other exceptions are self-help markets when the other markets experience technical problems, crossed markets, VWAP orders, and single-priced openings, reopenings, and closings. Finally investor can choose not to display an order, and such orders must be executed at the best displayed prices or better.¹⁰¹

b. Payment for Order Flow

i. Views of different regulators on the topic

Regulators in Australia, Canada, Europe, USA and Mexico expressed concern that payment for order flow (PFOF) may create a conflict of interests that negatively affects the quality of execution. Regulators' concerns is supported by several pieces of evidence, as described below. As an example, SEC Chairman Gary Gensler testified in US Congress asking himself, rhetorically, whether brokers dealers have inherent conflicts of interest and whether customers are getting best execution in the conflict of that conflict.¹⁰² Gensler immediately after referred to a case involving retail broker dealer Robinhood, where *"customers shouldered the costs of inferior executions; these costs might have exceeded any savings they might have thought they'd gotten from a zero commission."*¹⁰³

In December 2020, Robinhood agreed to pay the SEC a \$65 million penalty to settle charges for failing to satisfy its duty of best execution. As described in the SEC's order, in the course of negotiations between Robinhood and principal trading firms back in May 2016, certain principal trading firms told them that there was a tradeoff between payment for order flow and price improvement for customers: *"if Robinhood negotiated for higher payment for order flow revenue, according to the principal trading firms, there would be less money available for the principal trading firms to provide price improvement to Robinhood's customers."*¹⁰⁴ Further, one principal trading firm told Robinhood that retail broker dealers usually *"receive four times as much price improvement for customers than they do payment for order flow for themselves—an 80/20 split of the value between price improvement and payment for order flow."* Under such a scenario, Robinhood explicitly offered to accept less price improvement for its customers in exchange for receiving higher payment for order flow for itself. As a result, Robinhood negotiated a payment for order flow rate which resulted in approximately a 20/80 split of the value

¹⁰⁰ Memorandum to SEC Market Structure Advisory Committee from SEC Division of Trading and Markets on Rule 611 of Regulation NMS, April 30, 2015

¹⁰¹ Ibid.

¹⁰² Testimony of Gary Gensler Chair, Securities and Exchange Commission Before the House Committee on Financial Services May 6, 2021.

¹⁰³ Ibid.

¹⁰⁴ SEC Release No. 90694, December 17, 2020, ADMINISTRATIVE PROCEEDING, File No. 3-20171, in the Matter of ROBINHOOD FINANCIAL, LLC, Respondent.

between price improvement and PFOF.¹⁰⁵ As a result Robinhood's customers received inferior execution prices compared to what they would have received from Robinhood's competitors. Independent research confirmed execution was inferior on Robinhood compared to competing retail brokers, and this is related to the larger payment for order flow that it received.¹⁰⁶ For larger value orders, the SEC found that the price difference at Robinhood, negative for investors, exceeded the commission its competitors would have charged.¹⁰⁷

In Europe, ESMA warned investment firms that the receipt of PFOF raises significant investor protection concerns and may not be compatible with MiFID II obligations. ESMA called on National Competent Authorities (NCAs) to dive into the conflicts of interest arising from payment for order flow.¹⁰⁸ As a response, the Dutch Authority for the Financial Markets (AFM) conducted a study that looked into the execution quality of two PFOF trading venues and one non-PFOF trading venue used by pan-European operating low-cost neo-brokers. The AFM study compared the execution quality on those venues with that of liquid reference markets, such as exchanges. The results show that 70% and 82% of retail client transactions on the two PFOF venues, respectively, are executed at a worse price compared to the most liquid reference markets, with average price deterioration of €1.44 and €3.46 per transaction, respectively. In comparison, the non-PFOF venue shows that approximately 75% of trades were executed at the same level of reference market.¹⁰⁹

The Spanish capital market regulator CNMV contributed to the debate by conducting a study of the transactions executed in a particular PFOF trading venue on behalf of the clients of a single zero-commission broker that received PFOF.¹¹⁰ The study compared execution quality of the PFOF trading venue with the 10 largest venues excluding other PFOF venues and systematic internalizers. CNMV found that 86.4% of PFOF venue trades were executed at inferior prices compared to the 10 largest markets. Only 3.3% of trades were executed at better prices. Further, the average price deterioration was €1.09 per trade, including all trades, both improved and dis-improved. Comparing to the single most liquid trading venue, the PFOF venue showed inferior execution for 85.9% of the trades.

The German regulator BaFin conducted another study to analyze the quality of execution on German PFOF trading venues Tradegate Exchange, the Lang & Schwarz Exchange, Gettex and Quotrix.¹¹¹ Different from AFM and CNMV, BaFin included transaction fees in the analysis. Overall, 29% of transactions in DAX components and 37% of trades in non-DAX stocks were executed at inferior prices in

¹⁰⁵ Ibid.

¹⁰⁶ Lynch, Bradford, Price Improvement and Payment for Order Flow: Evidence from A Randomized Controlled Trial (June 27, 2022). Jacobs Levy Equity Management Center for Quantitative Financial Research Paper, Available at SSRN: <https://ssrn.com/abstract=4189658> or <http://dx.doi.org/10.2139/ssrn.4189658>

¹⁰⁷ SEC Release No. 90694, December 17, 2020, ADMINISTRATIVE PROCEEDING, File No. 3-20171, in the Matter of ROBINHOOD FINANCIAL, LLC, Respondent.

¹⁰⁸ ESMA warns firms and investors about risks arising from payment for order flow and from certain practices by 'zero-commission brokers', 2021.

¹⁰⁹ AFM, Assessing the quality of executions on trading venues, The "Comparative Pricing Model" March 2022 (version 2)

¹¹⁰ CNMV Payment for order flow: an analysis of the quality of execution of a zero-commission broker on Spanish stocks Policy and International Affairs Directorate General

¹¹¹ BaFin, Study into execution quality on selected German trading platforms, Securities Supervision Data Analysis Unit, Apr2022

the PFOF venues. This compares with 24% of transaction executed at better prices, both for DAX and non-DAX securities. For the average trade sizes, and for large trade sizes, execution is inferior on PFOF venues. But for small trades, of less than EUR 2,000, the proportion of trades with superior execution in DAX components was 28% compared to 19% of trades with price dis-improvement. Hence for small orders retail clients achieve better overall results on PFOF markets than on the reference markets. The difference reflects transaction fees on the reference markets, including minimum fees for order execution.¹¹²

Beyond conflicts of interest affecting best execution, regulators also expressed concerns about payment for order flow a) facilitating concentration in a small number of intermediaries and b) creating information asymmetries. SEC Chairman Gary Gensler has testified in Congress that *“payment for order flow has also led to increasing market concentration, which we have found, and history and economics show, can lead to fragility in markets, deter healthy competition, and limit innovation.”*¹¹³ Further, Gensler is concerned about information asymmetries arising from concentration in a small number of wholesalers. Gensler considers that *“wholesalers get valuable information from this order flow that other market participants get with a delay, if at all. In many aspects of the economy, from social media to search engines, access to data is a growing competitive advantage.”*¹¹⁴

Based on evidence, regulators in Europe, Canada, UK and Australia have banned payment for order flow. The European Union has recently banned payment for order flow starting in 2024, when MIFIR became effective. PFOF will be completely phased out by June 2026.¹¹⁵ Amended Article 39.a of Regulation (EU) No 600/2014 reads: *“Investment firms acting on behalf of (...) clients shall not receive any fee or commission or non-monetary benefits from any third party for executing order.”*¹¹⁶ Similarly, in Canada¹¹⁷ and the UK¹¹⁸, brokers are not allowed to route retail orders to off-exchange market makers in return for payments.

In Australia, payment for order flow, and even exchange rebates, are prohibited. Article 5.4B.1 of ASIC Market Integrity Rules explicitly bans payment for order flow.¹¹⁹ ASIC banned payment for order flow on concerns that it poses serious conflicts of interest in the best execution obligation by market participants. ASIC is also concerned that PFOF incentivizes *“gamification”* of investing. Further, ASIC

¹¹² Ibid.

¹¹³ Testimony of Gary Gensler Chair, Securities and Exchange Commission Before the House Committee on Financial Services May 6, 2021.

¹¹⁴ Ibid.

¹¹⁵ Regulation (EU) of the European Parliament and of the Council of amending Regulation (EU) No 600/2014 as regards enhancing data transparency, removing obstacles to the emergence of consolidated tapes, optimizing the trading obligations and prohibiting receiving payments for forwarding client orders.

¹¹⁶ Ibid.

¹¹⁷ Joint CSA/IIROC Consultation Paper 23-406, “Internalization within the Canadian Equity Market” at 8 (March 12, 2019).

¹¹⁸ CFA Institute, “Payment for Order Flow in the United Kingdom” (2016)

¹¹⁹ ASIC Market Integrity Rules (2017)

notes that it can divert order flow from lit markets, increasing adverse selection costs and concentrating the order flow in a few wholesalers.¹²⁰

The SEC, chaired by Gary Gensler, has not yet imposed an outright ban on payment for order flow. But it has proposed a mechanism to bring more competition to retail order execution to tackle concentration in a very small number of large wholesalers. In December 2022, the SEC proposed a rule that would require certain orders of individual investors to be exposed to competition in open auctions before such orders could be executed internally by any trading center that restricts order-by-order competition.¹²¹

ii. Pros and Cons of payment for order flow

The main advantage of payment for order flow seems to be that it enables zero commission trading which in turn promotes investing in capital markets among retail clients. Concerns are raised that this comes at the expense of:

- Conflicts of interest in execution leading to lower execution quality
- Concentration of trading in a very small number of large wholesalers
- Information asymmetries that are created, with large wholesalers obtaining an information advantage

c. Dark pools

We review the cases dark pools in USA and Canada, dark and mid-point matching in Australia, and Systematic Internalizers in the European Union. In USA, large broker-dealers may use their affiliated (Automated Trading Systems) ATS to internalize order flow. Most ATSs admit trading by affiliate broker-dealers. Most of them would trade against other brokers and institutional clients as participants. Seven ATSs match retail order flow as well. Dark pools owned by large banks and broker dealers, where affiliated entities provide liquidity, represent an opportunity to profitably internalize their customer's order flow and possibly obtain a price improvement for their clients.¹²²

But this comes at the expense of a higher latency in execution and relatively lower fills rates, with higher opportunity costs. In many cases, the dealer's SOR sends orders by default to the affiliated ATS, attempting to get a least a partial execution there, based on indications of interest (IOI) of conditional orders that are exclusively sent to the SOR. Conditional orders are a distinct feature of dark pools and, as shown in the summary table, available on most ATSs. When the SOR identifies a customer's contra-order for a conditional order resting in the system, a message is sent to the participant that had introduced the conditional order asking to either firm-up or reject the order. The participant with the

¹²⁰ ASIC CONSULTATION PAPER 347: Proposed amendments to the prohibition on order incentives in the ASIC market integrity rules

¹²¹ SEC 17 CFR Parts 240 and 242 [Release No. 34-96495; File No. S7-31-22] RIN 3235-AM57 Order Competition Rule

¹²² SEC Forms ATS-N Disclosures of US ATSs

conditional order typically has up to 100 milliseconds to respond. In the case a portion or all of the customer's order is not executed, the unfilled portion would be either cancelled or routed away.

In USA, around and after Regulation NMS, lit ATS also known as Electronic Communication Networks (ECN) became exchanges or part of exchanges. Among examples we can mention Archipelago (ARCA, now an exchange part of ICE), Instinet (INET, now part of Nasdaq), Brut (now part of Nasdaq), Supermontage (now part of Nasdaq), BATS (now exchanges part of CBOE) and Direct Edge (exchanges part of CBOE). These are multilateral platforms not used for internalization.

Dark pools remained as ATS. There are 30 active equity ATSs in USA, most of them are dark pools where the orders are typically not displayed. Some dark pools send aggregate indications of interest (IOI) to a Smart Order Router (SOR) and only a few send them to a selected group of participants. Five ATSs are used as block execution facilities: Liquidnet Negotiation, Liquidnet H2O, Instinet Blockcross, Dealerweb and Luminex. Their combined market share of NMS consolidated is 0.4%. BIDS ATS is a hybrid ATS that executes both small sizes and blocks, with average trade size. Its market share of consolidated is 0.3%. Then the average trade size on most other ATSs, which are the most liquid ones with higher volumes is less than two round lots. The collective market share of ATSs with average trade sizes below 400 shares is 11%.¹²³ Table 3 summarizes the main operational characteristics of ATS in USA.

US ATS Liquidnet and Instinet operate in Canada along with CBOE Match Now, Neo-L, and Alpha DRK, among others. But dark volume market share of consolidated in Canada is 4.5% of shares traded and 6.6% of value traded, smaller than in USA. By virtue of UMIR 6.6¹²⁴, "Provision of Price Improvement by a Dark Order", orders must receive price improvement to execute against a resting dark order, unless certain size requirements are met, in which case they are eligible to execute against a dark order without price improvement. On February 4, 2020, the minimum size requirement was set at 51 round lots and greater than \$30,000 notional value, or greater than \$100,000 notional value.

Similarly, in Australia, regulations require a full tick price improvement or execution at midpoint for an order to be executed off exchange, as for example in a dark pool. Therefore, opportunities for participants to internalize order flow are limited, and brokers' dark pools just account for 3% of consolidated value.¹²⁵ In comparison, ASX CentrePoint, a successful dark matching facility run by the incumbent exchange, currently holds 7% of consolidated market share in Australia¹²⁶. Non-displayed liquidity is matched at the mid-point or other permitted price step inside the NBBO. Sweep orders on CentrePoint interact with ASX order book, maximizing liquidity and fill rates. Further, Centre Point Preferencing allows brokers to maximize their internalization opportunities, or "crossings", regardless of the order's position in the queue.¹²⁷

¹²³ FINRA ATS Quarterly NMS volume

¹²⁴ IROC Universal Market Integrity Rules (UMIR)

¹²⁵ The Trade, A Deep Dive into Public Dark Pool Trading in Australia June 14, 2021

¹²⁶ ASIC "Equity Market Data for quarter ending June 2024"

¹²⁷ ASX CentrePoint Brochure

In Europe, under MiFID, Systematic Internalizers (SIs) must continually post, displayed, immediately executable quotes of a certain size (SMS). This way of continually streaming displayed quotes differs from dark pools in USA, Australia and Canada. Article 10 of RTS 1 as amended, reads *“The prices published by a systematic internalizer shall reflect prevailing market conditions where they are close in price, at the time of publication, to quotes of equivalent sizes for the same financial instrument on the most relevant market in terms of liquidity as determined in accordance with Article 4 for that financial instrument”*¹²⁸. Systematic Internalizers’ share of consolidated market is around 9%¹²⁹. It has declined over the last years as EU imposed minimum tick increments and banned payment for order flow.¹³⁰

What is the trend in these jurisdictions? Can regulation mitigate its negative effects?

Where implemented without significant restrictions, internalization has created an environment prone to abuse. Just as one of many aspects where internalizers actually incur in abuse is related to conflicts of interest arising from payment for order flow and was explained above. Another aspect is related to order handling and best execution. Several US broker-dealers in the USA were fined in recent years for not complying with best execution rules. Among firms being fined for violating best execution rules and committing other wrongdoing we can mention large broker-dealers like Interactive Brokers, Barclays, Deutsche Bank, Robinhood, Citadel, E*Trade and Virtu, among others. Below we describe each case, together with other examples of wrongdoing.

In December 2023, FINRA fined Interactive Brokers LLC \$3.5 million for failing to meet reasonable due diligence standard mentioned in Rule 5310 and the regular and rigorous review required under Rule 5310.09.¹³¹ FINRA found that reviews of customer execution quality were ad hoc, no adequately documented and did not consistently include all relevant execution quality factors or regularly assess competing venues. In addition, the firm failed to conduct reasonable reviews for price improvement opportunities. When IBKR’s own ATS and two other market centers disseminated price indication of interest (IOIs) at least \$0.01 better than the NBBO, the firm routed its customer marketable orders to those venues before routing to venues that did not disseminate IOIs without evaluating the likelihood of obtaining greater price improvement from non IOI venues. Also, the firm failed to review the impact that its routing to two broker dealers that traded on a net basis had on its customers’ execution quality. Procedures to review and comply with best execution were not well documented. Further, IBKR Rule 606 report did not disclose per share or per order amounts of rebates received from exchanges.¹³² IBKR settled with FINRA and agreed to pay \$3.5 million without admitting or denying the charges.

¹²⁸ Final Report Amendments to Commission Delegated Regulation (EU) 2017/587 (RTS 1)

¹²⁹ CBOE European Equities Market Share By Market tool, month-to-date value, as of August 15, 2024.

¹³⁰ AMF, QUANTIFYING SYSTEMATIC INTERNALISERS’ ACTIVITY: THEIR SHARE IN THE EQUITY MARKET STRUCTURE AND ROLE IN THE PRICE DISCOVERY PROCESS, IRIS LUCAS, MAY 2020

¹³¹ FINRA BrokerCheck Document on Interactive Brokers LLC. 2024

¹³² Ibid.

In October 2022, FINRA fined Barclays Capital Inc. \$2 million for failing to comply with its best execution obligations in connection with its customers' electronic equity orders.¹³³ From January 2014 through February 2019, Barclays Capital owned and operated an ATS known as LX. Barclays Capital routed all its customers' marketable orders to LX, prior to routing to any competing venue. Barclays failed to conduct reasonable reviews of execution quality for its customers' orders. The firm did not review price improvement data and speed of execution for orders routed to LX. Further, Barclays's LX own data showed inferior fill rates of marketable orders than some competing venues for every quarter from 2015 to 1Q19. In addition, the supervisory and compliance system failed to provide reasonable guidance on the factors and review procedures related to best execution. Barclays Capital settled with FINRA and agreed to pay \$2 million without admitting or denying the charges.

In March 2022, FINRA fined Deutsche Bank Securities, Inc. \$2 Million for violating provisions of Rule 5310 on Best Execution.¹³⁴ The firm SOR routed its customer's marketable orders to its subsidiary ATS SuperX before routing any part of the order to an exchange. The default routing preference known as the "SuperX ping" inherently delayed orders that were not fully filled. Deutsche Bank Securities did not modify its routing arrangement despite its best execution committee being aware of lower fill rates in SuperX. In addition, the firm did not reasonably consider how price improvement for SuperX ping orders compared to price improvement opportunities for orders routed directly to exchanges. Further, Deutsche Bank Securities routed more orders to SuperX than any other dark pool without considering alternative, best performing routing arrangements. Finally, the firm's supervisory system was not reasonably designed to achieve compliance with its best execution obligation. Deutsche Bank Securities settled with FINRA and agreed to pay \$2 million without admitting or denying the charges.

