

**Market Fragmentation and Its Impact: a
Historical Analysis of Market Structure
Evolution in the United States, Europe,
Australia, and Canada**

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EXECUTIVE SUMMARY

Market Fragmentation and Its Impact, commissioned by BM&F Bovespa and produced by Aite Group, examines the effects of market fragmentation on four specific financial centers: the United States, Europe, Australia, and Canada. The study takes a historical perspective of market fragmentation and evaluates how each market navigated through structural transformation, implemented specific market practices, and addressed certain regulatory issues during the last few years in attempts to ensure investor confidence and market transparency.

Highlights of the study include the following:

- While market fragmentation has occurred across many different markets to date, the overall impact of fragmentation on each market has varied depending on existing market size, regulation, infrastructure, post-trade environment, and the legacy of pre-fragmentation market structure.
- Market fragmentation has certainly led to a decline in explicit transaction costs and has encouraged market innovation, but it has also generated negative unintended consequences that have seriously threatened market stability and investor confidence.
- In the **U.S. equities market**, where market structure changes unfolded during a period of over 10 years, market fragmentation was accommodated by several key market infrastructure components that were already in place: a centralized clearing and settlement function, market competition amongst exchanges, and a well-defined business and technology process involving the concept of consolidated tape. This experience was unique amongst markets.
- Despite the fact that MiFID was implemented in 2007, market fragmentation in **Europe** is still not as evolved or stabilized as we have been able to observe in other markets, such as in Canada. Besides basic differences in size and simplicity, we can identify some other characteristics that have not been conducive to the success of the fragmented European market's path to maturity:
 - Regulatory changes are still ongoing at the pan-European level. No finality is imminent, and any potential compromise is difficult to predict.
 - Lack of consolidated tape and fragmentation in clearing and settlement has discouraged interest from new entrants, thus dampening the prospects for further market fragmentation.
 - While the market is clearly fragmented at the pan-European level, when analyzing individual major markets within Europe, it is clear that each incumbent exchange still has a strong presence in defending its domestic market. The only real competitor is BATS Chi-X, making most individual markets look like a duopoly.
- The **Australian market** is the most recent financial center to experience the process of market fragmentation. Australian market size and liquidity are small (but not tiny)

relative to the other markets included in this study, a characteristic which prompts debates regarding the fortuitousness of introducing a competitive structure considering the additional cost burden of multi-market surveillance, which is ultimately passed on to market participants. After regulatory expenditures upwards of A\$42 million, the new Australian market structure has resulted in market share of 12% to 17% for Chi-X Australia. Members of Australia's sizeable institutional community are better positioned to absorb the additional regulatory and connectivity costs associated with fragmentation than are the country's smaller domestic participants.

- The **Canadian market structure** transition that occurred over the last five years, at an arguably accelerated pace, was driven by leading Canadian banks desiring to pressure the incumbent market center to moderate its prices, as well as improve technology and customer service. After recent round of consolidation, today's Canadian market looks like a duopoly represented by the TMX Group (and all of its different execution venues including Alpha Trading) and Chi-X.

The study also analyzes key implications of market fragmentation for four specific areas within each market:

- Best execution
- Connectivity and routing
- Consolidated tape
- Self-regulation and rule-making

BEST EXECUTION

The definition of best execution globally is broad, and leaves many aspects to interpretation. While price is always an important variable to consider, it is never the only factor. Other key components (besides price) that should be considered as part of a best execution analysis in the context of market fragmentation include:

- Speed of execution
- Fill rates of specific venues (i.e., likelihood of execution)
- Liquidity profile of symbol
- Size of transaction and average volume of given symbol
- Specific instructions from qualified clients
- Prevailing market conditions during period of execution
- Details on order routing decisions

While identifying violations of best execution principles might be challenging for the regulator, the burden of capturing the requisite data, and storing such data, to prove best execution clearly resides with the broker-dealer community for all of the markets analyzed. Additionally, as markets fragment, post-trade reporting requirements must be heightened to allow specific information surrounding routing decisions to be clearly formulated, thus providing a better environment for best execution in a fragmented environment.

Furthermore, delineation of best execution policies according to end-customer segment (retail vs. institutional) can be an important component of best execution theory, as investors' needs and requirements will understandably differ according to categorization. Typically, the burden of best execution for retail investors will be more restrictive, following the general theory that retail investors are less informed, on average, in comparison to institutional investors, and thus require greater regulatory protection.

Not surprisingly, complying with best execution obligations is often the leading driver for investment in IT infrastructure. Developments in connectivity, trading systems, compliance engines and routing has become an integral part of ensuring best execution – a reality that is applicable from the broker-dealer community to the exchanges. Rapid development in the adoption of execution algorithms and smart order routing technology can be viewed as a reasonable response to the challenge of mitigating operational risk in a fragmented marketplace.

CONNECTIVITY AND ROUTING

If best execution should be viewed as specific written policy and procedure, connectivity and routing represents the necessary plumbing and logic to fulfill the promise of best execution. Currently, there are ample providers of both connectivity and routing services, and these will continue to lower the price of entry into a fragmented marketplace assuming that these global vendors are able to move into new fragmented markets without artificial competitive barriers in the form of hidden taxation or unfair protection of local competitors.

Cost associated with connectivity is completely dependent on level of fragmentation within the specific marketplace as well as the strategic needs of broker-dealers to connect to every venue available. In the U.S. market, which is clearly the most fragmented market in the world, even for the largest brokers, it is pretty rare for them to connect to every single venue, simply because the costs of connecting with certain markets (i.e., those with minimal trading activity) would outweigh any benefits of actually maintaining that particular connection. As a result, a handful of small-broker-licensed routing services function as the order router for small market centers.

Overall, in the U.S. market, Tier-1 brokers typically spend well over US\$1 million annually on connectivity, while Tier-2 brokers are burdened with approximately US\$700,000. Tier-3 firms currently stand at around US\$250,000. For a market like Brazil and Australia where significant market fragmentation is not expected due to its relative market size and trading activity, broker-dealer spending on connectivity is probably on the lower end of the spectrum at US\$250,000.

SOR platforms play a pivotal role in fragmented markets, enabling both brokers and market centers to make sub-millisecond order routing decisions based on preset parameters, typically aligned with best execution obligation. Similar to other technology components, cost for SOR can

also vary widely, depending on the total number of routable venues (also on access to dark pools), ability to handle order types, latency levels, and complexity of data input and analysis.

On the higher end of the spectrum, SOR can cost approximately US\$600,000 annually; on the lower end, it can go for a relatively affordable US\$150,000. Average cost currently stands at US\$300,000.

CONSOLIDATED MARKET DATA

Other than in the U.S. market and, to a lesser degree, the Canadian market, the provision of consolidated data has been wrongfully overlooked and can be viewed as one of the reasons for increased costs for operating in markets such as Europe. Lack of consolidated market data also adds unnecessary complication to compliance with best execution.

As market structures transform, it is vital for the marketplace to support a regulator-approved, single source information processor for consolidated market data to facilitate consistency and ensure validity of the data itself. This is precisely the approach the U.S. market took decades ago to guard against the fragmented side effect of fragmented market data. Competition amongst third-party vendors for dissemination of consolidated tape from the single source processor certainly occurs, which makes access to consolidated data more affordable. As a result, markets facing potential fragmentation should consider the following when dealing with potential for consolidated data:

- Single information processor should be designated by the regulator to ensure data validation and quality, following the lead of U.S. and Canadian markets
- Some form of data revenue sharing should be seriously considered for data contributors similar to the U.S. market
- Third-party vendors can actively participate in distributing data, with the potential for competing on the merits of speed, value added data, and also quality

SELF-REGULATION AND RULE-MAKING

The U.S. securities market is the most prominent marketplace for self-regulation and rule-making (i.e., the SRO model). There are many perceived benefits of the SRO model, including leveraging industry experts to self regulate, leading to fewer government-initiated directives and enabling government agencies with limited budgets to efficiently deal with complex market structure. However, given the numerous regulatory changes and ongoing upheaval related to fragmentation within the U.S. equities market during the last five years, one could also argue that the SRO model may not be the best industry benchmark for capital markets regulatory structure.

Indeed, while the U.S. market has fully embraced the SRO model, the rest of the world decidedly has not. Regulators in most non-U.S. markets have cited potential conflicts of interest for exchanges operating as an SRO. In those markets, exchanges remain active in terms of identifying potential compliance failures, but the investigation of and the ultimate disciplinary

action resulting from illegal activities resides firmly in the hands of the government regulators. The following factors also commonly appear in argument against the SRO model:

- Potential for regulatory arbitrage
- Incentives for loosening regulations
- Inherent conflict with members
- Potential growing conflict between SRO regulatory function and market operations
- Conflict with issuers
- Multiple SRO duplication
- Difficulty in harmonizing market surveillance

As markets morph from single- to multi-market structures and regulators are forced to adopt additional responsibilities in order to regulate different market centers, the overall cost of monitoring market activities will inevitably increase. A recent example from the Australian market is an appropriate one to examine, as the Australian regulator, Australian Securities and Investments Commission (ASIC), in expectation of marketplace competition, took over responsibility for supervision of real-time trading on domestic licensed markets in August 2010:

- Since August of 2010, ASIC's additional costs incurred as a result of the new regulatory functions necessitated by market fragmentation have exceeded A\$42 million, which have been somewhat evenly split between the cost of implementing the policy to promote market competition and the transfer of supervision
- A significant portion of these expenditures were either directly or indirectly related to market surveillance needs
 - Costs directly related to the market surveillance function (including real-time surveillance) drove the largest portion of spending
 - Technology infrastructure represented the second largest expenditure, which includes continuing upgrades to ASIC's Integrated Market Surveillance System (IMSS), which was originally purchased from NASDAQ SMARTS in 2010

INTRODUCTION

The global capital markets have experienced a metamorphosis during the last 15 years. The advent of the Internet and adoption of other innovative technologies have facilitated an unprecedented level of transparency in exchange-traded markets and substantially lowered barriers to market entry. Along the way, electronic trading has become a competitive requirement for most major financial centers, and automation within the marketplace has created high levels of efficiency while eliminating many jobs that will likely never be recreated.

One of the most fascinating changes over the last decade has been the transformation of the exchange competitive landscape, often beginning with the process of demutualization, which essentially altered the composition of many exchanges at a molecular level. As these venues transformed themselves from member-owned (i.e., broker-dealers) industry utilities to profit-maximizing entities, they also found themselves increasingly coming into conflict with their former members.

Across geographies, market consolidation has become a persistent trend over the years, as large exchanges have scrambled to further expand regional presence and broaden support for different asset classes. Causation of this widespread consolidation movement can be attributed to a number of factors, but one has certainly been increased competition among trading venues in domestic markets, referred to as market fragmentation.

The wave of market fragmentation can be traced back to the late 1990's in the U.S. equities market, with NASDAQ as perhaps the most famous example. The initial impact of the emergence of little-known brokers dubbed electronic communication networks (ECNs), driven by regulatory changes in the United States, seemed—at best—fairly innocuous at the time. With names like Island, Strike, and BRUT, the seemingly inconsequential new market entrants faced the arduous task of convincing established Wall Street veterans to take them seriously.

Nevertheless, the launch of the ECNs ultimately signaled end of the old way of trading, triggering what has amounted to a complete transformation of market microstructure, not only in the U.S. market but in other major financial centers around the globe as well. In the U.S. market, the market share of incumbent exchanges disintegrated from over 90% of the market to less than 25% in the most extreme cases. While increased competition has conclusively led to a dramatic decline in explicit execution costs, it has also generated some unsavory and unintended consequences. In some cases, these inadvertent repercussions have elicited fundamental questions regarding the fairness and stability of the capital markets.

This study presents a historical evaluation of the market fragmentation that has occurred in four major markets: the United States, Europe, Australia, and Canada. The following sections will detail the overall market structure changes observed in each market and illuminate some of the key market impacts that have shaped the current market reality.

MARKET STRUCTURE EVOLUTION IN THE U.S.

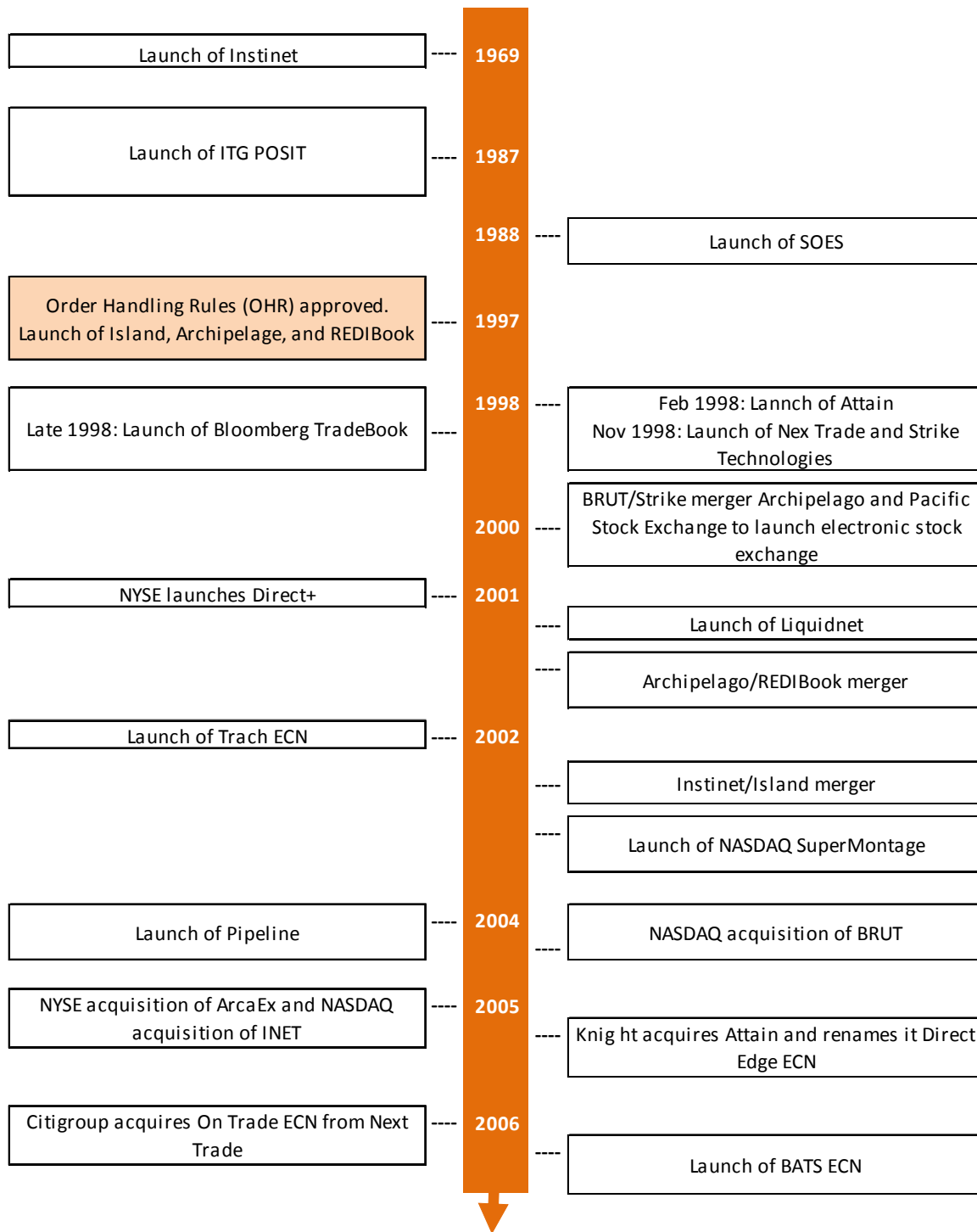
The U.S. equities market structure has undergone radical changes during the last 15 years. In the aftermath of the Order Handling Rules of 1997, competition has increased substantially and has led to the creation of various independent execution venues, including ECNs, alternative trading systems (ATSs), and dark pools. Initially, market fragmentation was limited to NASDAQ, as various viable execution venues materialized and proceeded to seriously threaten NASDAQ for execution revenue (Figure 1).

By 2002, however, a wave of consolidation was triggered by the merger of Archipelago and REDIBook, which was then owned by Goldman Sachs. Subsequently, the most significant ECN merger occurred when Instinet acquired Island (becoming INET), its chief competitor in the ECN market. NASDAQ embarked on a spending spree soon after the Instinet merger, determined to recapture its lost market share by acquiring BRUT. This consolidation trend peaked in 2005, during which the NYSE acquired ArcaEx and NASDAQ teamed up with INET, thereby creating a de facto duopoly in the U.S. equities market.

Just when the market was adapting to the concept of a more centralized marketplace, another wave of fragmentation swept the marketplace in the aftermath of Regulation NMS (typically referred to as Reg NMS), echoing 1997 events. Beginning in 2001, a number of ATSs appeared on the market landscape, endeavoring to meet the growing needs for block trading in the marketplace. Additionally, many large dealers, fearful of total dominance by the NYSE and NASDAQ, formed partnerships with buy-side firms in order to either support existing execution venues or to create new execution venues. Large bulge bracket firms also jumped into the fray more directly by launching or developing internal crossing engines, designed to take advantage of the massive order flow passing through broker trading desks.

By Q3 2006, the short wave of consolidation ended, and the U.S. equities market began to resemble the post-1997 state of the market, when market fragmentation appeared to gain momentum. This time, however, both the NYSE-listed and NASDAQ-listed securities were feeling the effects.

Figure 1: Key U.S. Market Events, Pre-Implementation of Regulation NMS



Source: Aite Group

MAJOR REGULATORY EVENTS IN THE U.S.

To many observers, the idea of a national market system in the U.S. market may appear to be something new rising out of the implementation of Regulation NMS in 2005. In fact, the concept is ingrained in the Securities Exchange Act of 1934 and has been behind much activity of the U.S. Securities and Exchange Commission (SEC) since 1975. In that year, the U.S. Congress amended the Securities Exchange Act to establish a framework for creating a national market system for equity securities. The framework was predicated upon the concept of market transparency (by way of quote and execution information), market center linkage, fairness, and efficiency. These underpinnings, Congress believed, would foster the development of a healthy, vibrant capital market—an essential foundation of a strong national economic structure. To facilitate the development of the national market structure, Congress expanded the powers of SEC.

The SEC focused on market structure development by encouraging the widespread use of evolving technology. Mandated to "facilitate" rather than "direct" the formation of a national market, the SEC relied on market participants to put forward collective plans on how to best implement a workable structure. Going was slow as agendas clashed in spite of SEC requests to act for the "greater good." Some 20 years later in the mid-1990s, the technological underpinnings of the market finally in place, the SEC took aggressive direct regulatory action designed to balance inherent inequities and remedy inefficiencies.