In December 2020, the SEC fined Robinhood \$65 million for misrepresenting execution quality and omitting that it received Payment for Order Flow (PFOF).¹³⁵ From 2015 through September 2018, certain of Robinhood's retail communications omitted its receipt of payment for order flow. Robinhood also instructed its customer service representatives not to mention payment for order flow in responding to questions about Robinhood's sources of revenue. Further, although Robinhood was on notice that its high payment for order flow rates could lead to less price improvement, the Best Execution Committee did not conduct adequate regular and rigorous reviews to ensure that Robinhood was satisfying its best execution obligations.

In December 2019, FINRA fined Robinhood \$1.25 million for violating best execution rules.¹³⁶ FINRA found Robinhood's review of customer executions did not meet the reasonable diligence standard required by the best execution rule and factors including opportunities for price improvement and speed of execution were not met. Further, Robinhood did not reasonably supervise for best execution. Robinhood agreed to pay the penalty without admitting or denying the charges.

¹³³ FINRA LETTER OF ACCEPTANCE, WAIVER, AND CONSENT NO. 2014041808601

¹³⁴ FINRA LETTER OF ACCEPTANCE, WAIVER, AND CONSENT NO. 2014041813501

¹³⁵ SEC Release No. 90694 / December 17, 2020 ADMINISTRATIVE PROCEEDING File No. 3-20171

¹³⁶ FINRA LETTER OF ACCEPTANCE, WAIVER, AND CONSENT NO. 2017056224001

In January 2017, SEC fined Citadel \$23 million for not seeking best execution for customer orders by intentionally exploiting difference in prices due to differential latency between the SIP's NBBO and the exchanges proprietary data feeds. The SIP NBBO at a given point in time will sometimes differ from the best quotes constructed from one or more of the depth of book feeds. The SIP NBBO may differ from the best prices determined from gathering a set of book feeds as market data in the depth of book feeds is received sooner by market participants and includes odd lots. There could be arbitrage in what the best price is. For example, the FastFill strategy was triggered when the best price from one or more of the depth of book feeds that FastFill referenced was better than the best price disseminated by the SIP feed. FastFill immediately internalized a marketable order at the SIP NBB or NBO, as applicable, or better.¹³⁷

In June 2016, FINRA fined E*Trade Securities LLC \$0.9 million for failing to adequately review the quality of execution of its customers' orders and for supervisory deficiencies concerning the protection of customer order information. FINRA found that E*Trade's Best Execution Committee lacked accurate information to assess the quality of the execution. The firm's Best Execution Committee also failed to take into account internalized order flow sent to its affiliated broker-dealer market maker G1 Execution Services (G1X). In addition, E*Trade regularly accepted requests from G1X to change prioritization in E*Trade's order routing system and to redirect certain order flow, without determining whether these changes would improve the quality of execution received by its customers. Also, it failed to adequately consider the actual execution quality provided by the market centers to which it routed orders. E*Trade neither admitted nor denied the charges but agreed to settle with FINRA for \$0.9 million.¹³⁸

In Canada, in July 2019, Caldwell Investment Management Ltd. agreed to pay CAD 1.8 million plus a further CAD 0.25 million to settle charges by the Ontario Securities Commission (OSC) for failing to comply with the best execution obligation.¹³⁹ From January 2013 to November 15, 2016, Caldwell failed to provide best execution of equity and bond trades for its clients by directing most of its client trades through Caldwell Securities Ltd. (CSL), its own related investment dealer, when in many cases unaffiliated dealers offered better commission rates and bond spreads. CIM also admitted that it had inadequate policies and procedures relating to best execution.

Violation of best execution rules is not the only source of abuse by internalizers. For example, in the E*Trade case, the firm failed to prevent use of customer trading information. Similarly, in 2024, the SEC is suing Virtu Financial for failing to prevent misuse of material non-public information and misleading customers.¹⁴⁰ And in January 2024, the SEC, along with the US Department of Justice (DoJ), charged Morgan Stanley \$249 million for disclosing confidential information about block trades and failing to

¹³⁷ SEC Release No. 79790 / January 13, 2017 ADMINISTRATIVE PROCEEDING File No. 3-17772

¹³⁸ FINRA News Release: FINRA Fines E*Trade Securities LLC \$900,000 for Supervisory Violations Related to Best Execution and Protection of Customer Order Information June 02, 2016 | FINRA.org

¹³⁹ Sections 127 and 127.1 of the Securities Act, RSO 1990, c S.5. IN THE MATTER OF CALDWELL INVESTMENT MANAGEMENT LTD. ORAL REASONS FOR APPROVAL OF A SETTLEMENT. Caldwell Investment Management Ltd. (Re), 2019 ONSC 25 Date: 2019-07-19

¹⁴⁰ SEC Charges Virtu for False and Misleading Disclosures Relating to Information Barriers, SEC press release 2023-176. 09/12/2023

enforce its policies on the matter.¹⁴¹ Head and senior members of Morgan Stanley's Syndicate Desk used to disclose confidential information on block trades under negotiation to buy-side investors who immediately after entered into a significant short position in the stock that was the subject of the upcoming block trade, with significant negative impact in the stock price. Other investment banks and hedge funds were also investigated.¹⁴²

Further, in other cases, client's information has been used for front-running. For example in 2009, the SEC fined 14 options specialists for trading ahead of customers and interposing.¹⁴³

In other cases, regulators found broker dealers misstated, misrepresented and omitted information on order handling and risk. For example, in 2021, FINRA fined Robinhood \$57 million and order \$12.6m plus interest in restitution to affected customers for negligently communicating false and misleading information to customers and other rule violations.

Regulators conduct permanent surveillance on the market and need to analyze each broker-dealers' best execution and order routing policies. It needs to overview if "reasonable steps" are followed to comply with best execution. As such, it needs to analyze governance, procedures and practices of each broker-dealer, and assess the quality of executions in all marketplaces. It needs to independently replay much of what the broker dealers are obliged to perform themselves. For example, in the penalties imposed by FINRA to Interactive Brokers, Barclays, Deutsche Bank and Robinhood related to failures in compliance with the best execution obligation, the regulatory organization reviewed internal processes, internal and external communications, and the quality of executions itself comparing to other market alternatives. It then needs to conduct enforcement procedures.

Regulators would need to act in anticipation to prevent rule violations, misconduct and wrongdoing. But at least in the IBKR, Barclays, Deutsche Bank, HOOD, Citadel and E*Trade, cases mentioned in other parts of the analysis, the regulator was not effective in preventing wrongdoing. In fact the regulators usually act after the facts through audits, penalties and sanctions.

What are the resources required for surveillance and enforcement under internalization?

Surveillance of fragmented markets and rules enforcement requires significant resources and capacity. In equity markets comparable in size to that in Brazil, like Australia and Canada, the regulators spend mid-to-high eight figures in overseeing the market. For example, Australian regulator ASIC spends AUD

¹⁴¹ Release No. 99336 / January 12, 2024 ADMINISTRATIVE PROCEEDING File No. 3-21825 in the Matter of Morgan Stanley & Co. LLC

¹⁴² Wall Street Journal, February 14, 2022, *Regulators Probe Block Trading at Morgan Stanley, Goldman, Other Wall Street Firms SEC, Justice Department investigate large share sales, communications between banks, hedge funds.*

¹⁴³ SEC Charges 14 Specialist Firms for Improper Proprietary Trading; 2009-42; March 4, 2009, SEC press release

71 million annually to supervise markets and intermediaries.¹⁴⁴ Table 4 details ASIC’s annual surveillance and related costs. ASIC spends AUD 52.9 million on surveillance and supervision of markets and its participants including indirect costs and other related regulatory activities. ASIC then spends AUD 18.2 in enforcing rules related to markets and intermediaries. Regulatory costs are recovered with levies, fees and penalties it charges market participants and infrastructures. Participants of large securities exchanges pay a minimum levy of AUD 9,000, plus AUD 0.0165 per transaction plus AUD 0.00034 per message.¹⁴⁵ For order book trades, the variable levy represents an average 0.1 bps per side, and is equivalent to 140% of CBOE Australia CLOB execution fees and 60% of ASX CLOB execution fees.¹⁴⁶ In addition, more than a thousand securities dealers pay a minimum AUD 1,000 in levies each plus 0.2337 bps of the transaction turnover. Further, OTC traders and retail derivatives issuers, exchange operators and clearing houses also contribute to finance ASIC surveillance and enforcement activity through levies and fees.¹⁴⁷

In Canada, the self-regulatory organization (SRO) called Investment Industry Organization of Canada (IIROC), spends CAD 64 million per annum supervising dealers and CAD 31 million in market surveillance. Table 5 summarizes IIROC annual surveillance and related costs. Market surveillance includes the cost of the SMARTS surveillance system, licensed from Nasdaq as technology provider.¹⁴⁸ On top of IIROC expenditures, the securities market regulators in Canada perform rules enforcement functions spends an aggregate and have their own budget. For example, the Ontario Securities Commission (OSC) spends CAD 167 million in total.¹⁴⁹

In USA, FINRA spends \$1.5bn per annum in total. Table 6 shows FINRA annual costs. In supervising intermediaries FINRA spends \$556.5 million. In markets regulation and surveillance, FINRA spends \$181 million annually, the majority of it related to equity markets. In enforcing rules and dispute resolution, FINRA spends \$240 million.¹⁵⁰ On top of FINRA costs, the SEC’s division of Trading and Markets spends \$144 million per annum.¹⁵¹ Indirectly, other management cost of the SEC should also be considered. Enforcement and dispute resolution costs are equivalent to 25% of costs. FINRA recovers its costs through fees charged to dealer members. FINRA imposes regulatory fees, user fees and contract services fees. Regulatory fees include a Gross Income Assessment, Personnel Assessment and Trading Activity Fees (TAF). The TAF is a transaction-based fee of 0.000166 per share executed.¹⁵²

To efficiently conduct surveillance of markets, US regulators have commissioned the creation of a consolidated audit trail (CAT). The annual cost to operate the CAT in 2024 is US\$ 216.7 million.¹⁵³ The

¹⁴⁴ ASIC industry funding: Annual dashboard report 2022–23

¹⁴⁵ ASIC “2023-24 CRIS: Summary of ASIC’s 2023-24 regulatory costs and estimated levies for subscribers”, 2023

¹⁴⁶ ASIC Equity Market Data for the quarter ended September 2024

¹⁴⁷ ASIC “2023-24 CRIS: Summary of ASIC’s 2023-24 regulatory costs and estimated levies for subscribers”, 2023

¹⁴⁸ IIROC Annual Report 2021-2022

¹⁴⁹ OSC Annual Report 2024

¹⁵⁰ FINRA 2024 Annual Budget Summary

¹⁵¹ SEC FY 2024 Congressional Budget Justification

¹⁵² FINRA 2024 Annual Budget Summary

¹⁵³ Consolidated Audit Trail, LLC 2024 Financial and Operating Budget - Mid-Year Update - July 2024

one-time cost to develop the Historical CAT amounts to US\$ 313 million.¹⁵⁴ Costs are recovered from the industry through transaction fees per share charged to brokers.¹⁵⁵ FINRA charges 0.000035 per share CAT fee to executing brokers.¹⁵⁶ As comparison, this is equivalent to one third of CBOE net fees for execution.¹⁵⁷ In addition, executing brokers pay 0.000013 per share until covering two thirds of the cost of the Historical CAT, or US\$212 million.¹⁵⁸

What are the additional costs of fragmented markets for participants?

Emerging costs under equity market fragmentation

With fragmentation of equity markets, a tangle of services and needs for participants and the exchange emerge. Under the fiduciary duty of brokers, most of these services represent costs that need to be covered by the market participants. Participants need to invest in technology and processes to connect to multiple marketplaces and comply with best execution obligation. New sources of costs include:

- a. Different market data sources
- b. Market data integration and aggregation
- c. Connectivity to different venues
- d. Smart order routers
- e. Execution algorithms
- f. Pre-trade and post-trade transaction cost analytics
- g. Best execution analytics and tools
- h. Best execution compliance, reporting and auditing
- i. Market surveillance costs passed on to the intermediaries and the investor

We describe each source of costs and provide some examples. The cost examples are provided to illustrate the concept but they may not represent a complete and exact picture of the costs effectively incurred by the market participants and are not scaled to the size of the Brazilian market. Further, such costs are not directly related with internalization but more broadly with fragmentation in general. Internalization is just one of the different ways a market can be fragmented. As a raw approximation, in a cost-benefit analysis, we could allocate new costs arising from fragmentation by the proportion of total volume that is internalized.

a. Market data sources

¹⁵⁴ CBOE Exchange, Consolidated Audit Trail Funding Fees (October 1, 2024)

¹⁵⁵ FINRA Rule 6897. Consolidated Audit Trail Funding Fees

¹⁵⁶ CBOE Exchange, Consolidated Audit Trail Funding Fees (October 1, 2024)

¹⁵⁷ CBOE 2Q24 earnings presentation

¹⁵⁸ CBOE Exchange, Consolidated Audit Trail Funding Fees (October 1, 2024)

To comply with the best execution obligation in fragmented markets, participants need to access data from different markets and sources. Market data costs have risen in competitive markets such as North America and Europe.¹⁵⁹

As a real world example of the market data costs incurred by a large participant in a fragmented market like USA, we recall the case of IEX affiliated broker-dealer. In response to growing concern about the cost of market data and connectivity, IEX revealed detailed its own costs to provide market data, as well as the physical connectivity and logical connectivity functions that are vital for trading on exchanges.¹⁶⁰ To comply with the order protection rule (OPR),¹⁶¹ IEX needs connect to other venues and receive their market data. IEX pays internal distribution fees, professional fees, non-display fees and direct access fees. IEX considers that its data and connectivity costs are representative of what any large broker-dealer would pay: “Because IEX routing broker-dealer affiliate, like other market participants, is a member of the NYSE, Nasdaq, and Cboe exchange families, we pay the same types of fees for market data and connectivity that other participants incur. (...) Many firms will require multiple physical connections, potentially dozens of logical connections, and more expensive market data services due to their size or use in trading strategies or otherwise.”

Based on actual use, IEX pays \$266,472 market data fees per annum to Nasdaq. Table 7 details all market data fees paid by IEX to NASDAQ. These include, for each of three exchanges, namely NASDAQ, NASDAQ BX and NASDAQ PSX, direct access, internal distribution license, non-display platform, non-display access, several professional and corporate licenses, and real time data product administration. Further, IEX pays \$265,200 annually to CBOE for market data. Table 8 details all market data fees paid by IEX to CBOE. These include, for each of the four CBOE exchanges, namely BYX, BZX, EDGX and EDGA, internal distribution license, non-display license for trading platform and several professional licenses. And IEX pays \$478,500 every year to NYSE Group for its market data.¹⁶² Table 9 details all market data fees paid by IEX to NYSE Group. These include, for each of three NYSE Group exchanges, namely NYSE, NYSE ARCA and NYSE American, an access fee, non-display fees for categories agency and matching and several professional user licenses. Overall, IEX affiliated broker dealer pays US\$ 1 million per annum, just in market data, and to just three of several exchange groups.

b. Market data integration and aggregation

In addition to data fees from different markets, participants need to allocate resources into the integration of all data sources. These sources may be of different quality, may come in different formats, and with different latencies. Market data integration, aggregation, and harmonization are costly and

¹⁵⁹ Copenhagen Economics, Pricing of market data, commissioned by the Danish and Swedish Securities Dealers Associations, 28 November 2018.

¹⁶⁰ IEX, The Cost Of Exchange Services Disclosing the Cost of Offering Market Data and Connectivity as a National Securities Exchange, January 2019

¹⁶¹ SEC Regulation NMS, Rule 611, Order Protection Rule. SEC 17 CFR PARTS 200, 201, 230, 240, 242, 249, and 270 [Release No. 34-51808; File No. S7-10-04] REGULATION NMS

¹⁶² IEX, The Cost Of Exchange Services Disclosing the Cost of Offering Market Data and Connectivity as a National Securities Exchange, January 2019

time consuming. In that sense, in markets such as USA, Canada, Mexico and Australia, the exchange provides a consolidated view of market information. For example, BMV consolidates Mexican data for a fee. Table 10 describes BMV's fees for consolidated data. BMV charges US\$3,120 per month for internal redistribution of consolidated trades and US\$4,680 per month for external redistribution. For consolidated best-bid offer in equities and DRs, the exchange charges US\$3,750 per month for internal distribution and US\$5,625 per month for external redistribution. For full depth consolidated feed, BMV charges US\$7,490 per month for internal distribution and US\$11,235 per month for external redistribution. These charges need to be considered besides the competing exchange BIVA's fees.

A single Consolidated Tape (CT) is cost effective and is needed to:

- i. provide investors with a single, comprehensive view of the market
- ii. comply with and effectively enforce the best execution obligation
- iii. mitigate the increase in market data costs derived from the introduction of competition

In USA and Canada, regulators and lawmakers designated the incumbent exchanges as the information processors. In Europe, MIFID II sought to introduce a commercial solution for a consolidated tape, but no provider emerged as intermediaries, including internalizers, don't cooperate. This is because intermediaries thrive on higher searching costs. Hence, EU will next force a Consolidated Tape.

c. Connectivity to different venues

IEX also disclosed the amount of connectivity fees it pays to NASDAQ, NYSE and CBOE. It includes physical connectivity fees, logical connectivity fees like order entry port fees, test port fees, redundant port fees, auxiliary port fees, order entry capacity fees, and market data connectivity fees. As reported under Table 11, every year, IEX pays NASDAQ \$330,833 for physical connectivity and \$91,200 for logical connectivity. Further, Table 12 shows that IEX pays NYSE \$668,333 per annum in physical connectivity fees and \$64,800 for logical connectivity. In addition, IEX pays CBOE \$276,000 annually for physical connectivity and \$158,400 for logical connectivity, as detailed in Table 13. Overall, IEX affiliated broker dealer pays US\$ 1.6 million per annum, just in connectivity, and to just three of several exchange groups.

d. Smart order routers (SOR)

Market participants are required to seek the best possible execution for their clients. This implies submitting client orders to market through an order routing system that maps liquidity and pre-trade transaction costs across market destinations, and selects the alternative, the so-called smart order routers. SORs need to be parameterized and calibrated to achieve best execution under different market conditions. Market participants can build their own tools or can rely on third parties offering software as service SORs for a fixed fee or variable according to volumes.¹⁶³ It can be sold as a separate tool or can be integrated as a key feature of an execution management system (EMS).

¹⁶³ The Trade, review of Fidessa.