ORDER HANDLING RULES OF 1997

Our analysis begins with the SEC regulatory decisions of 1997, which sought to rein in widespread corruption and illegal order handling by NASDAQ market-makers. The Order Handling Rules (OHR) of 1997 sought to create a more orderly market in which all market participants would have access to greater market transparency and improved execution rates. The OHR consists of two rules:

- **Limit Order Handling Rule (Rule 11Ac1-4):** This rule mandated that market-makers receiving limit orders inside their spread must handle these orders in one of three ways (the first two options effectively resulted in market-makers narrowing their spreads or reducing their profits):
 - Incorporate the price into their quote in NASDAQ quote montage
 - Execute the limit order immediately
 - Send the limit order to another market participant (other market-makers or ECNs) that will display the order
- **Quote Display Rule (Rule 11Ac1-1):** This rule banned market-makers from posting one quote in the NASDAQ quote montage and a different quote for the same stock in an alternative trading network. Under the same rule, however, dual quoting became permissible if the alternative trading network had a direct link to NASDAQ and had the capability to post its best bid and offer on the NASDAQ quote montage.

Collectively, these rules had a profound impact on both market structure and over-the-counter (OTC) securities trading. The Limit Order Handling Rule put client quotes on the same footing as market-maker quotes, while the Quote Display Rule in effect "sanctioned" ECNs as part of the

national market structure. And as a result, these two tenets of the OHR ensured that ECNs would thrive in the NASDAQ market. ECNs became the main outlet for unwanted limit orders from market-makers. Large buy-side firms became attracted to ECNs because of their ability to execute orders anonymously and to minimize market impact. For all market participants, the rapid, automatic matching capability of the ECNs substantially lowered transaction fees, which directly translated into substantial cost savings.

REGULATION ALTERNATIVE TRADING SYSTEM OF 1999

ECNs were proprietary systems beyond the scope of regulatory oversight at the time the OHR were implemented. The near-immediate proliferation of ECNs following the effective date of the OHR alerted the SEC to the growing number of execution venues not subject to regulation. To remedy the regulatory framework and better reflect the needs of the evolving market, the SEC implemented the Regulation Alternative Trading System (ATS) in 1999.

Regulation ATS set forth the definition of an alternative trading system and specified various operating requirements. Key elements include:

- **Registration as a Broker-Dealer (Rule 301b-1):** All ATSs were required to register as broker-dealers.
- **The "5% Rule" (Rule 301b-3):** ATSs registering as broker-dealers, displaying quotes to subscribers, and trading in excess of 5% of the average daily volume (ADV) of a national market stock in four of the preceding six months were required to submit quotes to a national securities exchange or the National Association of Securities Dealers (NASD, the current FINRA) for distribution to market data vendors (i.e., wide public dissemination). Broker-dealers with access to the exchange or NASDAQ had to be able to transact against those quotes.
- **The "Fair Access" Rule (Rule 301b-5):** ATSs registering as broker-dealers, displaying quotes to subscribers, and trading in excess of 5% of the ADV of a national market stock in four of the preceding six months were required to establish written standards that did not unreasonably prohibit access to the ATS.

Interestingly, the unstated alternative to broker-dealer registration under Rule 301b-1 was to apply to the SEC for exchange status. Of the nine ECNs in existence at the time of Regulation ATS implementation, three filed for exchange status. The benefits of exchange status over broker-dealer registration were twofold: As a self-regulatory organization (SRO), market centers had a broader ability to control some aspects of their trading operations; furthermore, as exchanges, these market centers would be able to join the Intermarket Trading System (ITS), which would provide them access to greater listed securities business. (At the time of Regulation ATS implementation, approximately two-thirds of listed securities volume was subject to stringent exchange rules that significantly restricted off-exchange trading, thereby providing exchanges with a distinct advantage in this business.)

A second interesting point, only ATSs that displayed quotes were subject to Rule 301b-5, the Fair Access Rule. Anonymous matching systems and crossing networks, which did not display quotes,

were specifically exempted from the fair access requirement if that venue executed in excess of 5% ADV as specified in the regulation.

REGULATION NATIONAL MARKET SYSTEM (REG NMS) OF 2005

Regulation NMS, first proposed in February 2004, took another weird turn when the SEC released a radically revamped version around Christmas 2005. Instead of retelling the story of the different versions, this section will focus on the content of the final proposal.

The SEC has traditionally walked a fine line between pushing for an integrated national market system and encouraging competition. The SEC is certainly not an insulated regulatory agency devoid of outside influences. On the contrary, the SEC is a political animal, highly influenced by external forces. Arguably a very conservative regulatory agency, the SEC, more often than not, errs on the side of minimum regulatory intrusion. As a result, despite its long desire for a more consolidated national market, it has thus far erred on the side of using competitive forces to push the national market system forward.

At least that was the case until early 2004, when the SEC came out with its proposed Regulation NMS, designed to create a more integrated market system. The SEC's main argument for Reg NMS can be summed up by the following considerations:

- **Protection of individual investors:** One unifying theme of the SEC has been its focus on protecting the interests of individual investors. This type of thinking went to the heart of the most controversial area of Reg NMS: the Trade-Through Rule (aka Order Protection Rule). This rule, in essence, took a very narrow view of what best possible execution should be by focusing on best price. While this may be beneficial for the individual investors in general, some of the largest institutional investors argued otherwise.
- **Recognition of available technology and the need to change ITS:** The viability of the outdated ITS, which began operations in 1979, had been the subject of debate for over a decade. Finally, the SEC decided that given the availability of cost-effective connectivity solutions provided by third-party technology providers, it was no longer necessary to operate an artificial national market system based on outdated IT infrastructure.
- **Leveling the playing field in terms of regulation:** With the existence of multitudes of execution venues, the SEC opted to create an overarching national regulation that can dictate the way the entire national market system will behave instead of singling out specific stock exchanges.

In the end, the SEC wanted a set of rules that can be applied uniformly across all U.S. equities market centers to improve market transparency and to guarantee fair access for individual investors. The core of Reg NMS is composed of four key rules:

- **Trade-Through Rule (Rule 611):** The basic idea of the Trade-Through Rule (aka Order Protection Rule) was to protect limit orders of investors by forbidding a particular market center from trading through another market with a better price and executing the order at an inferior price. The Trade-Through Rule within the ITS plan

had existed for many years, although only within the exchange-listed stocks and with little enforcement. Under the new Trade-Through Rule, order protection extended to NASDAQ stocks as well as to block trading and small orders (i.e., so-called "100 share order"). In addition, faced with the reality of floor and electronic markets, the Trade-Through Rule would only protect automated quotes. There were built-in exceptions to the Trade-Through Rule, including intermarket sweep (enabling firms to simultaneously sweep multiple market centers at different price levels) and flickering quotes. The rule also required all market centers to develop and enforce policies and procedures to deter trade-throughs. Perhaps the most controversial part of the Trade-Through Rule was the two alternative versions the SEC proposed:

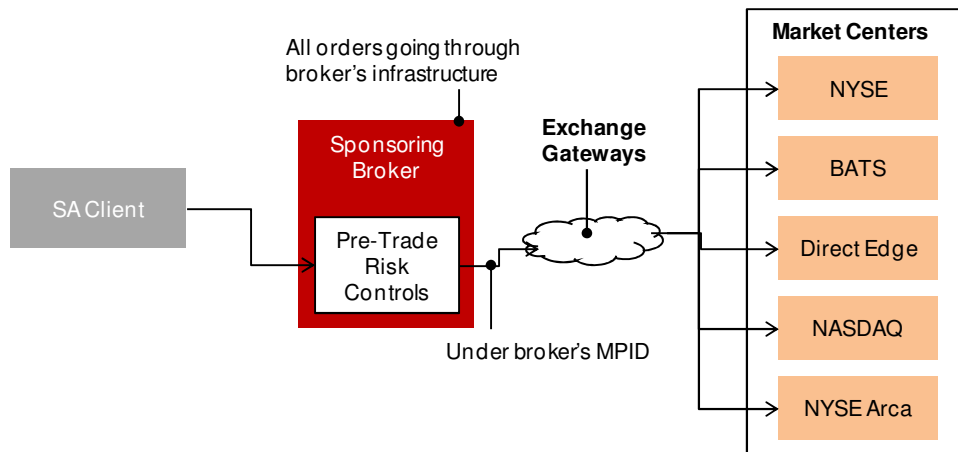
- **Top of book (TOB):** This first alternative (i.e., "Market BBO Alternative") would only protect the best bids and offers (BBOs), leaving the market requirement quite similar to the one that currently exists under the ITS plan.
- **Depth of book (DOB):** This second alternative (i.e., "Voluntary Depth Alternative") would protect the entire depth of book beyond the BBOs but only require market centers to display DOB on a voluntary basis. This was the virtual central limit order book (CLOB) alternative that caught most market participants off guard when it was introduced.
- **Access Rule (Rule 610):** This rule tackled a number of issues surrounding access to Reg NMS stock quotes. First, the Access Rule addressed the hotly debated ECN access fees by mandating that any market center can charge an access fee capped at US\$0.003 per share. Second, the rule encouraged ITS/UTP members to use private links to connect to other members, thereby implicitly signaling the eventual phase-out of ITS. Third, the rule required market centers to develop and establish procedures to prevent locked or cross markets. Finally, the rule lowered the threshold of fair access as stipulated in Regulation ATS from 20% to 5% of the ADV of a given stock.
- **Market Data Rules and Plans (Rules 601 and 603):** These rules addressed market data availability issues and the need to link market data revenue and usefulness of data. First, these rules would enable market centers and their members to independently distribute market data, with or without fees, while still mandating market centers to report their best quotes and trades to their designated securities information processors (SIPs). Second, a new formula would be used to allocate market data revenue, taking into account the value of quotes and trades into the consolidated data stream. Finally, the rule proposed a new definition of "consolidated display" to only include data on national BBO (NBBO) and consolidated last sale information.
- **Sub-Penny Rule (Rule 612):** Considered to be the least controversial aspect of Reg NMS, this rule prohibited market participants from displaying and accepting quotes of NMS stocks in sub-penny increments, with an exception for those stocks priced below US\$1.00 per share.

Combined, these four rules made up Reg NMS, which the SEC hoped would create a true national market system in which key rules could be applied uniformly across market centers and to ultimately protect the rights of individual investors.

MARKET ACCESS RULES (15C3-5)

One of the byproducts of market fragmentation has been the inability for a single market to keep track of levels of risk taken by individual firms in the overall marketplace. Prior to the credit crisis of 2008/2009, this was not a discernible issue, but the failures of Lehman and Bear Stearns highlighted the dangers of counterparty risk. On top of this, the continued growth of high frequency trading (HFT) and the perceived lack of regulatory oversight over their trading activities shed light on a type of market access activity called sponsored access.

The origin of sponsored access can be traced back to the practice of direct market access (DMA), in which a broker who is a member of an exchange provides its market participant identification (MPID) and exchange connectivity infrastructure to a customer interested in sending orders directly to the exchange. In this way, the broker has full control over the customer flow, including pre- and post-trade compliance and reporting. The DMA customer, in turn, gains direct access to major market centers (Figure 2).

Figure 2: Direct Market Access Work Flow

Source: Aite Group

While DMA can theoretically be considered part of a wider definition of sponsored access, for the purpose of this study, sponsored access is defined as a non-member entity (i.e., a sponsored participant) gaining direct access to market centers by using the MPID of a member broker-dealer (i.e., a sponsoring broker), leveraging access infrastructure not owned by the sponsoring broker.

There are potentially three types of sponsored participants in a sponsored access arrangement (Table A):

- Broker-dealer that is a member of market centers
- Non-member, registered broker-dealer
- Non-broker-dealer organization

Table A: Types of Sponsored Access in the U.S.

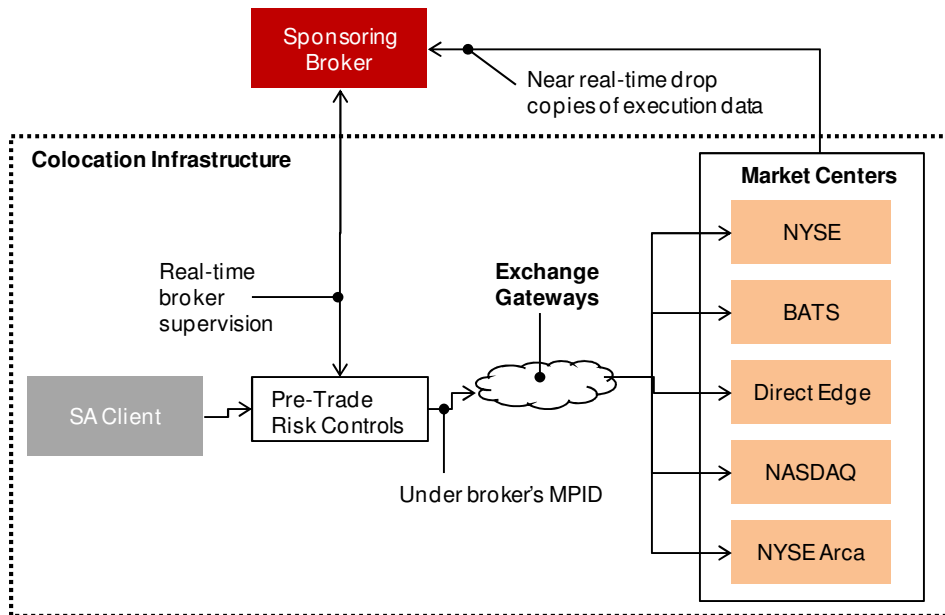
Type of Participant	Motivations for Participation
Member broker-dealer	- Lower execution costs by piggybacking off a member broker-dealer's volume discounts - Higher rebates
Non-member broker-dealer	- Lower execution costs by piggybacking off a member broker-dealer's volume discounts - Gain direct access to market - New revenue source for attracting customers looking for direct market access - Higher rebates - Anonymity
Non-broker-dealer entity	- Lower execution costs by piggybacking off a member broker-dealer's volume discounts - Gain direct access to market - Anonymity - Subject to less regulation and costs

Source: Aite Group

Firms opt to go through a sponsored access arrangement for many different reasons. While reduction in latency is one of the factors, other, more basic reasons include additional revenue opportunities and hitting volume discounts.

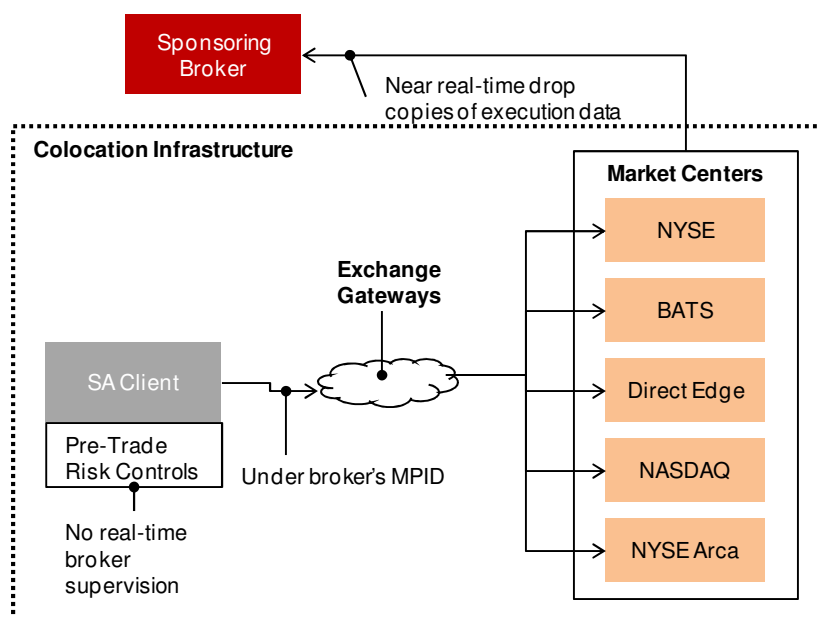
Sponsored access models prevalent in the U.S. cash equities market can be divided into two specific types based on whether real-time risk checks exist at an account level:

- **Filtered sponsored access:** More conventional and widely accepted by bulge bracket firms and third-party vendors, this model allows the sponsored participant to gain direct access to market centers via a dedicated port provided by the sponsoring broker. Risk controls and connectivity are typically provided by the sponsoring broker's recommended third-party vendors or service bureaus. The sponsoring broker can set up and monitor pre-trade risk parameters, and, if necessary, remotely modify and/or shut down trading activities (Figure 3).

Figure 3: Filtered Sponsored Access Work Flow

Source: Aite Group

- Unfiltered sponsored access (aka "naked" access):** Under this sponsored model, the sponsored participant gains direct access to market centers via a dedicated port provided by the sponsoring broker but lacks real-time pre-trade risk monitoring by the sponsoring broker. Instead, the sponsoring broker receives post-trade drop copies of each transaction, which may or may not be received in near-real-time and may or may not be used for any type of position risk management (Figure 4).

Figure 4: Unfiltered Sponsored Access Work Flow

Source: Aite Group

The term "filter" in this instance does not imply actually filtering orders for single-order quantity or price; it refers to the sponsoring broker's capability to provide real-time risk checks at an account level. In this scenario, real-time risk checks do not obtrusively filter but instead unobtrusively monitor the flow. Intervention is triggered only when a position limit has been breached.

Several key characteristics help define today's sponsored access business:

- Technology infrastructure that supports sponsored access is not provided by the sponsoring broker because its current systems are centralized. A robust colocation infrastructure is required in order to support today's HFT needs.
- Colocation increasingly plays a vital role in overall sponsored access relationships and is especially attractive for market centers looking to gain additional order flow and revenue sources.
- Conceptually, a tri-party relationship exists between the market center, sponsoring broker, and sponsored participant, all through contractual agreements.
- The ultimate legal, financial, and reputational risk of managing a sponsored access arrangement lies with the sponsoring broker.

Each sponsoring broker must perform due diligence on prospective customers looking for sponsored access; however, there is no standard, industry-accepted checklist for sponsoring brokers. Three potential types of pre-trade risks are involved in sponsored access, outlined in Table B and below:

Table B: Type of Pre-Trade Risk Checks in the U.S.

Type	By Exchange Port	Order Across Venues	By Sponsored Account	Ability of Sponsor to Stop Participant Order Flow
Market Center	Single	No	No	No
Third Party/Broker	Across ports	Yes	Yes	Yes
Fund Risk Checks	Across ports	Yes	Yes	No

Source: Aite Group

- Market center-provided, port-level, pre-trade risk controls that check for order-level restrictions vary depending on the venue and feature different latency levels. The main weakness of this approach is its being completely siloed into one particular venue. As such, it lacks the ability to check across venues and by account.
- Lack of sponsoring broker-provided, pre-trade risk controls does not automatically mean that sponsored participants lack their own sophisticated pre-trade risk filters. In fact, some of the sponsored participants are sophisticated proprietary trading firms with broker-dealer licenses. Despite this, the sponsoring broker does not ultimately have the ability to control the sponsored participant's order flow in real-time.
- The third-party with broker supported pre-trade risk model tries to bridge the strengths of the first two pre-trade risk approaches, enabling checks across venues and by account. It also provides the flexibility to monitor and change the sponsored participant's order flow in real-time if necessary.

Sponsored access has many benefits to be gained by the parties involved:

- For HFT traders with robust risk management capabilities, it enables dramatically faster access to market centers.
- Benefiting from volume aggregations services from the likes of Wedbush, Penson, Fortis, and Newedge, small to midsize brokers can now compete on a level playing field with larger brokers. This allows them to hit the maximum volume tiers and capture attractive pricing points across EDGX, NASDAQ, and NYSE Arca.
- From an additional-revenue perspective, revenue-sharing arrangements between sponsoring brokers and sponsored participants that are also registered brokers can be beneficial for both parties involved.
- Exchanges benefit from additional liquidity into their venues to boost volume and revenue. In addition, market centers operating their own data centers can expect additional revenue from value-added services such as colocation.