Nasdaq provides a smart order router on its workstation in the Nordic Exchanges. Nasdaq charges an additional routing fee of 1.75 bps, which is several times higher than the 0.357bps that the exchange charges as variable for an aggressive execution.¹⁶⁴ Table 14 shows Nasdaq order router fees.

e. Execution algorithms

In fragmented markets, it becomes more difficult to find liquidity. Hence, orders are worked out by traders using different order types and algorithms. Nasdaq offers a suite of algorithms and charges an additional 0.30bps as shown above. This way Nasdaq variable execution fees are virtually doubled.¹⁶⁵ Table 14 shows Nasdaq algorithm fees.

f. Pre- and Post-trade transaction cost analytics

With fragmentation, searching cost increases. Transaction cost analysis, both pre-trade and post-trade becomes increasingly a duty of the market participant. Participants need to grasp post trade cost analytics such as fill rates, effective spreads, slippage, and implementation shortfall. And, before and order, based on pre-trade liquidity measures such as book breadth and depth, and intraday volatility, participants need to anticipate the market impact cost and likely opportunity cost.

An example of transaction cost and best execution analytics is provided by BMV. As shown on Table 15, BMV charges thousand dollars per month for each a market quality report, a spread performance report, a pre trade transparency and pre trade analytics tool.¹⁶⁶ Similar to BMV, the goal for the exchange would be to position its transaction cost analytics and best execution compliance tools to provide to the brokers community. This includes becoming the market data consolidator to position its consolidated view of the market, with a Brazilian BBO.

g. Best execution reporting and tools

European exchanges are required to provide order book and execution analytics. Delegated Regulation (DR) 2017/575 requests for execution venues to publish up to nine reports for each instrument traded on their platform, for each trading day and each market segment. The content required is detailed under Chart 11.

The adopted text of the MiFID II review includes the deletion of the reporting obligation for investment firms set out in Article 27(6) of MiFID II to publish annually information on the identity of execution venues and on the quality of execution. The RTS 28 further specifies the content and format of this information (RTS 28 reports). RTS 28 reports were intended to provide investors with information on the execution quality which investment firms have actually achieved. However, according to Recital 8 of the MiFID II review amending Directive, evidence and feedback from stakeholders shows that RTS28 reports

¹⁶⁴ Nasdaq Nordic Cash Market Fees Schedule 2024

¹⁶⁵ Nasdaq Nordic Cash Market Fees Schedule 2024

¹⁶⁶ BMV information services fees schedule

are hardly read and do not enable investors or other users of those reports to make meaningful comparisons based on the information provided in them. However, investment firms still need to describe its best execution policy in a public report.

In USA, broker dealers, need to disclose its execution and order routing practices under SEC Rules 605 and 606. Rule 605 requires NMS market centers to make available standardized, monthly reports with information about order execution price and speed. Rule 606 requires broker-dealers to publish quarterly reports with details of their routing practices in NMS equities and stock options. Broker dealers must disclose where they routed orders and how much fees it paid or PFOF/rebates it received.¹⁶⁷

Australia and Canada also have best execution disclosure requirements. In Australia, market participants must document and disclose policies and procedures for complying with its best execution obligations.¹⁶⁸ Small orders in liquid products may be suited to an automated, high-volume process and not order by order. For those orders, the participant could program a smart order router with specific parameters and decision rules. In contrast, large orders in some products may require a case-by-case assessment. Participants must identify the order books and matching mechanisms it uses and disclose how the best execution obligation affects the handling and execution of client orders.¹⁶⁹ Further, participants may specify under which conditions an order would be internalized.

In Canada, Dealers must provide order handling disclosures explaining the factors they consider to achieve best execution, describing how they route orders throughout the day and after hours and what rules would the smart order router (SOR) follow. Dealers need to identify the marketplaces and types of intermediaries to which they might route orders for handling or execution. They also need to clarify whether marketplace trading fees and/or rebates are passed on to clients.¹⁷⁰

h. Best execution compliance, reporting and auditing

In USA, broker dealers need to define and publish their best execution policies and disclose how they route orders. Further, they need to create a best execution committee that should meet at least once every quarter to review the best execution quality, the practice and performance indicators. The committee should be integrated by independent members and exchange directors. Best execution and order handling becomes a major duty of the broker dealer along KYC, AML, investor protection and general disclosures. The compliance team might dedicate 10-20% of time of resources to the task. Further, just three penalties imposed by FINRA to Interactive Brokers, Barclays and Deutsche Bank related to failures in compliance with the best execution obligation accounted for 5% of all fines that FINRA imposed to the whole industry and for all matters in the last two years. FINRA oversees 628 thousands registered representatives and 3.3 thousand securities firms.¹⁷¹

¹⁶⁷ SEC Rule 605 and Rule 606.

¹⁶⁸ RG 265.195 to 199

¹⁶⁹ RG265.183, 184 and 185

¹⁷⁰ IROC Rule 3100 Part C - *Best Execution of Client* and Guidance on Best Execution, December 31, 2021

¹⁷¹ FINRA statistics for 2023

i. Market surveillance costs passed on to the intermediaries and the investors

As described under the previous section, fragmented markets result in considerable market surveillance costs that are passed on to the intermediaries and the investors. As shown in Chart 12, and based on comparable markets where the regulator imposes a volume based levy to recover the cost of supervision, like USA, Australia, Spain and Hong Kong, we believe the cost passed on to participants could be 0.28bps per side, or around US\$60 million per annum. This 0.28bps surveillance cost per side would be equivalent to 70% of the Brazilian exchange's average transaction fees, which is around 0.4bps per side.

What would be the impact of internalization on exchange fees?

In many developed markets, the introduction of internalization took place simultaneously with the introduction of competition for execution of different lit order books. In USA, internalization proliferated simultaneously with the emergence of lit electronic communication networks. It is therefore difficult to isolate the impact of internalization on lit market fees, as simultaneously, fees were impacted by competition from other displayed markets.

But unlike the US, in Europe in the early 2000s, the proliferation of internalization was coincidental with a period of concentration and consolidation of lit order book liquidity in national exchanges. Hence, we believe it represents a clearer case to assess the impact of internalization. In 2002, Europe formalized the re-introduction of the internalization of orders by enacting the Investment Service Directive.¹⁷² Exchange fees for lit execution have not declined; on the contrary, in EU fees went up with the re-introduction of internalization. Upon demutualization in the early 2000s, and despite the proliferation of internalization in European markets as competitive force, exchanges started raising prices. A study from the London Investment Banking Association (LIBA), a group of US and European banks based in London, found that since leading European exchanges demutualised to become commercial companies, they have enjoyed a substantial increase in their revenues as trading volumes soared.¹⁷³ At the same time however, these exchanges have also raised fees to customers as shown in Chart 13. The LSE's internal papers and board minutes from the strategic fee review group presented to UK regulators show that from 2000 to 2004, the LSE raised its execution fee by 33%, its maximum fee by 25% and its transaction fee by 50%. In April 2001, the LSE increased its on-order book execution fee from 0.6bps to 0.8bps, its on-order book min fee from £0 to £0.25, its maximum fee from £10 to £12, and its auction fees from 3bps to 8bps. The LSE also introduced an order fee of £0.01 for entering and deleting orders.

¹⁷² INVESTMENT SERVICES DIRECTIVE (2002). DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL ON INVESTMENT SERVICES AND REGULATED MARKETS AND AMENDING COUNCIL DIRECTIVES 85/611/EEC, 93/6/EEC and 2000/12/EC

¹⁷³ Financial News, *Banks expose stock exchanges' price hike*, By Peter Wilson-Smith and Sophie Brodie, Monday November 17, 2003.

Niki Beattie, head of market structure at Merrill Lynch, commented at the 2003 IBC World Stock Exchanges¹⁷⁴ conference "I am not sure how long we can sustain this", referring to the exchanges' raise in fees. As a response, banks decided to turn to regulators to enact rules to stimulate competition for displayed markets as well, in addition to internalization. Banks turned to regulators and to eliminate the "concentration" provisions that required transactions in equity securities to be executed by intermediaries on a regulated market and to introduce competition in lit markets. The Markets in Financial Instruments Directive (MiFID) was enacted in 2004, and became effective on November 1, 2007.¹⁷⁵ MiFID brought competition for display order books. In addition to regulated exchange trading, MiFID provided that trades may be executed on MTFs, or through systematic internalization of the order flow collected by investment firms and banks.

What could be impact of internalization in the Brazilian market?

Comparison of experiences with internalization with the case of Brazil

In Brazil, the stock exchange, along with the efforts of the entire capital markets industry and within the consistent framework provided by the securities regulator CVM, built and maintained significant liquidity. Order flow composition is diverse and includes retail investors, corporations, traditional institutional investors, swap houses, principal trading firms, high frequency traders and institutionalized market makers. Different from the case of USA, in Brazil, the natural order flow is executed on exchange and this attracts liquidity providers, as the adverse selection cost is small. In turn, the market makers attracted by B3 bring significant liquidity and tighten spreads on the exchange. Chart 14 shows the virtuous effect that market makers have on reducing bid ask spreads across the board.

Without unlimited internalization, only with capped RLP, bid-ask spreads compressed from several ticks a decade ago to a very small number of ticks, particularly in liquid securities. While in USA, liquidity providers are discouraged from participating on exchanges, market makers in Brazil, together with HFTs, quote the tightest spreads in the world. Chart 15 shows that the average bid-ask spread for Bovespa Index components is 4bps. This compares to 6 bps for US large caps, 8bps for European STOXX 200 components and 11bps for ASX 200 securities.

There is a risk that, if segmentation goes too far and retail order flow ends up executed almost completely off exchange, as in USA, market makers would refrain from adding liquidity and spreads would widen. It is rather anecdotic, but the CEO of a large US-based trading firm once told ERDesk in private that they prefer "not to make markets where there is internalization." This US-based principal trading firm has been designated as market maker in Brazil in many B3-listed stocks.

¹⁷⁴ Niki Beattie head of market structure at Merrill Lynch appearance at the 2003 IBC World Stock Exchanges

¹⁷⁵ MiFID: DIRECTIVE 2004/39/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 April 2004 on markets in financial instruments amending Council Directives 85/611/EEC and 93/6/EEC and Directive 2000/12/EC of the European Parliament and of the Council and repealing Council Directive 93/22/EEC

On B3, retail trading in cash equities accounted for 13.2% of volumes in the period.¹⁷⁶ If retail volumes posted on exchange virtually disappeared, we should expect the largest portion of market making interacting with that retail order flow to drop as well. Furthermore, with less naturals to interact with and higher bid-ask spreads than currently in Brazil, some foreign institutions may choose to trade the ADR version instead. Hence, one can expect a decline of approximately 25% in total volume as both the retail order flow and its market making and foreign counterparties disappear. Based on the relation between turnover velocity and bid ask spreads, as shown in Chart 16, a decrease of 25% in velocity corresponds to an increase of 60% in quoted spreads. For Bovespa Index components, this implies an increase of 2.5bps in quoted spreads.

What are the risks of expatriation amid its implementation?

In Brazil, transactions costs are lower and decreasing over time. It has been confirmed informally by a large asset manager like Fidelity¹⁷⁷, which prefers to trade ordinary shares in the primary exchange in Brazil (B3) rather than ADRs in USA to interact with the natural investors' flow and lower transaction costs. Transaction cost analysis from Virtu Financial exhibited under Chart 17 and Chart 18 shows slippage cost of institutional orders are consistently lower on B3 than in Brazilian ADRs in USA. Furthermore, lower transaction cost in Brazil in turn led to a repatriation of volumes since 2008. In stock with ADRs, the market share of B3 vs US increased to 69% in 2024 from just 33% in 2008, as shown in Chart 19. If spreads widen in Brazil and transaction costs to all investors increase, there is a risk that this virtuous process of repatriation of volumes could be reversed.

Could benefits surpass costs in Brazil to justify its implementation?

To conclude, we summarize what would be the costs and benefits of internalization in Brazil. As benefits, the retail can obtain a price improvement over best bid and offer¹⁷⁸. This comes at the expense of higher adverse selection costs resulting from cream skinning, lower liquidity, higher quoted spreads and higher transaction costs overall on lit markets, discriminatory access as not all investors can interact with a significant portion of the order flow, exposure to a higher risk of abuse in order execution, free riding of price discovery and higher searching, connectivity, data and surveillance cost.

¹⁷⁶ B3 operational figures, August 2024

¹⁷⁷ Private ERDesk interview with Fidelity portfolio manager in September 2016.

¹⁷⁸ Though, such price improvement would be applied to a worst price compared to the best bid and offer considering all trades happening on lit markets.

Data tables

Table 1: Internalization Models Summary Table:

Internalization Models	USA		Canada	Australia	Europe		Brazil	
Asset class	Equities	Options	Equities	Equities	Equities	Equities	Equities	Equities - Minis
Model	Off-exchange wholesaler	Exchange market maker	Broker Preferencing	Off-book price improvement	Systematic Internalizer (SI)	Best of Books (ENX BoB)	Xetra Retail	Retail Liquidity Provider (RLP)
Internalization conducted under the rules of a marketplace	Conducted off exchange by wholesaler	Internalization conducted under the rules of a marketplace	Internalization conducted under the rules of a marketplace	Internalization conducted under the rules of a marketplace	Conducted off exchange by SI	Conducted under Euronext rules	Conducted under Xetra rules	Conducted under the B3 rules
Payment for Order Flow (PFOF)?	Allowed and widespread	Allowed and widespread	Not allowed for listed securities	Prohibited	Banned in 2023.	To be completely phased out by end of June 2026		Allowed
Customer segmentation	<i>de facto</i>	<i>de facto</i>	<i>de facto</i>	<i>de facto</i>	<i>de facto</i>	By exchange rules design	By exchange rule design	<i>de jure</i>
Order execution	at NBBO or better	within top of book or MM quotes	at top of book or better	1 tick improvement to BBO or midpoint	At BBO or 1 tick improvement	at top of book or better	at top of book or better	At top of book or 1 tick improvement
Priority	No book priority	No book priority	Price / Broker / Time	Need 1 tick PI to jump the queue	No book priority	Price / Time	Price / Broker / Time	Price / Broker / Time
Interaction with order book	None	Depends on exchange model	Linked to order book	Linked to order book	None	Linked to order book	Linked to order book	Linked to order book
Is Price Improvement required to execute off-market?	Optional / Not guaranteed	Optional / Not guaranteed	Not for broker preferencing . Required for dark pools	Required	Optional / Not guaranteed	Optional / Not guaranteed	Optional / Not guaranteed	Optional / Not guaranteed
Minimum size of price improvement	Sub-penny	Sub-penny	Sub-penny but substantial	Full tick or midpoint	Full tick or midpoint	Sub-penny	Sub-penny	Full tick or midpoint
Quantitative restrictions (Maximum%)	None	None	None	None	None	None	None	Restricted to certain max %
Minimum quoted price increment	\$0.01 if share price > \$1	\$0.01	\$0.01 if share price > \$0.5	Full tick or midpoint	EU-wide regime; depends on price and liquidity	EU-wide regime; depends on price and liquidity	EU-wide regime; depends on price and liquidity	R\$0.01
Minimum trade price increment	Sub-penny executions allowed	Sub-penny	Full tick or midpoint	Full tick or midpoint	Full tick or midpoint	Full tick or midpoint	Full tick or midpoint	Full tick or midpoint
Order handling disclosures	SEC Rule 605 and 606 Reports. Not order by order.	SEC Rule 605 and 606 Reports. Not order by order.	Order Handling and Execution Disclosure	Usually high volume process; exceptionally order by order	Order and best execution policy. RTS 28 to be deleted	Best execution policy. RTS 28 to be deleted	Order and best execution policy. RTS 28 to be deleted	Quarterly disclosures detailed on MPO B3
Best execution criteria	Best price		Total consideration	Best price for retail	Total consideration	Total consideration	Total consideration	Minimum cost

Table 2: Summary of best execution rules

	Brazil	USA	Canada	Europe	Australia
BestEx principle	Best total consideration	Best-price	Best total consideration subject to order protection rule	Best total consideration	Best total consideration
Order protection / Is trade through allowed?	Trade through	No trade through top of book	No trade through except from directed orders	Trade through	Trade through
Duty imposed to / Interlinked venues	Brokers only	Brokers and venues	Brokers and venues	Brokers only	Brokers only

Table 3: active ATSS in USASource: *FINRA ATS Transparency Data Quarterly Statistics and SEC Form ATS-N disclosures*