Sponsored access, on the other hand, has specific risks and challenges for participating parties as well as for the market overall.

- Supporting non-filtered sponsored access can lead to sponsored participants taking unacceptable levels of risk, which can cause both great financial burden and reputational damage to the sponsoring broker.
- In order to support non-filtered sponsored access, sponsoring brokers must develop strong risk management and due diligence teams capable of handling sponsored participants' credit and operational risk.
- Broker-to-broker sponsored access can lead to a situation in which the sponsoring broker loses track of the activities of the sponsored broker's customer.
- Providing filtered sponsored access often leads to a higher pricing point for sponsored participants, resulting in favorable competitive conditions for those brokers offering unfiltered sponsored access.
- While the potential is slim, there is a chance that a rogue sponsored participant can increase overall systemic risk.

Following the May 6, 2010 market anomaly known as the "flash crash," the U.S. SEC faced inordinate pressure to regulate out the possibility of another event of this type. It took a substantial amount of time to research and identify the appropriate cause of the flash crash, but the SEC determined at the outset that mandatory pre-trade risk checks seemed a safe bet for reducing risk across the market. Based upon this assumption, Rule 15c3-5—the "Market Access Rule"—was finalized and went into effect on July 14, 2011, essentially banning unfiltered sponsored market access.

CONSOLIDATED AUDIT TRAIL (CATS)

Passed by the SEC in July 2012, CATS requires exchanges (SROs) and the Financial Industry Regulatory Authority (FINRA) to establish a market-wide consolidated audit trail that must collect and accurately identify every order, cancellation, modification, and trade execution for all exchange-listed equities and equity options across all U.S. markets. In addition, all exchanges, members of exchanges (broker-dealers), and customers of those broker-dealers will be assigned unique cross-market identifiers that will be associated with every order. CATS is in its very early stages of implementation, especially from compliance infrastructure and reporting perspective.

SPREAD OF MARKET FRAGMENTATION IN THE U.S.

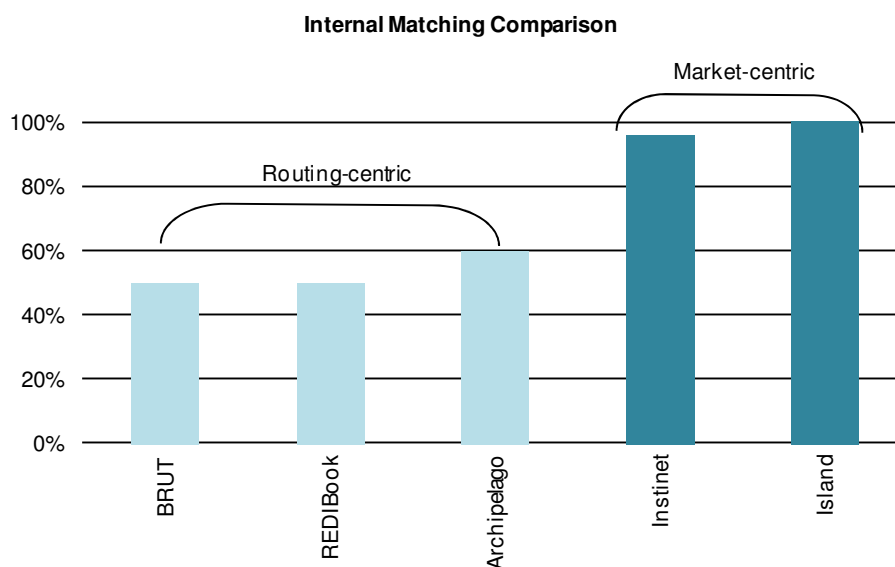
With the basic regulations enabling competition based on electronic trading in place, the U.S. equities market has experienced massive levels of fragmentation over the last 15 years, more pronounced than any other financial center globally, with over 40 execution venues that consist of regulated exchanges, ECNs, lit ATs, and dark pools. The fragmentation of the market can be viewed in two separate stages.

MARKET FRAGMENTATION, PHASE I: 1997 TO 2005

One of the most important events of the last decade in the U.S. equities market has been the introduction and evolution of ECNs. Prior to the OHR of 1997, the only ECN-like platform with notable liquidity was Instinet. Instinet began its operations in 1969, nearly three decades before the creation of the first NASDAQ ECNs.

As a category, ECNs are a fully electronic subset of ATSs that automatically and anonymously match orders based on price-time priority. ECNs function as an execution venue similar to exchanges, but from a regulatory perspective, they are broker-dealers. Unlike other agency broker-dealers, ECNs were allowed to post their BBO on the NASDAQ quote montage. In this way, ECNs were able to participate in NASDAQ and compete head-to-head against other market participants for order flow. (The term "ECN" only applied to those private networks that were recognized as such under the SEC's ECN Display Alternative Rule.) At the height of their existence, ECNs exhibited two very distinct business models (Figure 5):

Figure 5: Market-Centric vs. Routing-Centric ECNs



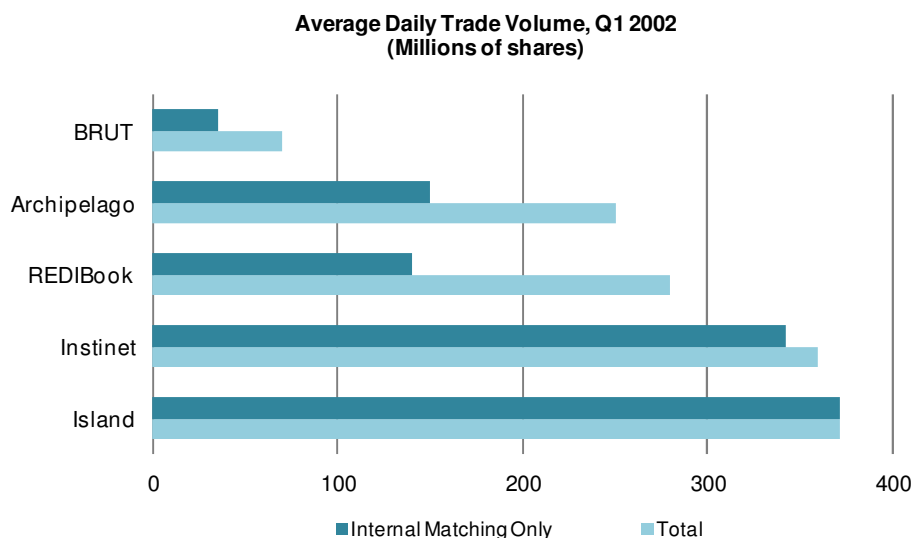
Source: ECNs

- Market-centric:** Initially, only Instinet and Island truly represented this model, under which most orders that entered their trading systems were matched internally and were rarely routed out of their platforms to other execution venues. In general, those using Instinet and Island were more concerned about speed of execution than with execution price.
- Routing-centric:** The remaining ECNs followed the best-execution-centric model dictated by the reality of a lack of internal liquidity. These ECNs (e.g., Archipelago, REDIBook, BRUT, etc.) would look to match orders internally first and then, using smart order routing (SOR) technologies, would route the unmatched orders to

various execution venues with the best price. Not surprisingly, the best price often took precedence over speed of execution under this model.

In Q1 2002, only Instinet and Island could claim to be true execution venues with high levels of internal liquidity. Other ECNs used a hybrid model of order execution and order routing. Some focused more on order routing than others —again driven by the reality of a lack of internal liquidity (Figure 6).

Figure 6: ADV of Leading ECNs and Internal Matching Rates

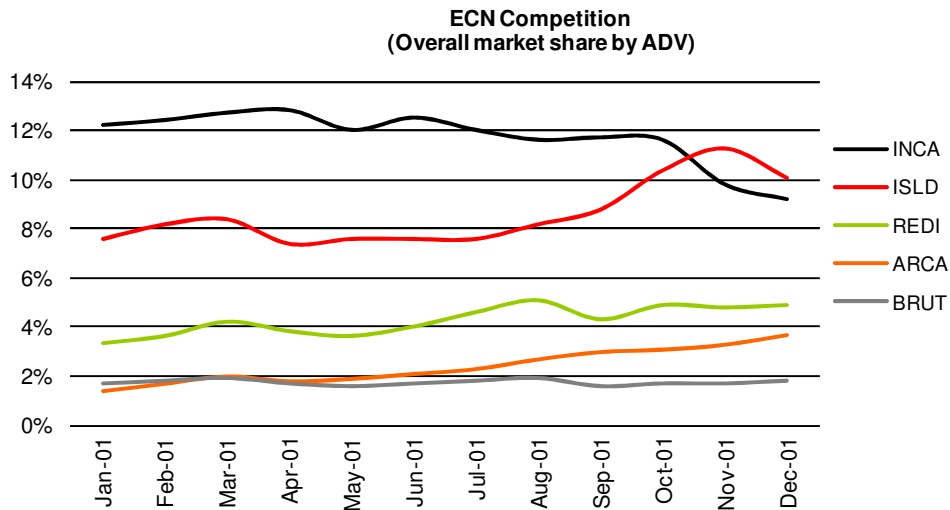


Source: ECNs

In the end, the one true value proposition of an ECN was its ability to match orders internally, based on a high level of liquidity. Although order routing was a value-added service, it increasingly became marginalized as the popularity of direct market access providers (i.e., aggregators), such as Lava Trading, continued to increase.

In terms of direct ECN-to-ECN competition, the initial spotlight was on Island and Instinet. Over the years of competition, Instinet continued to rely on order flow from its traditional client base of institutional traders and market-makers. Island, on the other hand, focused on the underserved but rapidly growing client segments of hedge funds, proprietary trading desks, program trading desks, and retail flow. Instinet did not succumb to the commission compression that was impacting all of the other ECNs until it started losing market share to Island in 2001. Finally, by the end of 2001, Island became the largest ECN on NASDAQ (Figure 7). In order to remain competitive, Instinet in June 2002 did the only thing it could: acquire Island for more than US\$500 million in cash.

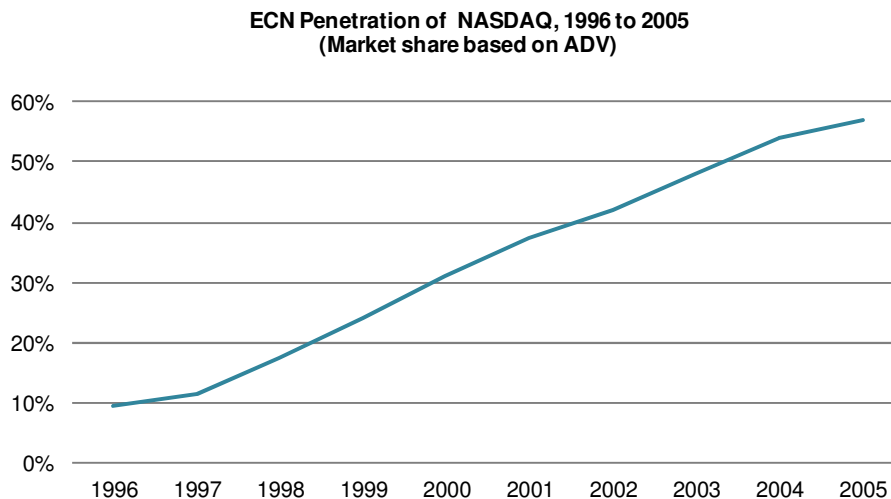
Figure 7: ECN Competition



Source: ECNs

Overall, ECNs made tremendous progress in penetrating NASDAQ and accounted for approximately 57% of the market share within NASDAQ by the end of 2005 (Figure 8). NASDAQ was then at a crossroads, and something drastic had to be done for it to retain its leadership position in the U.S. equities execution market. In the end, NASDAQ had to resort to an aggressive acquisition program.

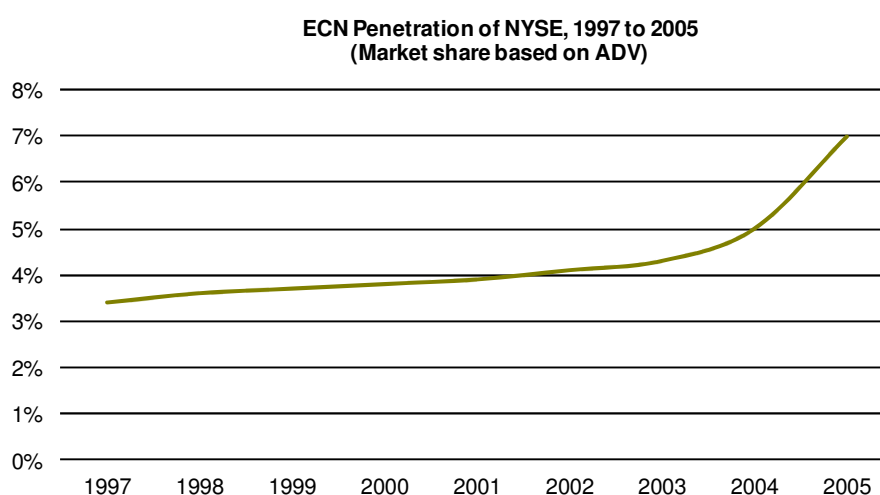
Figure 8: Market Share of ECNs on NASDAQ



Source: ECNs, NASDAQ

On the other hand, ECN penetration of the listed market had been disappointing at best. The most notable exception had been the trading of exchange-traded funds (ETFs), which originally started at the American Stock Exchange (AMEX). Overall, however, ECNs' foray into the listed market failed to produce any significant gains. Examining the NYSE market alone, ECNs accounted for approximately 5% of the NYSE trade share volume at the end of 2004. By the end of 2005, however, much progress had been made by the combination of INET, BRUT (with its free DOT program), Bloomberg TradeBook, and ArcaEx to gain a foothold into the NYSE. The fact that the competition had been opened up as a result of impending Reg NMS in the electronic trading market also played an important role in making some of the ECNs viable alternatives to trading NYSE stocks. By the end of 2005, the ECN market share of the NYSE reached 7% (Figure 9).

Figure 9: Market Share of ECNs in NYSE



Source: ECNs, NYSE

Overall, NYSE had been experiencing losses in market share in NYSE-listed trading since 2000, when its market share stood at well above 80%. By January 2006, that market share had plummeted to 71.7%. Competitive pressures continued to increase, not only from ECNs but also from other exchanges (most notably NASDAQ) and ATSS that specialized in block trading. Regulatory pressure from Reg NMS and customer demand also mounted, forcing the NYSE to initiate a hybrid market strategy. At the same time, the NYSE looked to take a bold step toward the electronic market by quietly seeking out a potential partner.

BRIEF PERIOD OF MARKET CONSOLIDATION: 2006

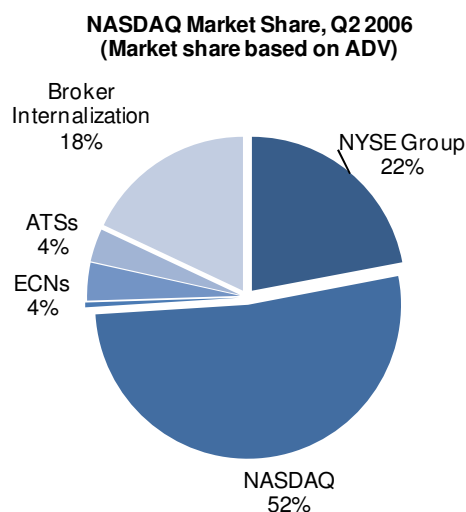
NASDAQ began the process of reclaiming its market share in the NASDAQ market in 2004, when it acquired BRUT. Subsequently, in early 2005, months of rumors ended in two blockbuster mergers. The NYSE was the first to break the somewhat shocking news that it had joined forces with ArcaEx. That news was followed by the confirmation that NASDAQ had acquired INET (which market players had assumed for months). The end result of all these acquisitions and

mergers was that all of the large ECNs disappeared in a matter of months, leaving the ECN market littered with smaller players. Perhaps more importantly, in only a matter of months, years of market fragmentation appeared to be coming to an end as the NYSE and NASDAQ forcefully moved back to the top of the execution market and created a de facto duopoly.

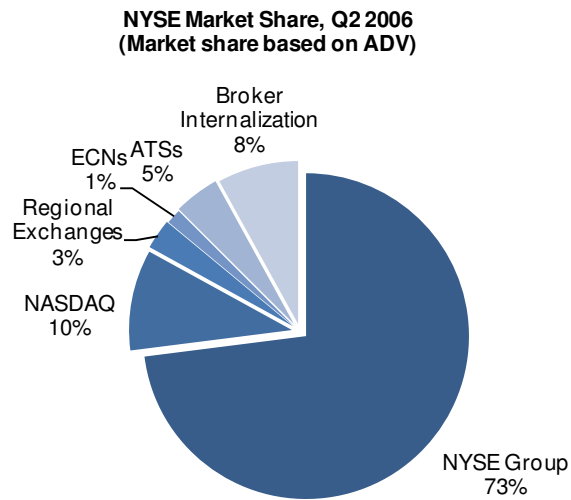
The future of the remaining ECNs looked quite bleak, and the future of the largely manual regional exchanges looked even worse—they would need to somehow come up with a new plan not only to compete against the re-outfitted NYSE and NASDAQ but to compete in a post-Reg NMS market structure in which electronic trading would dominate the marketplace. Without much capital or internal liquidity, it appeared that most of the regional exchanges would simply be crushed by the competition.

With the acquisition of INET by NASDAQ and the combination of ArcaEx and the NYSE, the competitive landscape of NASDAQ changed completely in matter of months. The reign of ECNs in NASDAQ market abruptly ended as the largest of the ECNs were essentially acquired by NASDAQ, and the new NASDAQ consolidated its market share to hold approximately 52% of the market share in trading volume at the end of Q2 2006 (Figure 10). The mega-mergers of NYSE/ArcaEx and NASDAQ/INET briefly changed the competitive landscape of trading in NYSE-listed securities as well (Figure 11).

Figure 10: NASDAQ Market Share After Consolidation

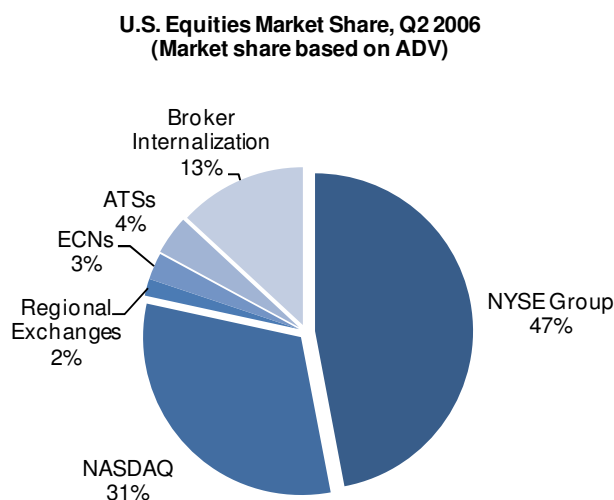


Source: Exchanges, ECNs, ATs, brokers, Aite Group

Figure 11: NYSE Market Share After Consolidation

Source: Exchanges, ECNs, ATSS, brokers, Aite Group

While quite brief, market consolidation led to the creation of two of the largest pools of liquidity in the form of NASDAQ and the NYSE Group. In Q2 2006, the NYSE Group and NASDAQ collectively accounted for 78% of the entire U.S. equities market (Figure 12). At this point in time, more than 20 other execution venues were battling for the remaining 22% of the U.S. equities market share.