ATS Name	mp_id	# Trades	Share Volume	Avg size	Market share		Owner	Participation					Transparency		Orders			
					of ATS	of consolidated		Affiliate	Institutional	PTF	Brokers	Retail	Display or dark	Conditional	Firm	PIM	Mid-point	IOI
UBS ATS	UBSA	169,933,533	13,563,048,058	80	16.1%	1.9%	UBS	•	•	•	•	•	Dark	•	•	•	•	•
INTELLIGENT CROSS LLC	INCR	148,612,905	11,170,426,144	75	13.3%	1.6%	Independent	•	•	•	•	•	Lit and dark	•	•	•	•	•
SIGMA X2	SGMT	125,655,437	8,818,457,869	70	10.5%	1.2%	Goldman Sachs	•	•	•	•	•	Dark	•	•	•	•	•
MS POOL (ATS-4)	MSPL	34,326,922	6,464,783,746	188	7.7%	0.9%	Morgan Stanley	•	•	•	•	•	Dark	•	•	•	•	•
LEVEL ATS	EBXL	225,198,363	6,131,453,051	27	7.3%	0.9%	Kezar Markets - Nasdaq Ventures	•	•	•	•	•	Dark	•	•	•	•	•
INSTINCT X	MLIX	40,065,492	5,357,334,477	134	6.4%	0.7%	BOFA	•	•	•	•	•	Dark	•	•	•	•	•
JPM-X	JPMX	48,302,313	5,043,293,122	104	6.0%	0.7%	JPMorgan	•	•	•	•	•	Dark	•	•	•	•	•
MS TRAJECTORY CROSS (ATS-1)	MSTX	14,954,379	3,395,162,706	227	4.0%	0.5%	Morgan Stanley	•	•	•	•	•	Dark	•	•	•	•	•
THE BARCLAYS ATS	LATS	26,577,347	3,028,292,147	114	3.6%	0.4%	Barclays	•	•	•	•	•	Dark	•	•	•	•	•
BIDS ATS	BIDS	2,457,178	2,353,142,372	958	2.8%	0.3%	CBOE	•	•	•	•	•	Dark	•	•	•	•	•
IBKR ATS	IATS	11,649,285	2,204,301,375	189	2.6%	0.3%	IBKR	•	•	•	•	•	Dark	•	•	•	•	•
VIRTU MATCHIT ATS	KCGM	23,484,324	2,188,094,618	93	2.6%	0.3%	Virtu Financial	•	•	•	•	•	Dark	•	•	•	•	•
PURESTREAM	PURE	51,227,343	1,928,343,416	38	2.3%	0.3%	PureStream	•	•	•	•	•	Dark	•	•	•	•	•
BOATS	BLUE	13,197,376	1,609,605,960	122	1.9%	0.2%	Blue Ocean	•	•	•	•	•	Lit	•	•	•	•	•
CROSSSTREAM	XSTM	3,984,375	1,378,716,216	346	1.6%	0.2%	National Financia	•	•	•	•	•	Dark	•	•	•	•	•
POSIT	ITGP	2,751,850	1,095,969,346	398	1.3%	0.2%	Virtu Financial	•	•	•	•	•	Dark	•	•	•	•	•
JPB-X	JPBX	6,941,609	1,079,918,492	156	1.3%	0.2%	JPMorgan	•	•	•	•	•	Dark	•	•	•	•	•
ONECHRONOS	CGXS	10,354,974	1,043,127,479	101	1.2%	0.1%	OneChronos	•	•	•	•	•	Dark	•	•	•	•	•
MS RPOOL (ATS-6)	MSRP	9,707,528	1,041,092,348	107	1.2%	0.1%	Morgan Stanley	•	•	•	•	•	Dark	•	•	•	•	•
LIQUIDNET H2O ATS	LQNA	95,965	842,583,913	8,780	1.0%	0.1%	TP ICAP	•	•	•	•	•	IOI invitation	•	•	•	•	•
CITI-ONE ATS	ONEC	10,641,661	829,626,127	78	1.0%	0.1%	Citigroup	•	•	•	•	•	Dark	•	•	•	•	•
CBX	ICBX	11,928,046	710,299,477	60	0.8%	0.1%	Nomura	•	•	•	•	•	Dark	•	•	•	•	•
DEALERWEB	DLTA	3,761	676,495,991	179,871	0.8%	0.1%	Tradeweb	•	•	•	•	•	Lit	•	•	•	•	•
INSTINET BLOCKCROSS	BLKX	59,276	648,043,836	10,933	0.8%	0.1%	Nomura	•	•	•	•	•	IOI invitation	•	•	•	•	•
BNPP CORTEX ATS	BNPX	7,066,813	632,320,327	89	0.8%	0.1%	BNP Paribas	•	•	•	•	•	Dark	•	•	•	•	•
LIQUIDNET NEGOTIATION ATS	LQNT	12,243	329,663,810	26,927	0.4%	0.0%	TP ICAP	•	•	•	•	•	IOI invitation	•	•	•	•	•
CODA	CODA	1,889,782	211,973,982	112	0.3%	0.0%	CODA	•	•	•	•	•	IOI alert	•	•	•	•	•
LUMINEX ATS	LMNX	7,968	205,267,242	25,761	0.2%	0.0%	Kezar Markets - Nasdaq v	•	•	•	•	•	IOI alert	•	•	•	•	•
IBKR EOS ATS	IEOS	84,376	21,810,469	258	0.0%	0.0%	IBKR	•	•	•	•	•	Lit	•	•	•	•	•
STIFEL X	STFX	126,741	15,745,201	124	0.0%	0.0%	Stifel	•	•	•	•	•	Dark	•	•	•	•	•
Grand Total		1,001,299,165	84,018,393,317	84	100.0%	11.7%												

Table 4: annual surveillance costs in Australia (2023)Source: *2023–24 CRIS: Summary of ASIC's 2023–24 regulatory costs and estimated levies for subsectors**ASIC industry funding: Annual dashboard report 2022–23*

ASIC Market infrastructure and intermediaries		Recovered through levies:		Subsector
Supervision and surveillance	12.7 AUDm	Securities exchanges	8.8 AUDm	
Indirect costs	34.9	Futures exchanges	1.2	
Other regulatory activities	5.3	Post trade facility operators	5.0	
Enforcement	18.2	Securities participants	23.1	
Total	71.1 AUDm	Futures participants	5.8	
		OTC products and market participants	26.5	
		Benchmarks and credit rating	0.2	
		Total	70.6 AUDm	

Table 5: annual surveillance costs in Canada (2022)Source: *IIROC Annual report 2022**IIROC (2022 Annual Report)*

Dealers regulation	63.8	
Market regulation - equities	28.9	CADm
Market regulation - debt	2.2	
Subtotal	94.8	CADm

Table 6: annual surveillance costs by FINRA in USA (2024 Budget)Source: *FINRA 2024 Annual Budget Summary*

	FINRA (2024 Budget)	
Member supervision	556.5	\$m
Market regulation - equities	168.2	
Market regulation - debt	13.1	
Enforcement	167.8	
Credentialing, Registration, Education, Disclosure (CRED)	112.1	
Transparency Services	101.6	
Dispute Resolution Services	69.7	
Other Regulatory Operations	143.9	
Initiatives	150.0	
Total	1,482.9	\$m

Table 7: market data fees paid to NASDAQ by IEX affiliated broker dealer

Source: IEX, *The Cost Of Exchange Services, Disclosing the Cost of Offering Market Data and Connectivity as a National Securities Exchange*, January 2019. Fees for items reported updated as of 2023.

Market data		Market Data	Feed Name	Fee Name	Base Fee	Quantity	Monthly fee	Annual fees	
		Internal distributor	Nasdaq	Nasdaq TotalView (ITCH)	Real time data products administration	\$ 100	1	\$ 100	\$ 1,200
					Internal distributor	\$ 1,500	1	\$ 1,500	\$ 18,000
					Direct Access	\$ 3,000	1	\$ 3,000	\$ 36,000
					Non display platform	\$ 5,000	1	\$ 5,000	\$ 60,000
					Non-display via Direct Access	\$ 375	9	\$ 3,375	\$ 40,500
		Non display			Professional/Corporate	\$ 76	31	\$ 2,356	\$ 28,272
			Nasdaq BX	Nasdaq BX TotalView (ITCH)	Real time data products administration	\$ 100	1	\$ 100	\$ 1,200
					Internal distributor	\$ 750	1	\$ 750	\$ 9,000
					Direct Access	\$ 1,000	1	\$ 1,000	\$ 12,000
			Non-display via Direct Access	\$ 55	9	\$ 495	\$ 5,940		
Pro fees			Professional/Corporate	\$ 40	31	\$ 1,240	\$ 14,880		
	Nasdaq PSX	Ndaq PSX TotalView (ITCH)	Real time data products administration	\$ 100	1	\$ 100	\$ 1,200		
			Internal distributor	\$ 500	1	\$ 500	\$ 6,000		
			Direct Access	\$ 1,000	1	\$ 1,000	\$ 12,000		
			Non-display via Direct Access	\$ 50	9	\$ 450	\$ 5,400		

Source: IEX

Table 8: market data fees paid to CBOE by IEX affiliated broker dealer

Source: IEX, *The Cost Of Exchange Services, Disclosing the Cost of Offering Market Data and Connectivity as a National Securities Exchange*, January 2019. Fees for items reported updated as of 2023.

Market data	Internal distributor	Market Data	Feed Name	Fee Name	Base Fee	Quantity	Monthly fee	Annual fees	
			CBOE BZX	BZX Depth (PITCH)	Internal distributor	\$ 1,500	1	\$ 1,500	\$ 18,000
			CBOE BZX	BZX Depth (PITCH)	Non-display usage by trading platforms	\$ 5,000	1	\$ 5,000	\$ 60,000
			CBOE BZX	BZX Depth (PITCH)	Professional user fee	\$ 40	31	\$ 1,240	\$ 14,880
			CBOE BYX	BYX Depth (PITCH)	Internal distributor	\$ 1,000	1	\$ 1,000	\$ 12,000
	Non display		CBOE BYX	BYX Depth (PITCH)	Non-display usage by trading platforms	\$ 2,000	1	\$ 2,000	\$ 24,000
			CBOE BYX	BYX Depth (PITCH)	Professional user fee	\$ 10	31	\$ 310	\$ 3,720
			CBOE EDGA	EDGA Depth (PITCH)	Internal distributor	\$ 1,000	1	\$ 1,000	\$ 12,000
			CBOE EDGA	EDGA Depth (PITCH)	Non-display usage by trading platforms	\$ 2,000	1	\$ 2,000	\$ 24,000
			CBOE EDGA	EDGA Depth (PITCH)	Professional user fee	\$ 10	31	\$ 310	\$ 3,720
	Pro fees		CBOE EDGX	EDGX Depth (PITCH)	Internal distributor	\$ 1,500	1	\$ 1,500	\$ 18,000
			CBOE EDGX	EDGX Depth (PITCH)	Non-display usage by trading platforms	\$ 5,000	1	\$ 5,000	\$ 60,000
		CBOE EDGX	EDGX Depth (PITCH)	Professional user fee	\$ 40	31	\$ 1,240	\$ 14,880	
CBOE market data total							\$ 22,100	\$ 265,200	

Table 9: market data fees paid by IEX to NYSE Group

Source: IEX, *The Cost Of Exchange Services, Disclosing the Cost of Offering Market Data and Connectivity as a National Securities Exchange*, January 2019. Fees for items reported updated as of 2023.

Market data	Access	Exchange	Feed Name	Fee Name	Base Fee	Quantity	Monthly fee	Annual fees		
		NYSE	NYSE OpenBook	Access Fee	\$	5,000	1	\$	5,000 \$	60,000
				Non-display fee - Category 2 (Agency)	\$	6,000	1	\$	6,000 \$	72,000
				Non-display fee - Category 3 (Matching)	\$	6,000	1	\$	6,000 \$	72,000
				Professional user fee	\$	60	31	\$	1,860 \$	22,320
	NYSE Total						\$	18,860 \$	226,320	
	Non display	NYSE ARCA	NYSE ArcaBook	Access Fee	\$	2,000	1	\$	2,000 \$	24,000
				Non-display fee - Category 2 (Agency)	\$	6,000	1	\$	6,000 \$	72,000
				Non-display fee - Category 3 (Matching)	\$	6,000	1	\$	6,000 \$	72,000
				Professional user fee	\$	60	31	\$	1,860 \$	22,320
		NYSE ARCA Total						\$	15,860 \$	190,320
	Pro fees	NYSE American	NYSE American OpenBook	Access Fee	\$	1,000	1	\$	1,000 \$	12,000
				Non-display fee - Category 2 (Agency)	\$	2,000	1	\$	2,000 \$	24,000
				Non-display fee - Category 3 (Matching)	\$	2,000	1	\$	2,000 \$	24,000
				Professional user fee	\$	5	31	\$	155 \$	1,860
NYSE American Total						\$	5,155 \$	61,860		
NYSE Group						\$	39,875 \$	478,500		

Table 10: BMV consolidated tape fees

Source: *BMV Market Data Price list for 2024*

Consolidated Tape	Monthly Internal Use Fee USD	Monthly Redistribution Fee USD
Consolidated Feed: Equities Market and Global Market Trades (Consider this fee besides BIVA's fees and Pre authorization) Channel 25	\$3,120	\$4,680
Consolidated Feed: Best Bid /Offer Equities and Global Market (Consider this fee besides BIVA's fees and Pre authorization) Channel 26	\$3,750	\$5,625
Consolidated Feed: Full Depth Equities and Global Market (Consider this fee besides BIVA's fees and Pre authorization) Channel 27	\$7,490	\$11,235

Table 11: connectivity fees paid to NASDAQ by IEX affiliated broker dealer

Source: IEX, *The Cost Of Exchange Services, Disclosing the Cost of Offering Market Data and Connectivity as a National Securities Exchange*, January 2019. Fees for items reported updated as of 2023.

Physical connectivity	Physical	Physical connectivity type							
		10Gb Fiber	\$ 1,000	\$ 10,000	2	\$20,000	\$240,000	\$240,333	
		10Gb Ultra Fiber via POP	\$1,500	\$ 7,500	1	\$7,500	\$90,000	\$90,500	
		Nasdaq total physical connectivity				\$27,500	\$330,000	\$330,833	
	OE ports	Logical connectivity	Port type	Port Name		Base Fee per Port	Quantity	Monthly fee	Annual fees
			Nasdaq	Order Entry	FIX or Binary (OUCH)	\$ 575	4	\$ 2,300	\$ 27,600
			DR	Chicago DR Ports	\$ 25	4	\$ 100	\$ 1,200	
		DR ports	Test	NTF Port		\$ 100	1	\$ 100	\$ 1,200
			Nasdaq BX	Order Entry	FIX or Binary (OUCH)	\$ 500	2	\$ 1,000	\$ 12,000
			DR	Chicago DR Ports	\$ 25	2	\$ 50	\$ 600	
		Test ports	Test	NTF Port		\$ 100	1	\$ 100	\$ 1,200
			Nasdaq PSX	Order Entry	FIX or Binary (OUCH)	\$ 400	2	\$ 800	\$ 9,600
			DR	Chicago DR Ports	\$ 25	2	\$ 50	\$ 600	
		Market data ports	Test	NTF Port		\$ 100	1	\$ 100	\$ 1,200
Nasdaq Total Order Entry, Test and DR				\$ 4,600	\$ 55,200				
Nasdaq	Market data port		Multicast ITCH (MTCH)	\$ 1,000	1	\$ 1,000	\$ 12,000		
Nasdaq BX	Market data port		Multicast ITCH (MTCH)	\$ 1,000	1	\$ 1,000	\$ 12,000		
Nasdaq PSX	Market data port		Multicast ITCH (MTCH)	\$ 1,000	1	\$ 1,000	\$ 12,000		
Nasdaq Total Market Data ports				\$ 3,000	\$ 36,000				
Nasdaq total logical ports				\$ 7,600	\$ 91,200				

Table 12: connectivity fees paid to NYSE by IEX affiliated broker dealer

Source: IEX, *The Cost Of Exchange Services, Disclosing the Cost of Offering Market Data and Connectivity as a National Securities Exchange*, January 2019. Fees for items reported updated as of 2023.

Physical	Physical	Exchange/January 2021 Fees for Items Reported updated as of 2021:							
		Physical connectivity type		Installation fees	Base fee per Port	Quantity	Monthly fee	Annual fees	with installation
		10Gb Fiber LCN Access		\$15,000	\$ 22,000	2	\$ 44,000	\$ 528,000	\$ 533,000
		10Gb Fiber IP Network Access		\$10,000	\$ 11,000	1	\$ 11,000	\$ 132,000	\$ 135,333
Logical connectivity	OE ports	NYSE physical connectivity fees				\$ 55,000	\$ 660,000	\$ 668,333	
		Exchange	Port type	Port Name	Base Fee per Port	Quantity	Monthly fee	Annual fees	
		NYSE	Order Entry	FIX or Binary	\$ 550	4	\$ 2,200	\$ 26,400	
		NYSE ARCA	Order Entry	FIX or Binary	\$ 550	4	\$ 2,200	\$ 26,400	
		NYSE American	Order Entry	FIX or Binary	\$ 250	2	\$ 500	\$ 6,000	
		NYSE National	Order Entry	FIX or Binary	\$ 250	2	\$ 500	\$ 6,000	
		NYSE Total				\$ 5,400	\$ 64,800		

Table 13: connectivity fees paid to CBOE by IEX affiliated broker dealer

Source: IEX, *The Cost Of Exchange Services, Disclosing the Cost of Offering Market Data and Connectivity as a National Securities Exchange*, January 2019. Fees for items reported updated as of 2023.

Physical	Physical	Physical connectivity type					
		Installation fees	Base fee per Port	Quantity	Monthly fee	Annual fees	with Installation
		10Gb Fiber	-	\$ 8,500	2	\$ 17,000	\$ 204,000
		10Gb Fiber (Disaster Recovery)	-	\$ 6,000	1	\$ 6,000	\$ 72,000
		CBOE total physical connectivity fees			\$ 23,000	\$ 276,000	\$ 276,000
Logical connectivity	OE ports	Logical connectivity					
		Port type	Port Name	Base Fee per Port	Quantity	Monthly fee	Annual fees
		CBOE BZX	Order Entry	FIX or Binary	\$ 550	2	\$ 1,100
		CBOE BZX	Order Entry	FIX or Binary	\$ 550	2	\$ 1,100
		CBOE EDGA	Order Entry	FIX or Binary	\$ 550	2	\$ 1,100
		CBOE EDGX	Order Entry	FIX or Binary	\$ 550	2	\$ 1,100
	DR ports	DR Ports	DR	FIX or Binary	\$ 550	-	-
		Test Ports	Test	FIX or Binary	\$ 550	-	-
	Test ports	Purge ports	Purge	FIX or Binary	\$ 550	-	-
		CBOE Total Order Entry, Purge, DR, Test				\$ 4,400	\$ 52,800
	Purge ports	CBOE BZX	BZX Depth (PITCH)	Multicast PITCH Spin Server Ports	\$ 550	4	\$ 2,200
		CBOE BYX	BYX Depth (PITCH)	Multicast PITCH Spin Server Ports	\$ 550	4	\$ 2,200
	MD ports	CBOE EDGA	EDGA Depth (PITCH)	Multicast PITCH Spin Server Ports	\$ 550	4	\$ 2,200
		CBOE EDGX	EDGX Depth (PITCH)	Multicast PITCH Spin Server Ports	\$ 550	4	\$ 2,200
		CBOE Total Market Data ports				\$ 8,800	\$ 105,600
		CBOE total logical ports				\$ 13,200	\$ 158,400
mps	Match Capacity	Match capacity					
		Fee Name	Base Fee	Quantity	Monthly fee	Annual fees	
		CBOE BZX	Match capacity fees. Allocation of 5,000 messages per second	\$ 550	-	\$ -	\$ -

Table 14: NASDAQ order router and algorithm fees

Source: Nasdaq Nordic Cash Market fee list effective from June 1, 2024

NORDIC ORDER ROUTING SERVICE

Fees for the executed orders that have matched to trades in other trading venues than Nasdaq Nordic equals the variable fee³ according to the equities price list plus an additional routing fee.