Figure 12: U.S. Equities Market Share Pre-Reg NMS

Source: Exchanges, ECNs, ATSSs, brokers, Aite Group

MARKET FRAGMENTATION, PHASE II: 2006 AND BEYOND

After market consolidation effectively created a duopoly of NYSE and NASDAQ, the rest of the market looked completely overmatched. The implementation of Reg NMS, however, and growing broker concerns over the increased market clout of NYSE and NASDAQ quickly ignited the next phase of market fragmentation. One thing that NASDAQ and NYSE did not expect was active involvement of broker-dealers in exacerbating the fragmented nature of the U.S. equities market. Leading broker-dealers achieved this in two ways:

- **Investing in various venues:** With the passage of Reg NMS and the resurgence of both the NYSE and NASDAQ, the future prospects of regional exchanges and ECNs looked bleak. Nevertheless, regional exchanges and two particular ECNs (i.e., BATS and Direct Edge) sprang back to life driven by investments from leading sell-side firms and, in some cases, buy-side firms and prop shops. From the investing firm's perspective, these deals were low-risk investments with high upside potential that simply could not be passed up. Upsides included:
 - **Having a say in market development:** Investments into these entities certainly provided a voice for these participants in the future of the U.S. market structure development.
 - **Taking a warning shot at the NYSE and NASDAQ:** These deals sent a clear message to the NYSE and NASDAQ that there were plenty of alternative execution venues that could be utilized in the hope of curbing any price hikes that the NYSE and NASDAQ may have considered in the post-Reg NMS market structure.

- **Making a potentially safe investment:** In the end, these were fairly safe investments (i.e., cheap investments) with huge upside potential for the participants considering valuations in the public exchange space.
- **Diversifying instruments:** New entrants into the equities market, such as the International Securities Exchange (ISE) and Chicago Board Options Exchange (CBOE), were looking to leverage their dominance in the options market to branch out into the equities market, just as the NYSE sought to move into the options market through ArcaEX.

Table C: Investments in Major Venues

Venues	Main Players	Details
Philadelphia Stock Exchange (PHLX)	PHLX, Merrill Lynch, Citadel, Citigroup, Credit Suisse, Morgan Stanley, and UBS	Investment into PHLX by the various dealers and Citadel; in the end, the new investors can end up owning 89.4% of PHLX common stock
Boston Stock Exchange (BSE)	Boston Stock Exchange, Citigroup, Credit Suisse, Fidelity, Lehman, Atos Euronext Market Solutions, and Lava Trading	Formation of a new electronic stock exchange, BeX (Boston Equities Exchange)
International Securities Exchange (ISE)	ISE, Bear Stearns, Citadel Derivatives Group, Deutsche Bank, Interactive Brokers Group LLC, JP Morgan, Knight Capital, and Sun Trading	Launch of anonymous matching service called MidPoint Match (MPM) in Q3 2006, followed by a fully displayed market in Q4 2006
Chicago Stock Exchange (CHX)	CHX, Bank of America, Bear Stearns, E-Trade, Goldman Sachs	Total investment of US\$20 million for a minority equity stake in CHX
Chicago Board Options Exchange (CBOE)	CBOE, Interactive Brokers, LaBranche, Susquehanna International Group, VDM Specialists	Launch of new equities exchange, CBOE Stock Exchange (CBSX), in early 2007 with backing from large specialist firms
BATS	GETCO, Wedbush, Citi, Credit Suisse, Lime Brokerage, Lehman Brothers, Morgan Stanley, Merrill Lynch	Acquiring buy-in from major liquidity providers
Direct Edge	Knight Capital, Citadel, Goldman Sachs	Knight purchased Attain ECN and turned it into Direct Edge, then attracted investments from Citadel and Goldman Sachs

Source: PHLX, BSE, CHX, ISE, CBOE

- **Aggressively launching broker-owned dark pools:** Prior to implementation of Reg NMS, most dark pool activities were based on block trading, with the likes of Liquidnet and ITG's POSIT. Starting in 2005 and 2006, however, real competition

began. While some of the broker-owned dark pools had launched prior to that (e.g., Credit Suisse's Crossfinder launch in 2004), the rest of the broker-dealer community recognized potential opportunity to reduce their trading costs and while at the same time providing yet another execution tool in the form of these crossing platforms.

The growth of dark pools over the 10 years has been one of many changes that the U.S. equities market has experienced, leading to a complete transformation of the institutional trading environment. No one could have predicted that the U.S. equities market would go from having two major market centers not so long ago to more than 50 venues today. Most of these new venues have been dark pools, whether owned by an individual broker-dealer or operated by a consortium or an exchange.

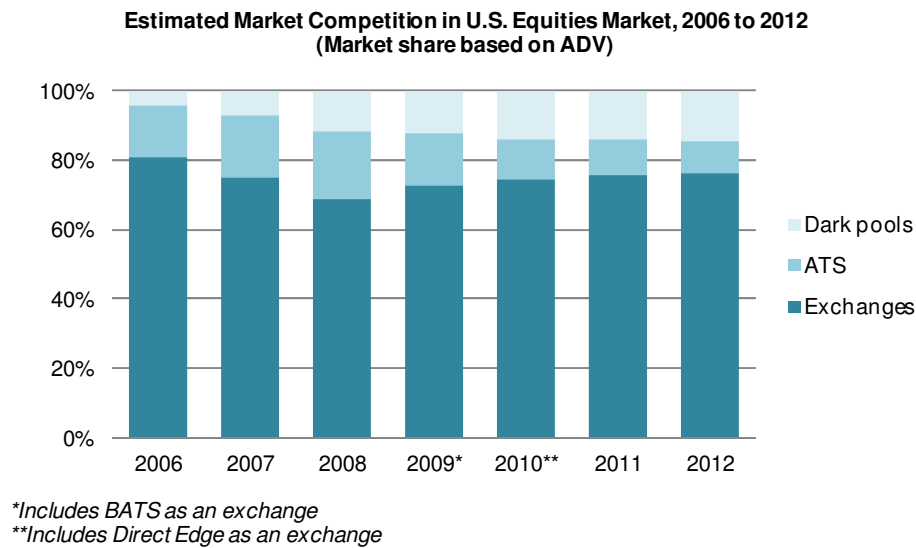
Dark pools can be defined as execution venues that do not provide public quotes. The core value of a dark pool is its ability to provide access to liquidity while minimizing market impact. In recent years, however, this rather restrictive definition of a dark pool has been challenged as an increasing number of dark-pool users appear to be willing to live with a certain level of market impact in return for higher fill rates. Some dark pools have also opted to link up with other dark pools in the hope of increasing the chances for client orders to get a significant portion of their orders done in the non-displayed market before being routed out to the displayed side.

The proliferation of dark pools has undoubtedly made the life of an average buy-side trader extremely difficult, as those traders must still make real-time decisions in terms of where the order should be routed to get the best possible execution. In today's microsecond-execution environment, market fragmentation certainly adds another layer of complexity to the buy-side.

Due to their "dark" nature, non-displayed pools are misunderstood by some and downright distrusted by others. Given the increasing use of outbound and inbound indications of interest (IOIs) within some dark pools, it is not currently clear whether the traditional definition of a dark pool still applies to a majority of the venues. One thing is certain, however: The overall market concern over the share of dark pools has grown, and regulatory intervention appears inevitable.

On the lit market, both BATS and Direct Edge have grown tremendously since their entry into the market, typically occupying about 10% of the overall U.S. equities market share each. Eventually, both BATS and Direct Edge became exchanges themselves, creating four large exchanges in the U.S. equities market by 2010 (Figure 13).

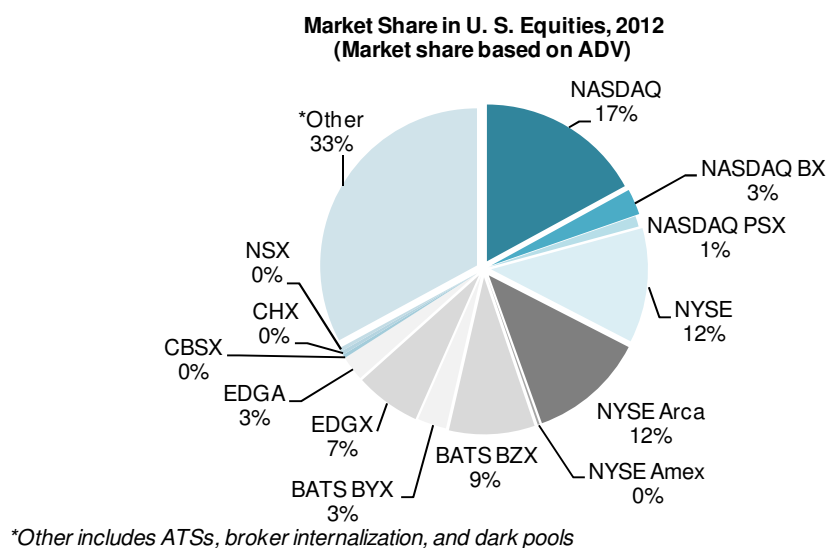
Figure 13: Market Fragmentation in the U.S. Equities Market



Source: Aite Group

Another key trend within the U.S. exchange marketplace over the last few years has been exchanges operating more than one exchange license to test out new pricing schemes or launch new order types and products. In fact, all top four U.S. exchanges currently operate more than one exchange, making the U.S. market look even more fragmented (Figure 14). Market fragmentation has become the norm in the U.S. equities market, and all market participants have spent the last 15 years adjusting to this market reality.