PARTICIPANT'S EQUITIES PRICE LIST SELECTION

ROUTING FEE

Price List 1	0.0175%
Price List 2	0.0050%

Nordic order routing fee for all executed orders using Nasdaq's algorithmic trading service regardless of the venue the execution takes place on:

ALL TRADES PER MONTH (EUR)

FEE

0 -	Variable trading fee (according to Fee List selection) + 0.0030%
-----	--

Table 15: BMV best execution and transaction cost analytics fees schedule

Source: BMV Market Data Price list for 2024

Best Execution Analytics	Monthly Internal Use Fee USD	Monthly Redistribution Fee USD
Analytics of prices and market depth Channel 29	\$1,010	\$1,515
Market Quality Channel 32	\$1,010	\$1,515
Spread Performance Channel 33	\$1,010	\$1,515
Negotiation Analytics Channel 34	\$1,010	\$1,515
Package with 2 Analytics Channels	\$1,720	\$2,580
Package with 3 Analytics Channels	\$2,240	\$3,360
Package with 4 Analytics Channels	\$2,710	\$4,065

Charts

Chart 1: order routing destinies of large retail brokers

Source: SEC Rule 606 disclosures of retail brokers

Order routing destinies of largest retail brokers
(June 2024)

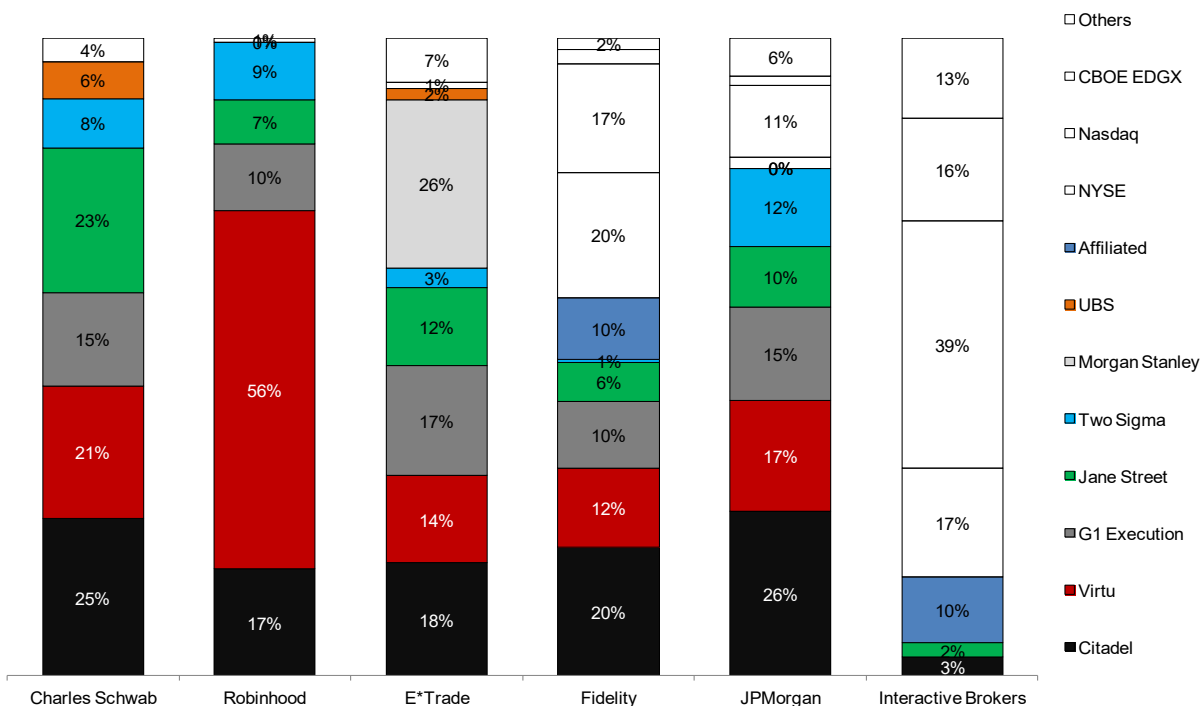


Chart 2: proportion of lit and dark trading

Source: CBOE and FINRA for USA, CBOE Europe, ASIC, IIROC

% Lit and dark trading

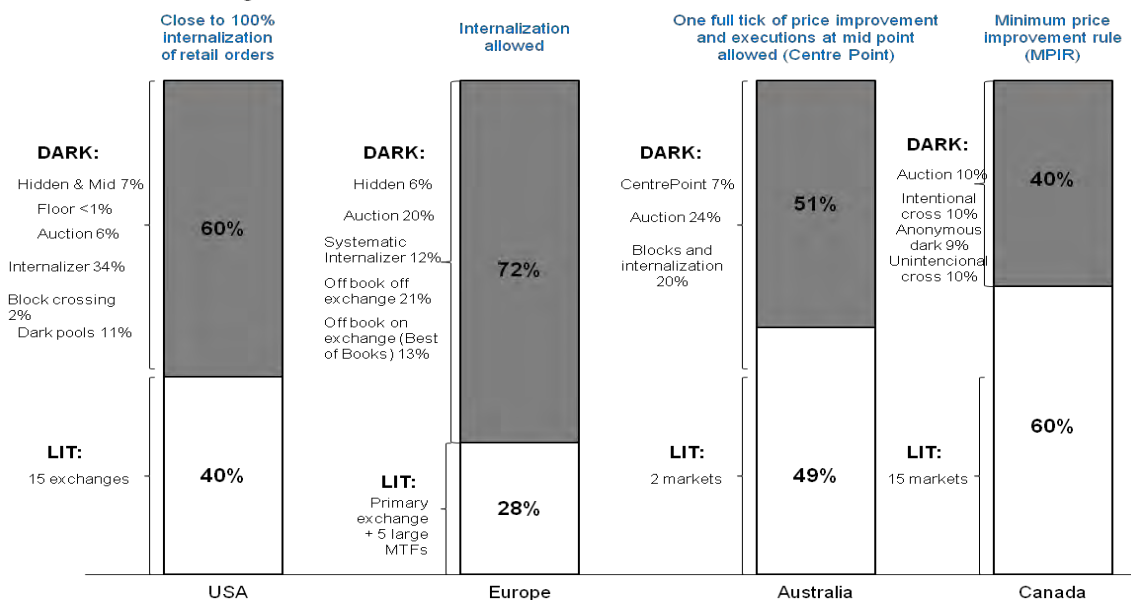


Chart 3: bid ask spreads after decimalization and Regulation NMS in USA

Source: SEC Market Structure Advisory Committee hearing 09/27/2015, written and oral testimony of Matt Lyons, The Capital Group SVP and global equity trader, on the Failure of Regulation NMS.

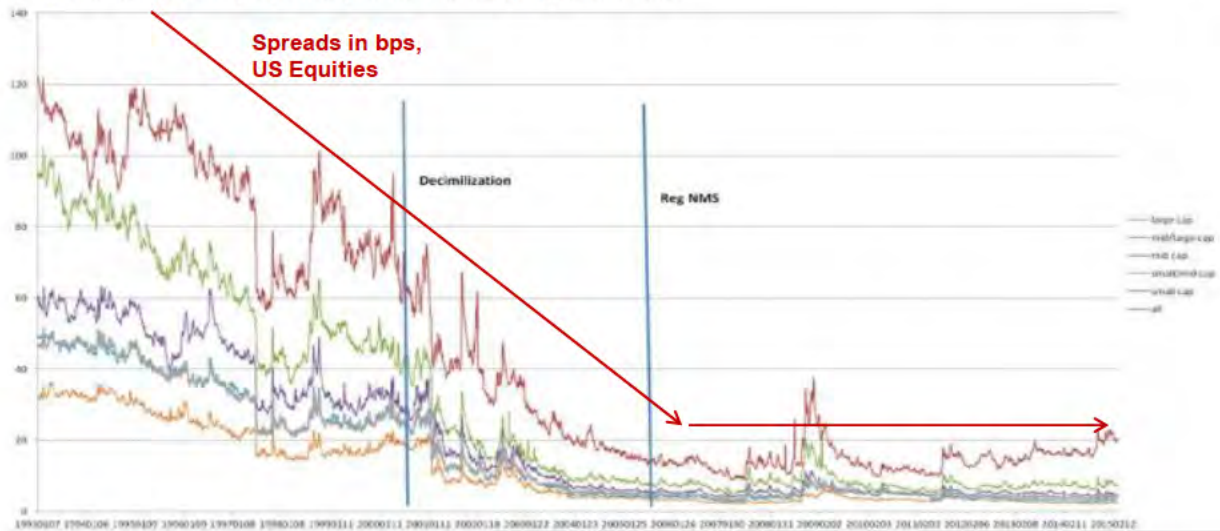


Chart 4: average VIX-adjusted bid-ask spread in S&P 500 components

Source: Nasdaq, *Optimizing Markets for Today and Tomorrow: A Framework for U.S. Equities Market Reform*, February 2022.

VIX-adjusted average bid-ask spread in S&P 500 components (in bps)

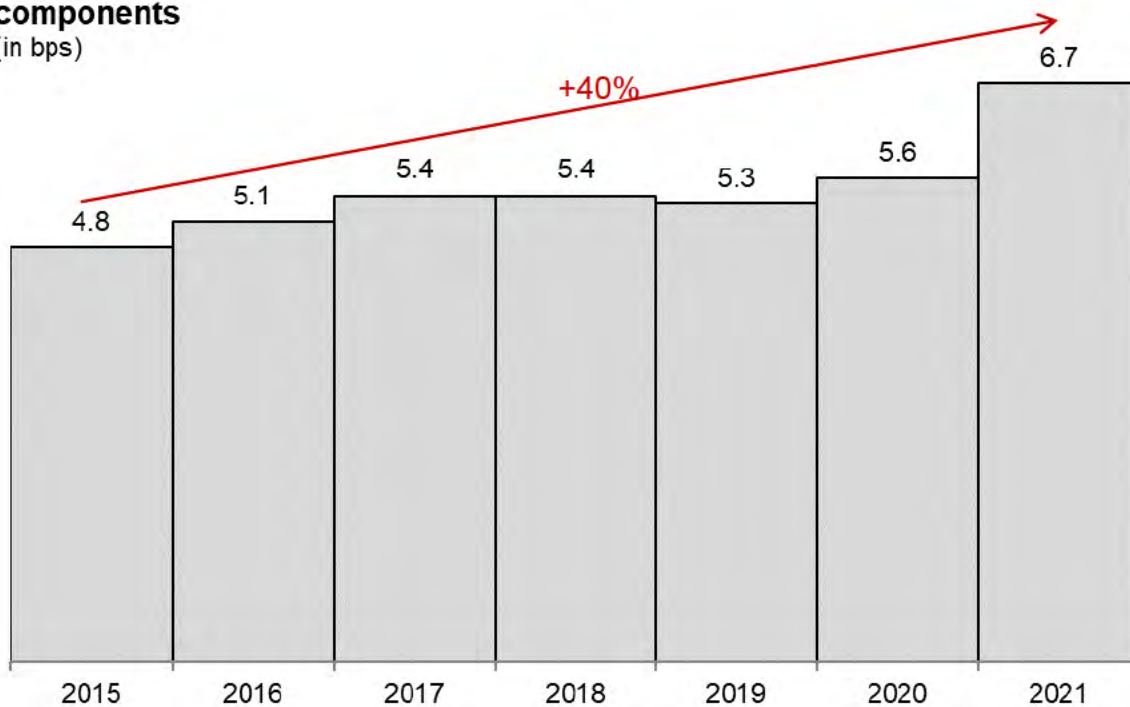
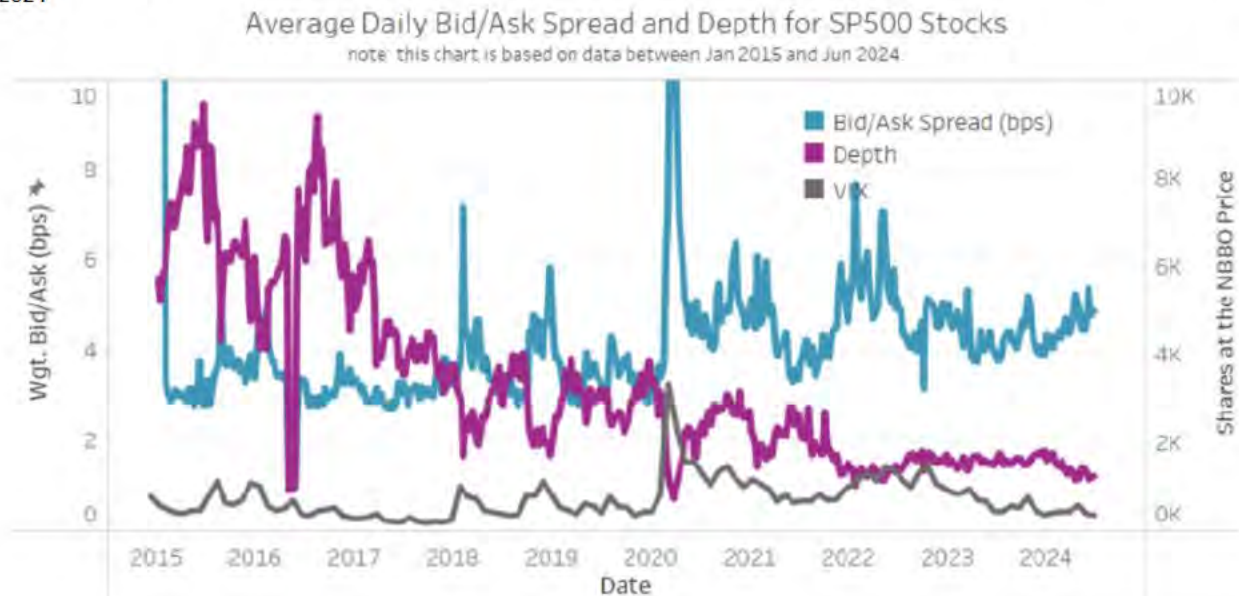


Chart 4 bis: average bid-ask spread and depth for S&P 500 stocks

Source: Nasdaq Economic Research, Tick Sizes Are a Trade-off, by Nasdaq Chief Economist Phil Mackintosh, September 17, 2024



Source: Nasdaq Economic Research

Chart 5: Slippage cost in USA as measured by Virtu Financial Global Cost Review

Source: Virtu Financial Global Cost Review 4Q 2021

Slippage cost
(in bps)

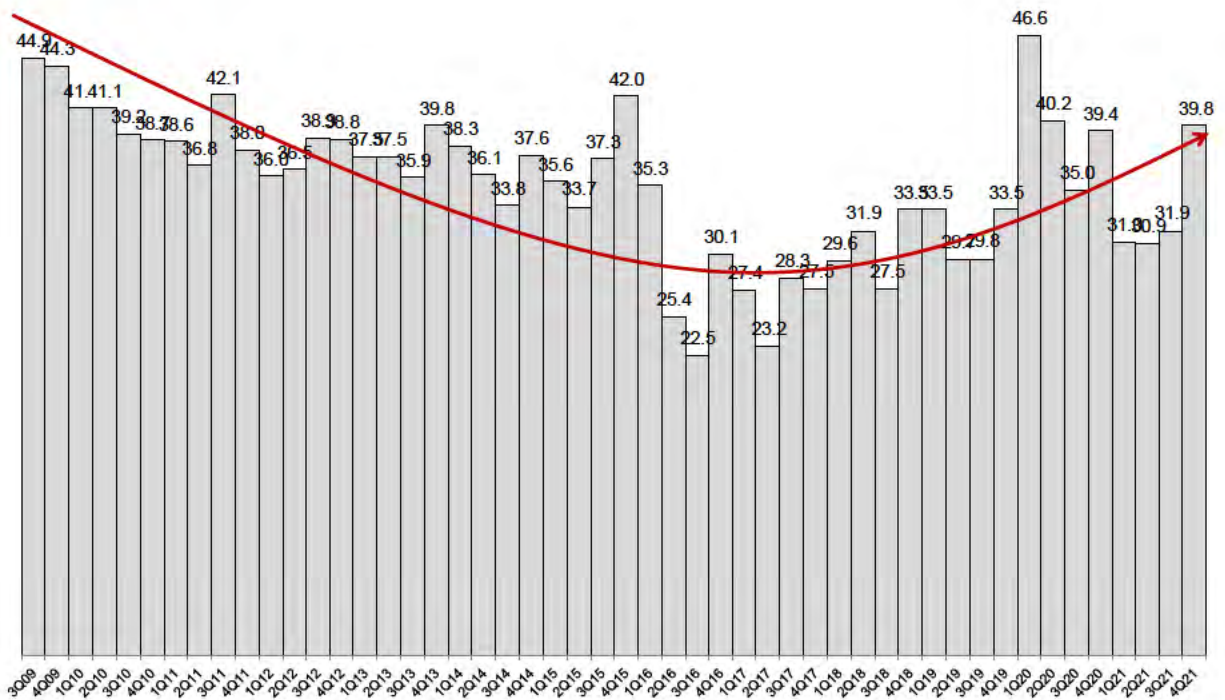


Chart 6: Bid Ask spreads in Europe as reported under ESMA's TRV Reports

Source: ESMA TRV II Report, September 2024 and previous version of the semiannual ESMA TRV Report

Median bid-ask spread in STOXX Europe Large 200
(in bps)

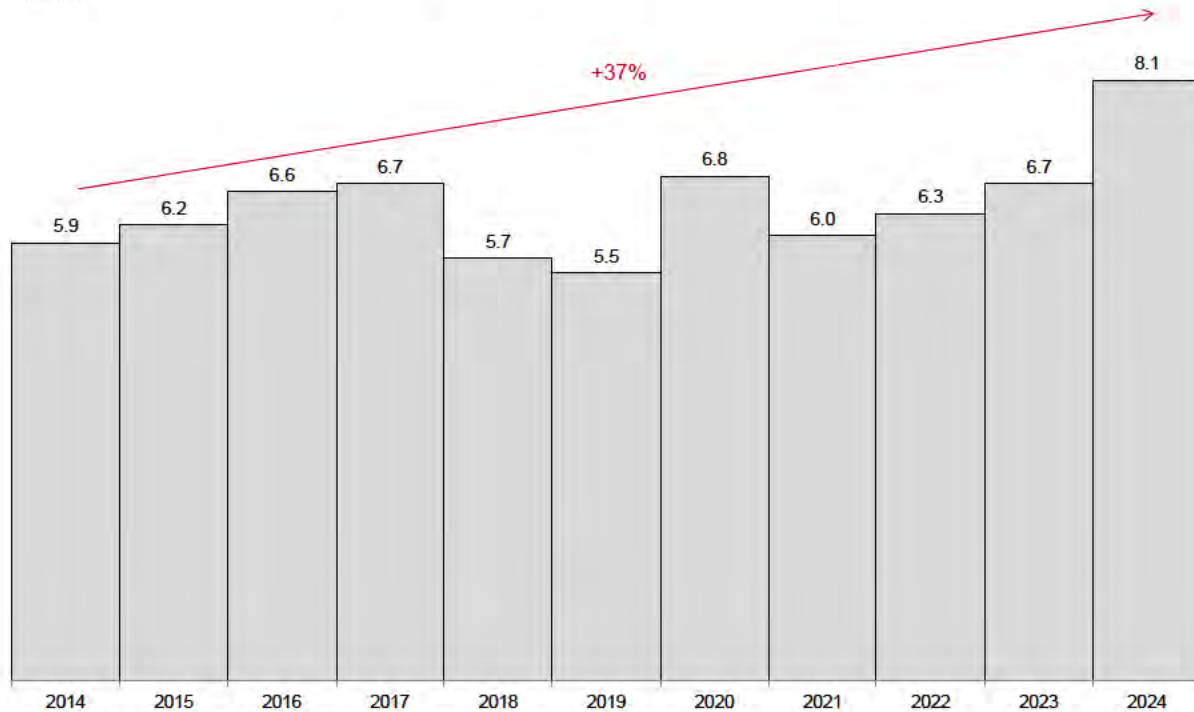


Chart 7: bid ask spread in the largest 200 Australian equities

Source: ASIC Equity Market Data for Quarter Ending June 2024

Bid ask spread in the largest 200 Australian equities
(bps)

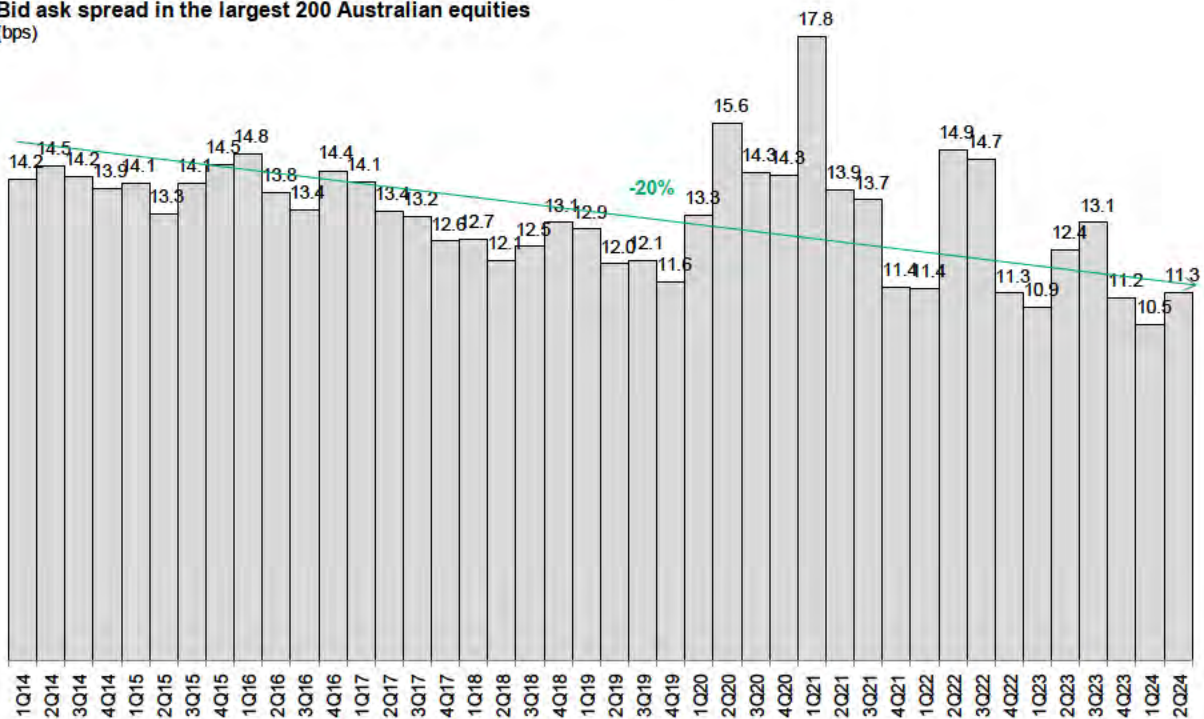


Chart 8: Number of Nasdaq market makers and average bid ask spreads

Source: Nasdaq

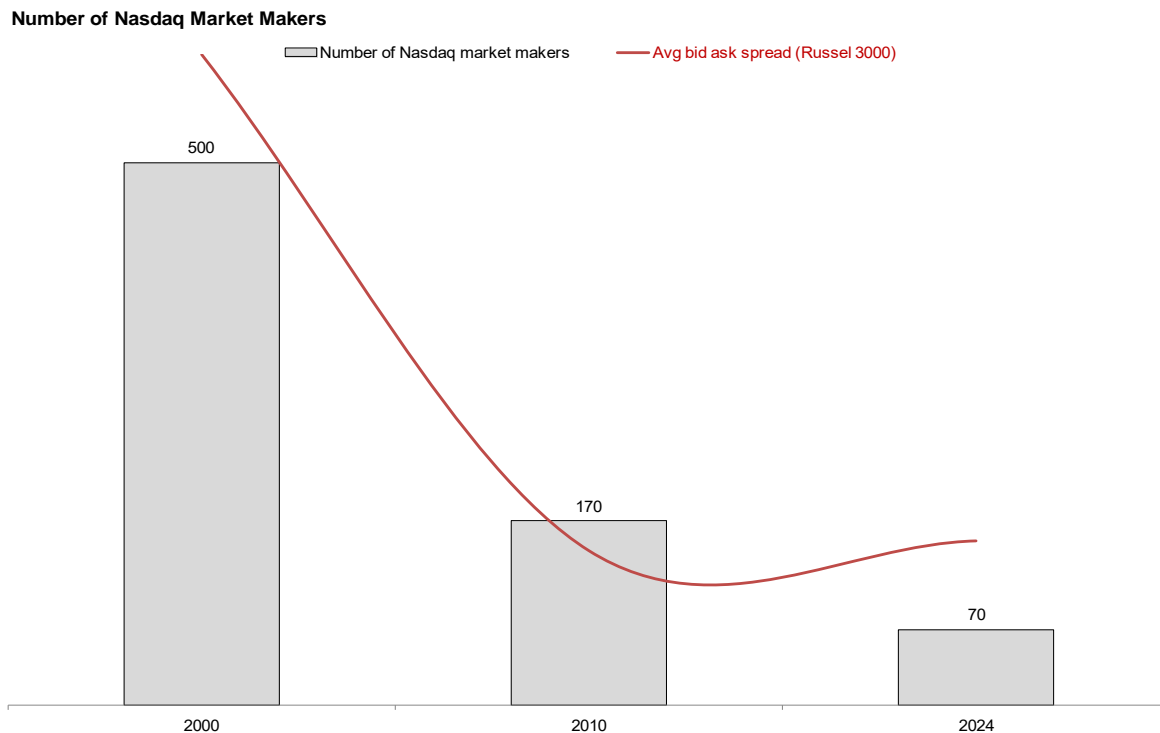


Chart 9: Summary findings about PFOF venues execution quality in Europe

Source: AFM, Assessing the quality of executions on trading venues, The “Comparative Pricing Model” March 2022 (version 2)
 BaFin, *Study into execution quality on selected German trading platforms*, Securities Supervision Data Analysis Unit, April 2022
 CNMV, *Payment for order flow: an analysis of the quality of execution of a zero-commission broker on Spanish stocks*, Policy and International Affairs Directorate General

		Better	Similar	Worse
BaFin:				
DAX components	Avg size	24%	47%	29%
DAX components	< €2,000	28%	53%	19%
Non-DAX	Avg size	24%	39%	37%
Non-DAX	< €2,000	28%	42%	30%
Dutch AMF:				
vs other venues		8%	24%	69%
vs Euronext Amsterdam		6%	22%	72%
CNMV:				
vs other venues		3%	10%	86%
vs BME		4%	11%	86%

Chart 10: Transaction costs analytics tools

Source: ERDesk analysis

TCA	Type of cost	Type of analytics	Measures	Examples
Pre-trade Analytics	Spread	Headline spread	Best Bid Offer	CTA, TMX (NBBO) CBOE (BBO)
		Depth of book Liquidity Analytics Order flow analytics	Market Depth Market Width Order quantities	CME, DB1 CBOE, CLS, NASDAQ
	Adverse selection Market impact	Cost estimation	Likely speed, fill rate, slippage	CME, CBOE, IEX
	Rollover	Pace of Roll	Cheapness	MX, CME
Post-Trade Analytics		Effective spread	Effective spread	CBOE
	Timing or delay cost	Slippage	Slippage Post Trade	ITG NYSE
	Opportunity cost	Implementation shortfall	Fill rates	IEX
Best Execution Analytics	Total implicit and explicit cost	Best execution reports	Spreads Fill rates % time at NBBO Book depth Performance	DB1 BME Liquidmetrix Markit

Chart 11: public reports by venues as required by EU delegated regulation 2017/575. Deutsche Boerse.

The DR 2017/575 requests for execution venues to publish up to nine reports for each instrument traded on their platform, for each trading day and each market segment

Table 1 – Identification information – type of execution venue <ul style="list-style-type: none"> Venue Competent authority Market segment Outages Scheduled auctions Failed transactions 	Table 2 – Identification information – type of financial instrument <ul style="list-style-type: none"> ISIN or written description of financial instrument Instrument classification Currency 	Table 3 – Price information <ul style="list-style-type: none"> Intraday price information taken for 2-min periods 4 times a day (average price, value) Information to provide for 3 size ranges depending on the instrument type
Table 4 – Price information <ul style="list-style-type: none"> Daily average and volume-weighted transaction price Daily highest and lowest executed price 	Table 5 – Costs information <ul style="list-style-type: none"> Description and value of: <ul style="list-style-type: none"> ✓ All components of costs (execution fees...) ✓ Rebates, discounts or other payments offered to users ✓ Non-monetary benefits ✓ Taxes and levies invoiced or incurred 	Table 6 – Likelihood of execution information <ul style="list-style-type: none"> Number of orders or requests for quotes received, cancelled or withdrawn Number and total value of transactions executed Median size of transactions, orders or RFQs Number of market makers
Table 7 – Likelihood of execution information <ul style="list-style-type: none"> Intraday best bid and offer price, best bid and offer size, book depth within 3 price increments Data to provide 4 times a day at reference times 	Table 8 – Trading information <ul style="list-style-type: none"> Average spread, volume at BBO Number of failed FOK Number and average duration of trading interruptions, suspensions Number and value of transactions executed under waivers (LIS and others)... 	Table 9 – RFQ information <ul style="list-style-type: none"> Meantime, median time between acceptance and execution Meantime and median... <p>Not applicable for Deutsche Börse Cash Market</p>

Chart 12: regulatory levies and market size

Source: ASIC, SFC, CNMV, FINRA

Volume-based regulatory levies vs size of market

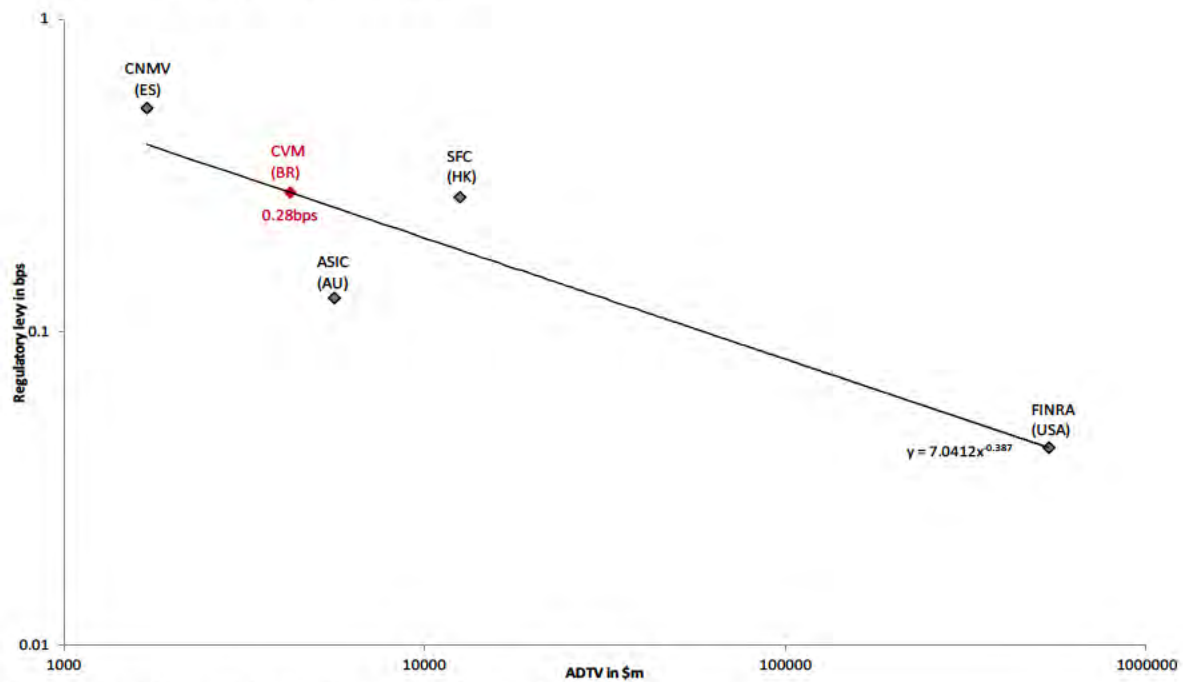
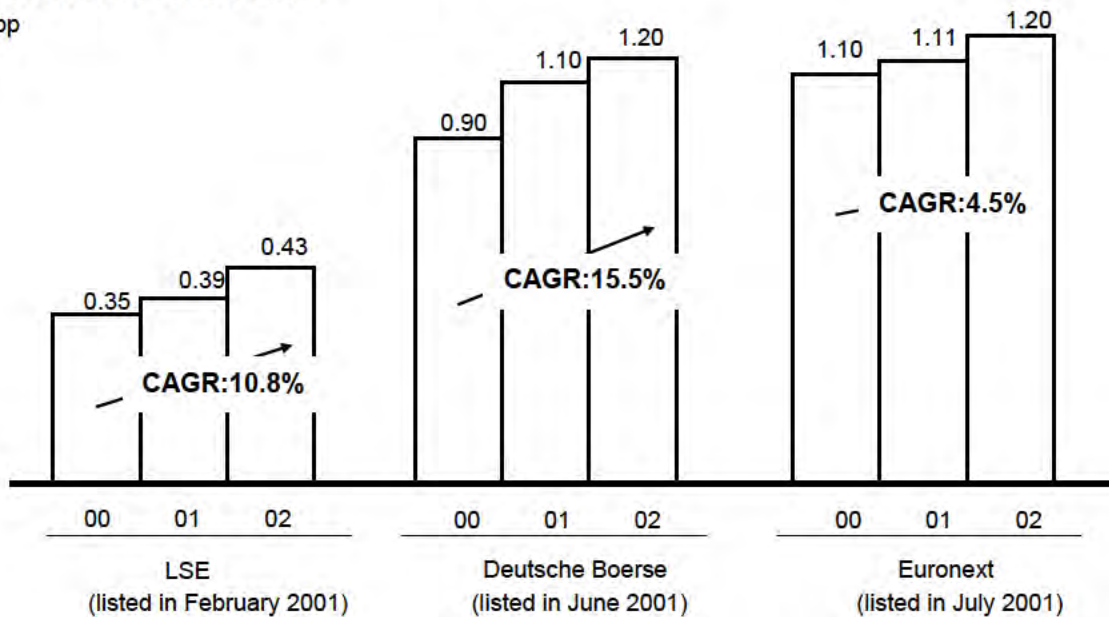


Chart 13: exchange fees in Europe in the early 2000s

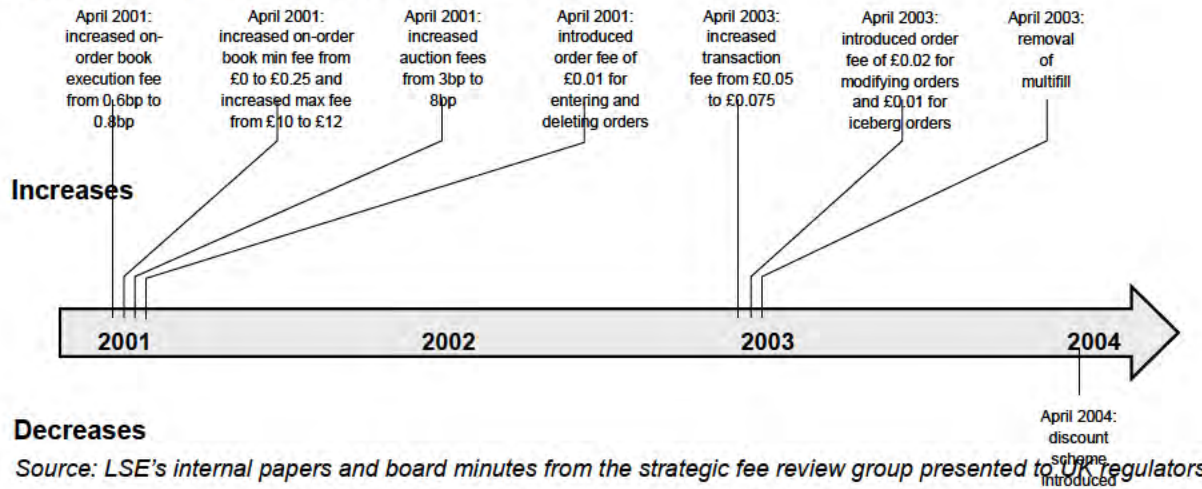
Effective Execution Fees

in bp



Source: LIBA, July 2003

Timeline of LSE's Fee On-Order Book Changes



	Apr.00	Apr.01	Apr.03	Apr.04	Aug.04	Jan.05	Apr.05
On-book (only aggressor pays)							
Ad valorem in bp	0.6	0.6	0.8	0.8	0.8	0.8	0.8
Minimum fee in £	0.00	0.25	0.25	0.25	0.25	0.25	0.25
Maximum fee in £	10.00	12.50	12.50	12.50	12.50	12.50	12.50
Auctions (1) ad valorem in bp							
Minimum fee in £	0.00	0.25	0.25	0.25	0.25	0.25	0.25
Maximum fee in £	5.00	12.50	12.50	12.50	12.50	12.50	12.50
Transaction fee in £	0.050	0.050	0.075	0.075	0.075	0.075	0.075
Order fee in £							
Entered	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Deleted	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Modified	N/A	N/A	0.02	0.02	0.02	0.02	0.02
Icebergs	N/A	N/A	0.10	0.10	0.10	0.10	0.10

Chart 14: bid ask spread in stocks with market makers compared with stocks without MM on B3

Source: based on data provided by B3 for the 3Q 2021

In Brazil, market makers bring significant liquidity and tighten spreads

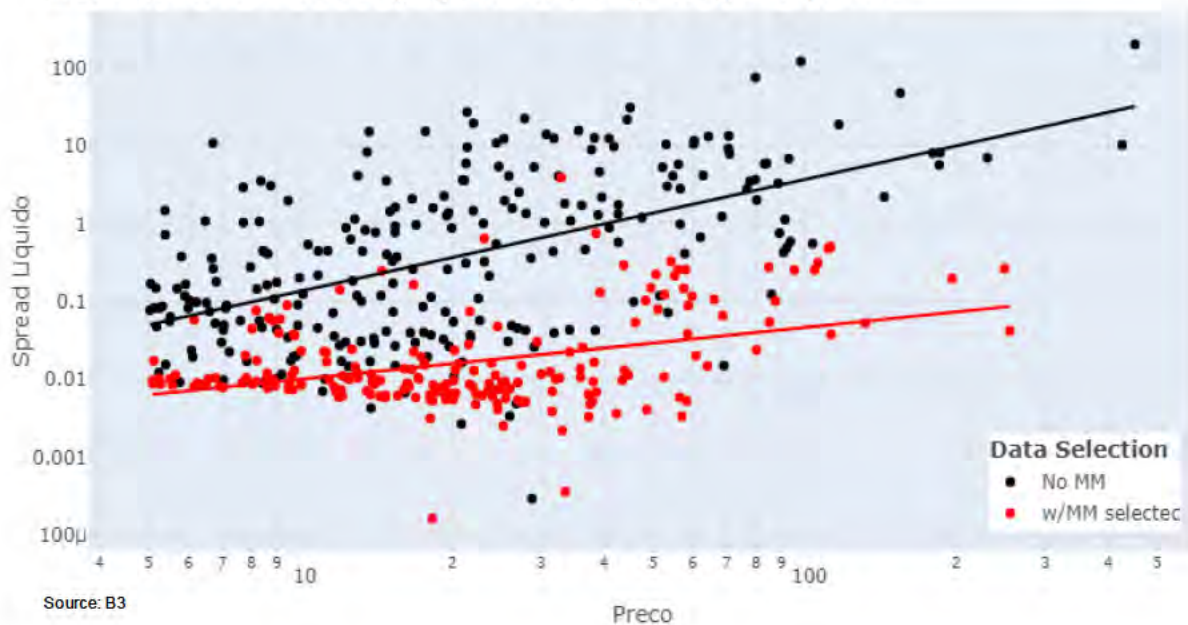


Chart 15: average bid ask spread in benchmark large cap index (2021)

Source: B3, NASDAQ, ESMA, HKEX, ASIC, Liquidmetrix

Bid-ask spreads (in bps)

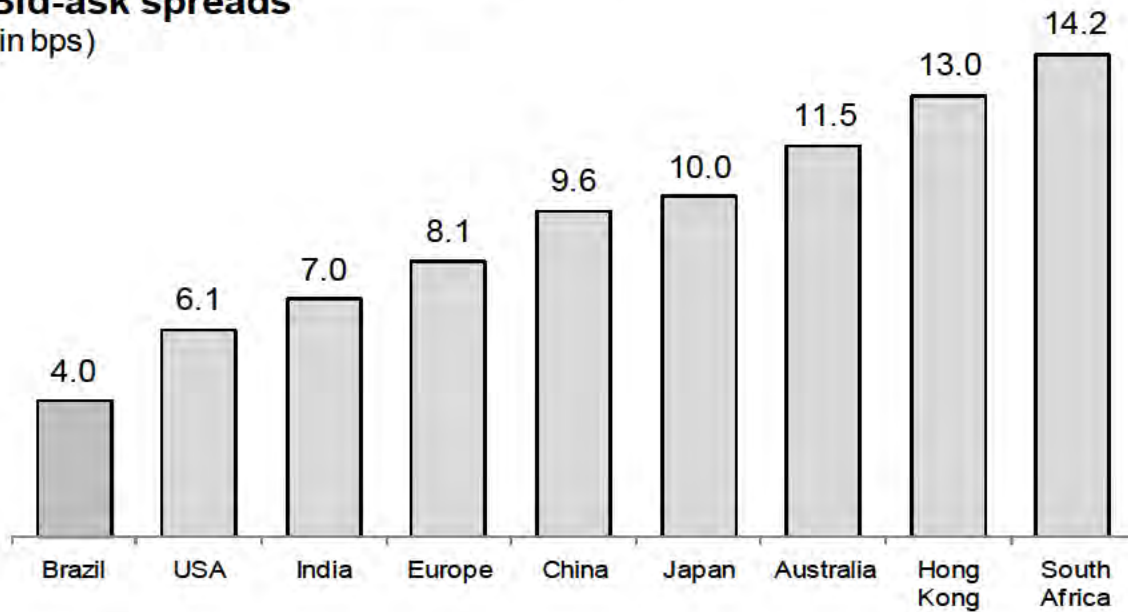


Chart 16: spread and velocity in B3-listed stocks

Source: based on data provided by B3 for the 3Q 2021

Velocity vs spread

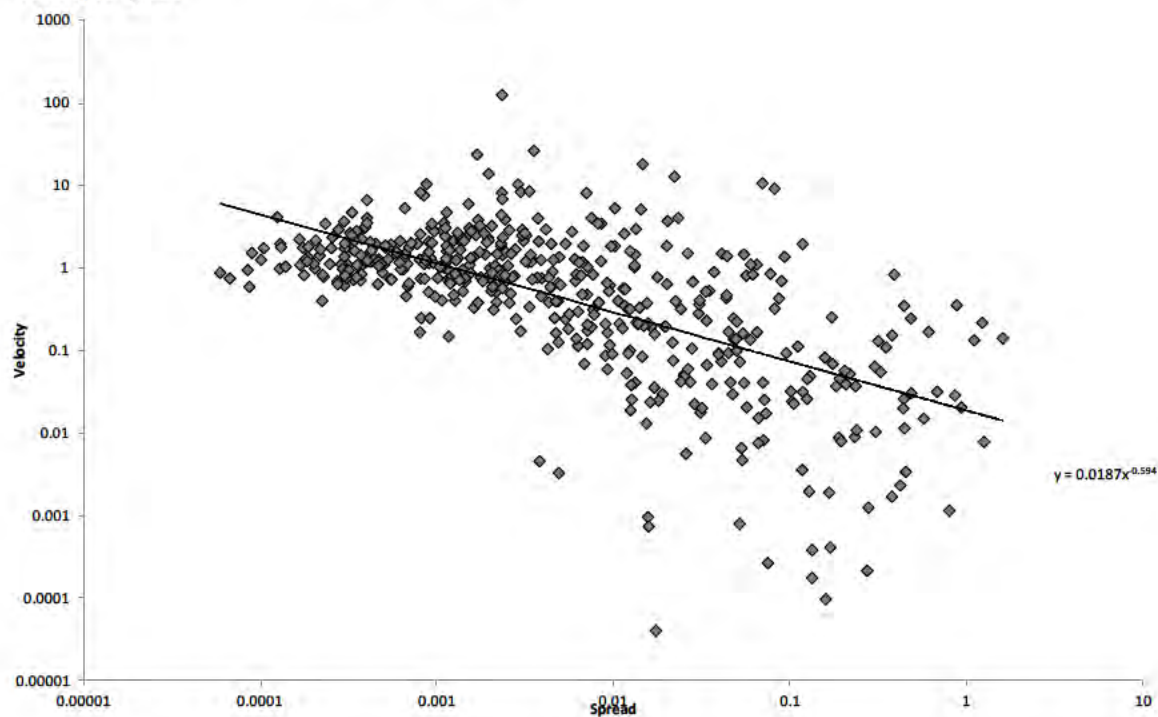
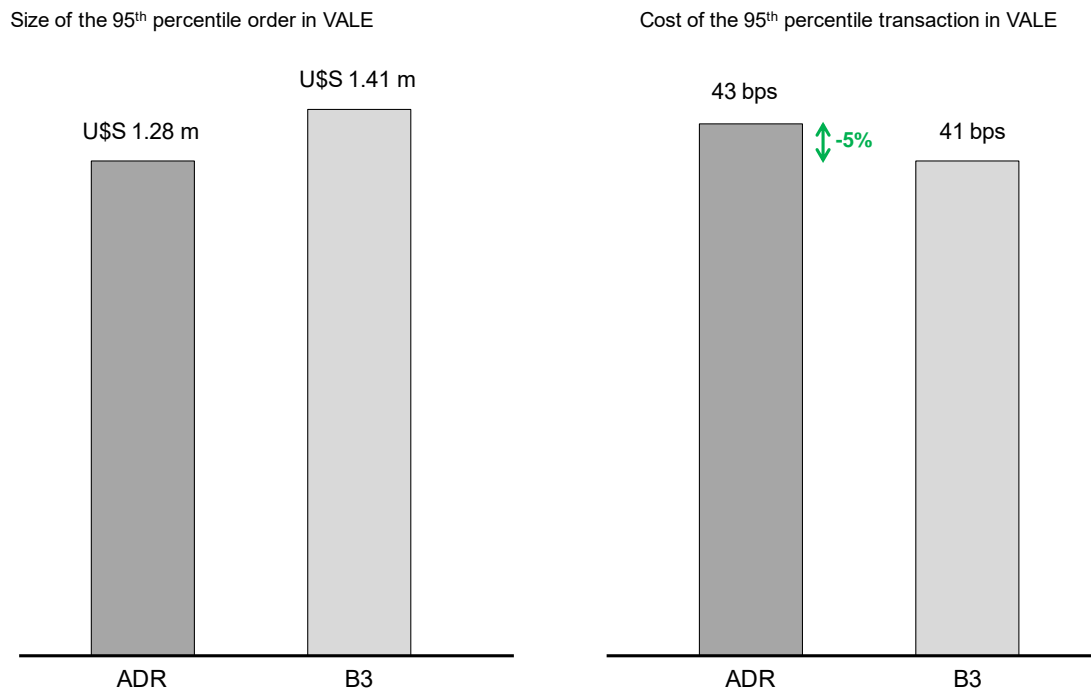


Chart 17: slippage cost for VALE as measured by ITG Virtu in 2021

Source: Virtu ITG data provided to B3 in 2021



Source: Virtu Financial's ITG

Chart 18: slippage cost of Brazilian ADRs compared to ORDs

Source: Virtu ITG data provided to B3 in 2021

Total transaction cost
in bps

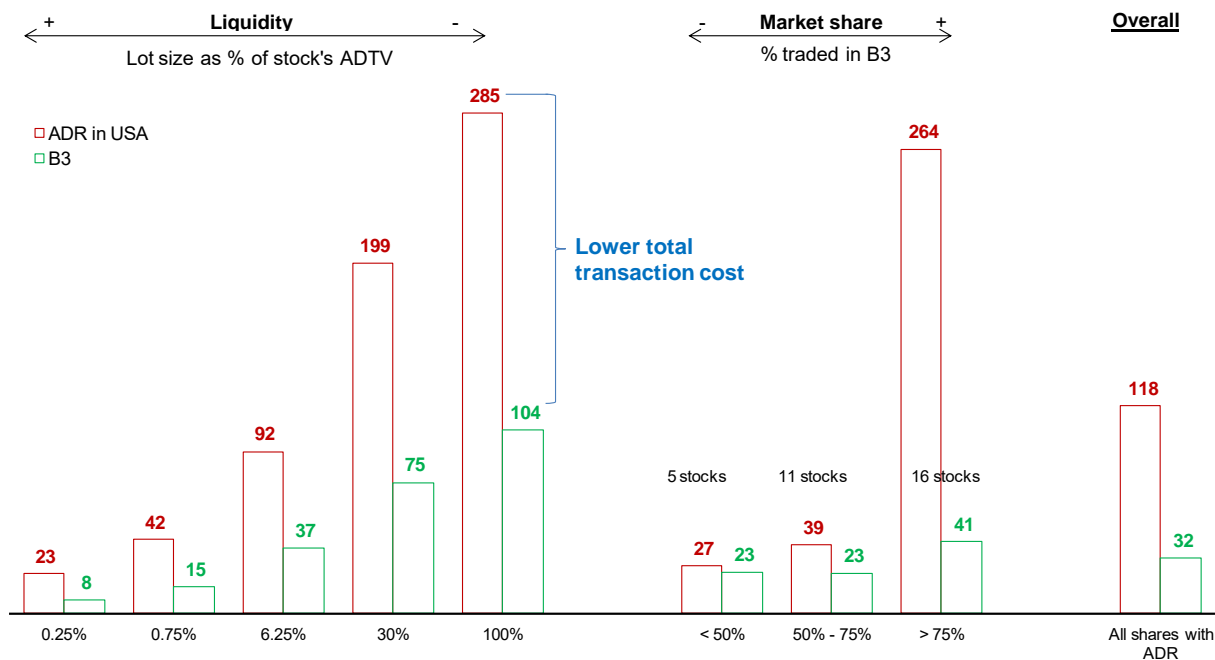
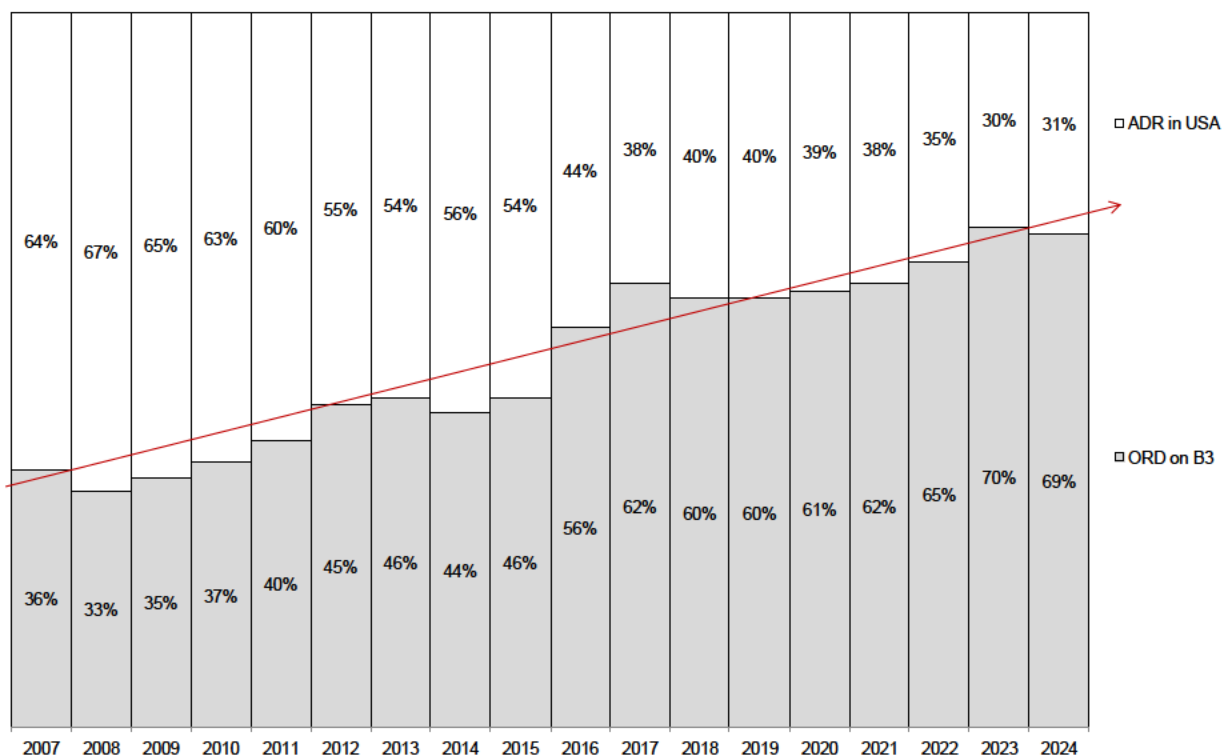


Chart 19: market share in Brazilian stocks with ADRs

Source: B3 and Bloomberg

Market share in Brazilian stocks with ADR



ANNEX 1: Description of Retail Liquidity Provider (RLP) programs in US and Europe

We review the cases of Deutsche Boerse’s Xetra Retail, Euronext Best of Books, Boerse Berlin Equiduct, and NYSE RLP. These “Best of Book” like retail liquidity provider programs are subject to the rules of an exchange and are linked to the order book.

Euronext Best of Books (ENX BoB). Best of Books is a best execution service for retail orders whereby dedicated liquidity providers offer price improvement for the retail flow.¹⁷⁹ BoB liquidity providers (RLP members) accept higher trading costs to be able to capture uninformed flow of retail investors, which has lower adverse selection costs compared to the order book. A Retail Member Organization needs to flag retail orders as such, for the orders to potentially interact with RLP orders. RLP quotes are passive, firm orders and execute in direct competition with the Euronext Central Order Book. These quotes are at, or better than the European Best Bid and Offer (EBBO). If the RMO order is not matched against an RLP quote, it will be matched with an order from the central order book. Price improvements must be provided in full ticks, not sub-ticks, to comply with EU regulations. RLP orders do not have priority over

¹⁷⁹ <https://www.euronext.com/en/media/1818/download>

an identically priced order in the central order book, hence pure price-time priority applies.”¹⁸⁰ Broker clients connecting to the service receive best execution reports, so that investors can measure the quality of the order execution and price improvements. Retail liquidity providers receive fee discounts on Euronext based on the amount of liquidity and competitiveness of the quotes maintained on the central limit order book as market makers.¹⁸¹ Hence retail liquidity providers get an incentive to actively quote on the lit order book as well, benefiting the whole market. Trades are reported by the exchange, cleared by interoperable CCPs, and are settled through the local CSD.

In April 2020, 36% of retail investor trading volumes executed on the Paris stock exchange was conducted via the BoB. In previous month it ranged between 14% and 36%. The remaining part of retail volume were executed on Euronext under the same conditions applicable for an institutional participant. In 2023, the proportion of BoB executions receiving a price improvement was 13%. In fact, AMF data shows that BoB executes both sides at BBO 64.8% of the time, obtains price improvement for one side of the trade 26.1% of the time and provides price improvement to the two sides 8.7% of the time. An overwhelming 98.82% of BoB trades complied with best execution criteria in terms of price, speed and transaction costs. The average execution size is €4.4k. The average price improvement was €3.66 per trade; and the system on aggregate let retail clients save €99 million over the year. Best of Book provides a higher price improvement at times when spreads are wide, generally when there is high volatility. In those cases the probability of obtaining a full tick price improvement increases. Retail Liquidity Providers (RLP) executions are very concentrated with one RLP representing 75% of the volumes in the segment, and other two matching 10% of volumes each.¹⁸²

Deutsche Boerse offers Xetra Retail, a new execution service to offer price improvements based on the current Central Limit Order Book (CLOB) and based on the competing quotes of dedicated Retail Liquidity Providers (RLPs). Xetra segregates retail flow in the order book (aggressive and passive) with preferred execution of the retail orders against RLPs ensuring reference top of book matching with a price improvement option. Price improvements are provided in full ticks, not sub-ticks, to comply with EU regulations. Retail orders are matched against all available orders in the order book and all available RLP quotes. The RLP quote is treated as fully integrated in the order book. However, different from ENX BoB, for the execution of retail orders, a price/ retail / time priority for the RLP quote applies. RLP quotes cannot match against each other. Transaction fees for the execution of retail orders are also reduced. RLP quotes are not displayed and trades are reported by the exchange.

Boerse Berlin Equiduct Apex offers its retail brokers clients consolidated access to 16 order books via a single connection to their platform. It includes the Euronext order book, but without the Best of Book prices. Equiduct provides execution at the Volume-weighted Best Bid and Offer (VBBO), which is a weighting of the best spreads observed on the different order books by volume. The trading platform is

¹⁸⁰ AMF, Analysis of the execution of retail investors' orders in the first months of COVID-19 crisis, March 2022

¹⁸¹ https://www.euronext.com/sites/default/files/202407/Market%20Maker%20Liquidity%20Provider%20Trading%20Fee%20Guide%20Euronext%20Cash%20Markets_Effective%2001JUL2024_01AUG2024.pdf

¹⁸² AMF, Analysis of the execution of retail investors' orders in the first months of COVID-19 crisis, March 2022

supported by a pool of Equiduct's Liquidity Providers and active brokers who are constantly providing liquidity and volume to the major European primary and secondary markets. Liquidity providers specify only a quantity, the VBBO price being automatically calculated by the venue. Similar to BoB, liquidity provision is highly concentrated (86%) in one market maker. 55% of the retail investor volumes traded on Equiduct are executed at the VBBO. If a retail investor's order cannot be executed at the VBBO, the order is then redirected to the Hybrid Book (HB) which is a conventional continuous order book. Hybrid Book centralizes passive orders of retail investors which are not executed via the VBBO; and accounts for the remaining 45% of the total volumes traded on Apex.¹⁸³

In fact, Equiduct does not provide significant price improvement compared to the established exchange. Excluding fees, a comparison with Euronext Paris for French stocks shows that VBBO executions happen at Euronext best bid and offer around 57% of the time, better than Euronext around 10% of the time and worse than Euronext 33% of the time. HB executions, in turn, are inferior to Euronext a significant 64% of the time, at Euronext levels 25% of the time and better to Euronext just 11% of the time. When AMF includes the fees in the analysis, retail is better off executing at VBBO on Equiduct 73% of the time and below Euronext 27% of the time. When comparing HB executions, Equiduct is better than Euronext 64% of the time and worse 36% of the time. Comparing with Best of Book, including fees, Equiduct is better than Euronext 46% of the time, and Best of Book is better 54% of the time.

Also, Equiduct Apex lowers costs to retail brokers as it does not charge execution fees. It charges lower membership fees and market data fees; it has lower clearing costs as orders trade in greater single execution sizes reducing the number of trades sent to clearing. Further, it does not require a smart order routing mechanism and they say that they provide access to the whole European exchanges with a single connection. Apex is fully pre- and post-trade transparent, providing daily execution quality reports to evidence best execution for retail orders.

The New York Stock Exchange (NYSE) created a Retail Liquidity Provider Program in 2012. Retail brokers need to register as Retail Member Organizations (RMO) with the exchange to receive a price improvement for their clients. Liquidity to the RLP program can be provided by any member. Client orders executed in the RLP cannot originate from a trading algorithm or any other computer methodology. RLP orders are not displayed and NYSE requires a minimum price improvement of \$0.001. Trades must be conducted at minimum RLP quotes increments of \$0.001. Executions respect the order book price time priority. Recall the exchange's minimum increment for displayed quotes is one cent. In fact, the average price improvement that retail clients are obtaining is \$0.003 per share.¹⁸⁴

Summary of RLP programs

¹⁸³ AMF, ANALYSIS OF THE EXECUTION OF RETAIL INVESTORS' ORDERS IN THE FIRST MONTHS OF THE COVID-19 CRISIS, MARCH 2022

¹⁸⁴ Pankaj K. Jain, Jared A. Linna, Thomas H. McNish, An examination of the NYSE's retail liquidity program, The Quarterly Review of Economics and Finance, Volume 80, May 2021, Pages 367-373

Internalization Models	Europe			USA	Brazil
Asset class	Equities	Equities	Equities	Equities	Equities and Minis
Model	Best of Books	Xetra Best	Borse Berlin Equiduct	NYSE RLP	Retail Liquidity Provider (RLP)
Internalization conducted under the rules of a marketplace	Conducted under Euronext rules	Conducted under Xetra rules	Equiduct rules	NYSE rules	Conducted under the B3 rules
Payment for Order Flow (PFOF)?	Banned in 2023. To be completely phased out by end of June 2026			Allowed	Allowed
Customer segmentation	By exchange's rule design	By exchange's rule design	By design	By design	<i>de jure</i>
Order execution	at top of book or better	at top of book or better	at Volume-weighted BBO	at top of book or better	At top of book or 1 tick improvement
Priority	Price / Time	Price / Broker / Time	Price / Broker / Time	Price / Time	Price / Broker / Time
Interaction with order book	Linked to order book	Linked to order book	Executes at BBO or routes	Linked to order book	Linked to order book
Is Price Improvement required to execute off-market?	Optional / Not guaranteed	Optional / Not guaranteed	VBBO, not price improvement	Requires	Optional / Not guaranteed
Minimum size of price improvement	Sub-penny	Sub-penny	-	\$0.001	Full tick or midpoint
Quantitative restrictions (Maximum%)	None	None	None	None	Restricted to certain max %
Minimum quoted price increment	EU-wide regime; depends on price and liquidity	EU-wide regime; depends on price and liquidity	EU-wide regime; depends on price and liquidity	\$0.001	R\$0.01
Minimum trade price increment	Sub-penny	Sub-penny	Sub-penny	\$0.001	Full tick or midpoint
Order handling disclosures	Best execution policy. RTS 28 to be deleted	Order and best execution policy. RTS 28 to be deleted	Order and best execution policy. RTS 28 to be deleted	Rule 606	B3 MPO
Best execution criteria	Total consideration	Total consideration	Total consideration	Best price	Minimum cost

In France, retail participation is small overall.¹⁸⁵ During the pandemics, amid the global retail frenzy, the number of retail traders increased by 150 thousands, similar to what we have seen in other regions of the world. RLP programs like, Euronext Best of Books and Equiduct represent a significant portion of that order flow. Best of Book represents 17% of retail volume, Equiduct VBBO accounts for 11%, Equiduct Hybrid Book represents 9% and Tradegate makes 4%.¹⁸⁶ In this sense, while overall retail represent with a small part of the whole market, RLP programs contribute with a significant portion of the segment.

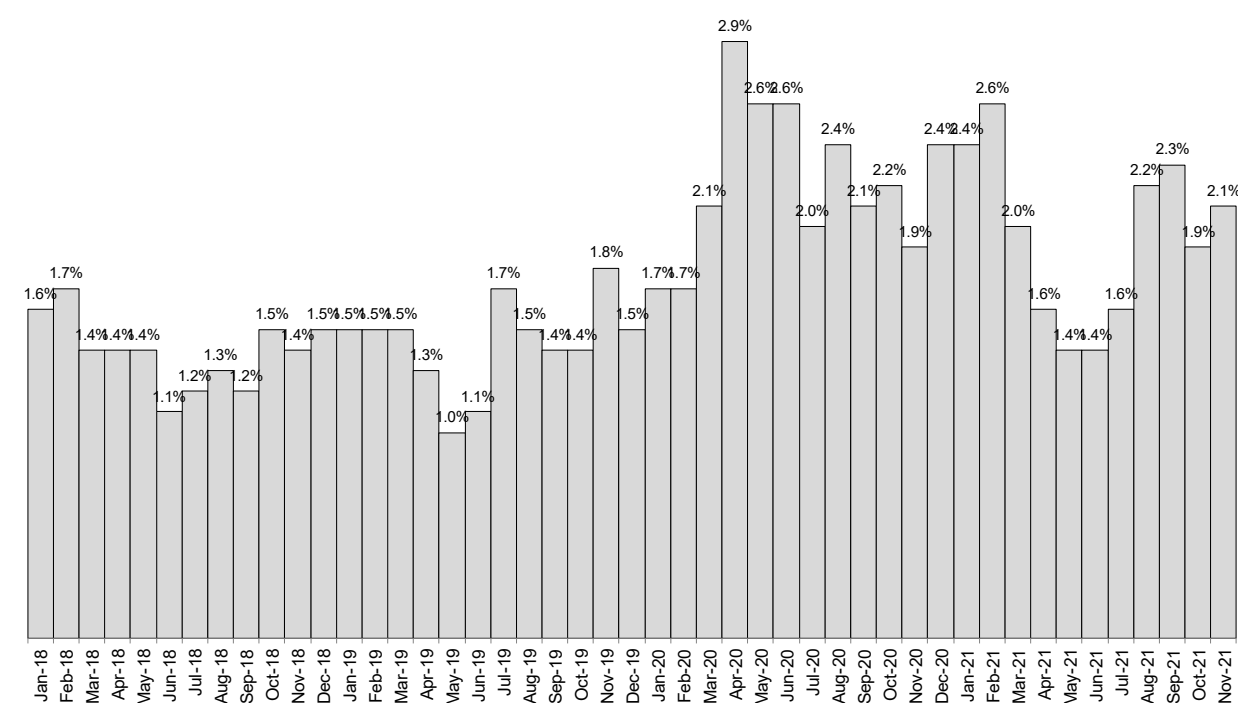
In USA on the contrary, even when RLP volume on NYSE and NYSE Arca has grown in recent years, as retail volume has increased, it remains a small share of total market activity and total retail activity.¹⁸⁷

¹⁸⁵ AMF, Analysis of the execution of retail investors' orders in the first months of the Covid-19 crisis, MARCH 2022

¹⁸⁶ Based on AMF Analysis of the execution of retail investors' orders in the first months of the Covid-19 crisis, MARCH 2022

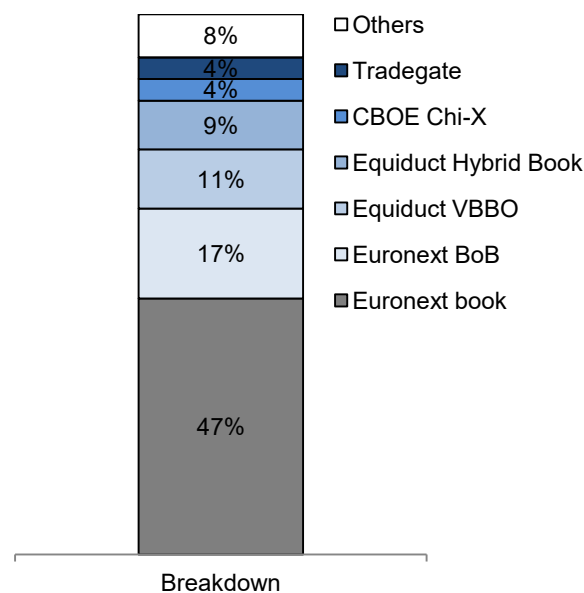
¹⁸⁷ See NYSE

% retail trading in France



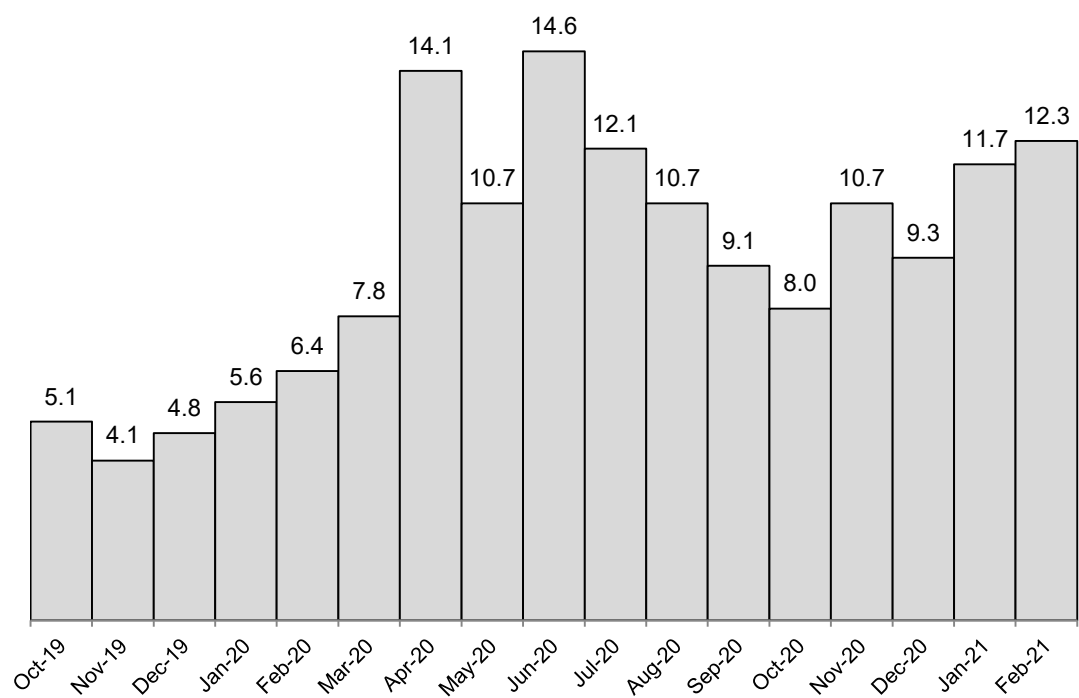
Source: AMF , Analysis of the execution of retail investors' orders in the first months of the Covid-19 crisis, MARCH 2022

Breakdown of retail trading in France

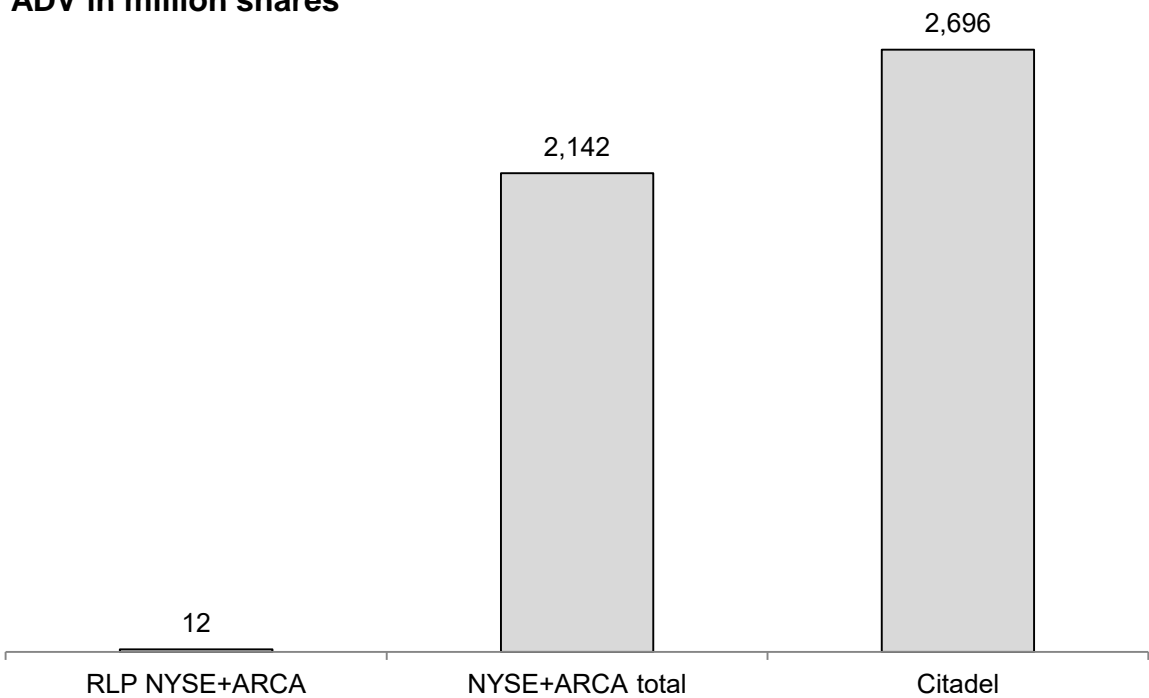


Source: AMF , Analysis of the execution of retail investors' orders in the first months of the Covid-19 crisis, MARCH 2022

NYSE and NYSE ARCA retail ADV
(in million shares)



ADV in million shares



After the implementation of the RLP programs, do the regulators changed any rule related to internalization on these jurisdictions?

Xetra Best was introduced by Deutsche Boerse in 2002¹⁸⁸, even before the enactment of Markets in Financial Instruments Directive (MiFID) in Europe in 2004, which became effective in 2007. In 2002, Europe enacted the Investment Service Directive which opened the door to internalization.¹⁸⁹ In 2004, the European Parliament enacted MiFID, which abolished the concentration rule and recognized systematic internalizers.¹⁹⁰

In 2024 Xetra launched Xetra Retail, a revised RLP service.

After the introduction of Best of Books at Euronext in late 2016, the European Union established a pan-European tick size regime, set the minimum price improvement based on those tick sizes, or mid-point,¹⁹¹ and banned payment for order flow in 2023¹⁹².

¹⁸⁸ Theissen, Erik, 2002. "Internalisierung und Marktqualität: Was bringt Xetra Best? ", CFS Working Paper Series 2002/06, Center for Financial Studies (CFS).

¹⁸⁹ INVESTMENT SERVICES DIRECTIVE (2002). DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL ON INVESTMENT SERVICES AND REGULATED MARKETS AND AMENDING COUNCIL DIRECTIVES 85/611/EEC, 93/6/EEC and 2000/12/EC

¹⁹⁰ MiFID: DIRECTIVE 2004/39/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 April 2004 on markets in financial instruments amending Council Directives 85/611/EEC and 93/6/EEC and Directive 2000/12/EC of the European Parliament and of the Council and repealing Council Directive 93/22/EEC.

¹⁹¹ Delegated Regulation (EU) 2017/58, Article 10

¹⁹² Regulation (EU) of the European Parliament and of the Council of amending Regulation (EU) No 600/2014 as regards enhancing data transparency, removing obstacles to the emergence of consolidated tapes, optimising the trading obligations and prohibiting receiving payments for forwarding client orders.