Figure 14: Market Share Reality in 2012 in the U.S. Equities Market



Source: Exchanges, ATSS, brokers, Aite Group

KEY IMPLICATIONS OF MARKET FRAGMENTATION IN THE U.S.

This section will focus on implications of market fragmentation for four specific areas:

- Best execution
- Connectivity and routing
- Consolidated tape
- Self-regulation and rule-making

U.S. BEST EXECUTION

Similar to other markets, "best execution" is a term that lacks precise definition in the U.S. market. Some confusion has been caused by the Order Protection Rule of Reg NMS, Rule 611, which appears to single out best price as the sole determinant for best execution in the U.S. market.

It is very important to note that the Order Protection Rule refers only to the overall routing obligation of integrated market centers and does not equate to any concrete best execution obligation. Another thing to keep in mind is that Rule 611 was specifically adopted to address the issues caused by the Trade-Through Rule that has existed in the U.S. equities market since the last 1990s, which leveraged antiquated market linkage ITS. The major issue with this was that the linkages of various market centers that were both slow (e.g., floor-based NYSE) and fast (e.g., NASDAQ), and as a result, trade-throughs were often ignored and left the market linkages largely ineffective. Rule 611 was an attempt to fix this while applying it only to fast markets (i.e., electronic markets) with a specific time frame of one second to make routing decision to the venue with the best price at a given time.

With that clarification out of the way, it is not surprising that one broker's view of best execution in relation to a trading decision may differ significantly from that of another. To generalize, best execution involves an unspecified combination of price, speed, and execution parameters. Still, it is quite true that best execution has been associated with price. Using a security's NBBO as a point of reference, a trader or investor receiving an execution at or inside the spread was considered to have received a quality execution. Execution outside the NBBO was subject to question.

Best price does not always constitute best execution, however. An investor may have a need to transact an order quickly—more rapidly than it can be absorbed in the prevailing market at or within the best displayed quotes. Filling the order in the prevailing market may "push" the stock's price and result in an execution price outside of the existing bid/ask spread. Still, this may constitute "best execution" in the view of the investor, as greater emphasis was placed on completion as opposed to price.

Under the FINRA Rules 5310, the definition of best execution requirements are as follows:

Rule 5310(a) requires a member firm, in any transaction for or with a customer or a customer of another broker/dealer, to use "reasonable diligence" to ascertain the

best market for security and to buy and sell in such market so that the resultant price to the customer is as favorable as possible under prevailing market conditions.

The rule also specifies five factors that the firm must consider to be found to have used reasonable diligence:

- Character of the market for the security
- Size and type of transaction
- Number of markets checked
- Accessibility of quotation
- Terms of conditions of order as communicated to the firm

Each broker-dealer has documented its best execution policies and procedures. With the above factors in mind, most broker-dealers will focus on potential for price improvement, speed of execution, and likelihood of trade execution as major components when trying to make trading decisions on behalf of clients.

Maintaining best execution obligation in a single market environment requires much effort on the part of broker-dealers in terms of data capture, store, and analysis to ensure compliance. This obligation can become quite complex when working in a fragmented marketplace. One of the major implications on the regulatory compliance resulting from market fragmentation in the U.S. market has been reporting obligations by both market centers to shed light on order routing and execution practices:

- **Rule 11Ac 1-5:** Requires market centers to publicly disclose, on a monthly basis, basic information related to their handling and execution of orders. Sample info includes the following:
 - Execution of market orders relative to public quotes
 - Price improvement data on limit orders compared to public quotes
 - Quoted and effective spreads
 - Speed of execution
 - Fill rates
- **Rule 11Ac 1-6:** Requires broker-dealers to publicly disclose, on a quarterly basis, information regarding their routing decisions. Sample info includes the following:
 - Identity of market centers to which the orders were routed
 - Disclosure of relationship with market centers, including internalization or payment for order flow arrangements
 - On customer request, disclosure of where a customer's individual order was routed to for execution

In the end, while market fragmentation itself has not significantly altered the actual definition of best execution, extra regulatory burden has been imposed on market centers and broker-dealers alike to ensure that their best execution obligations are being followed and met. As a result, there is a clear cost impact on regulatory compliance that requires market centers and broker-dealers to capture, store, extract, and analyze data. Cost implications will be discussed in a separate section at the end of this study.

The most dramatic change to best execution as a result of market fragmentation is the direct impact that it has had on the need for increased connectivity, routing, and complicated market data needs. This will be discussed in proceeding sections.

U.S. CONNECTIVITY AND ROUTING

Unlike other markets, the U.S. market has always been fragmented, if we stretch the definition of "fragmentation" to purely mean the existence of multiple execution venues within a domestic marketplace, without taking into account market share distribution among the individual venues. That is, if a given market is home to more than one market center, yet one venue commands 99% of trading, one could reasonably argue that the market is not truly fragmented from a practical perspective. Prior to 1997, the fragmented nature of the U.S. equities market closely mirrored this scenario—a handful of regional exchanges supported trading of listed stocks, but the NYSE dominated the marketplace with over 90% of the market share in listed securities trading, while NASDAQ represented the OTC market.

In order to accommodate this type of fragmentation and foster a more integrated marketplace, in 1978 the SEC directed several exchanges to submit a joint plan to develop a system that would facilitate communication and order routing within the exchange community. The plan was approved, and ITS was launched within the year.

ITS was designed to be an automated means of linking exchanges, thus enabling electronic communication and routing orders to the destination with the best pricing. In 1979, the SEC began exploring alternatives to the existing exchange rules restricting off-exchange trading of listed securities. Concluding that the rules were overly prohibitive, the SEC authorized third-market trading for listed securities that had traded on-exchange after a particular date in 1979.

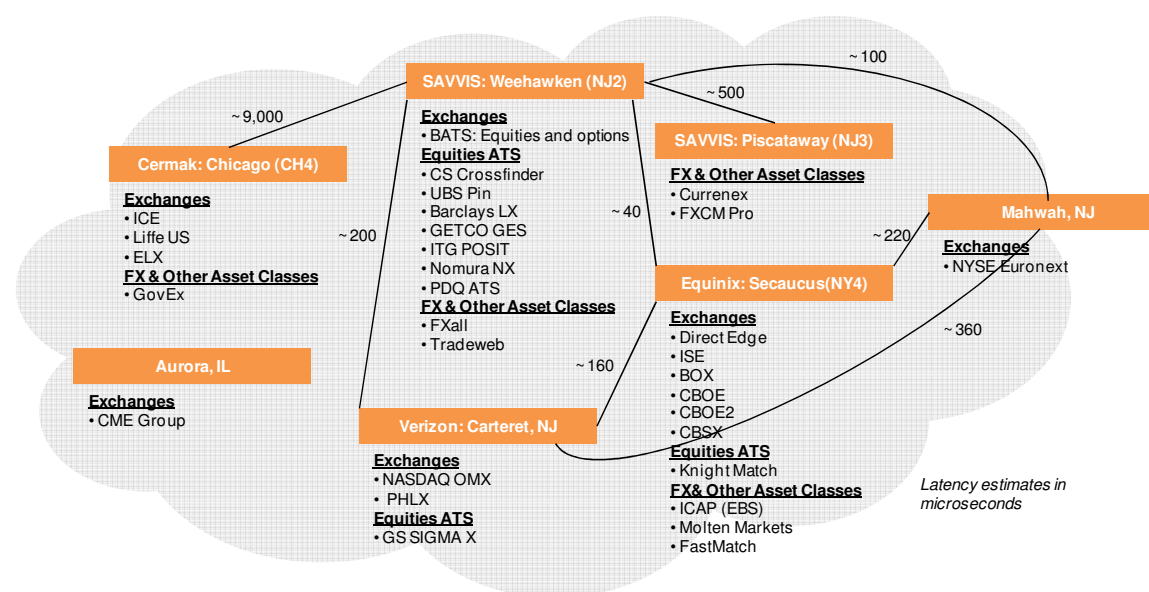
In 1980, the SEC requested those SROs that were members of ITS to present a plan for linkage to the NASD's Computer-Assisted Execution System. When no satisfactory plan was reached voluntarily, the SEC mandated a linkage be implemented. In 1983, ITS and CAES were linked, marking the first-ever automated link between the listed and OTC stock communities.

The ITS framework ultimately failed to mature with the market structure changes that started occurring in late 1990s, with the introduction of ECNs and the true fragmentation of the market that presented not only fragmentation in terms of number of execution venues but also fragmentation of actual liquidity. With the launch of Reg NMS, the regulatory mandated ITS disappeared and was consequently replaced by private networks and connectivity services.

For trading firms, market fragmentation has led to the practical IT issues of figuring out which venues to connect with to optimize trading capabilities. For execution venues, the difficulty has been to determine which data center is the most appropriate location for their matching engines

to attract liquidity. Figure 15 provides basic snapshot of the U.S. market in terms of potential connectivity issues that trading firms face. While this looks quite convoluted, the reality is much worse for those firms with interest in trading in European and Asian markets.

Figure 15: Fragmentation in Data Centers and Connectivity: Chicago and NYC Metro



Source: Data centers, Aite Group

The need for robust and reliable connectivity and routing capabilities is closely tied to best execution obligations for both broker-dealers and market centers; however, it is certainly not the case that a major broker-dealer needs to directly connect to each venue. While there are four major venues in the U.S. equities market, a number of venues represent less than 1% market share each. Most brokers (even global brokers) do not view direct connection to these venues as vital to meeting their best execution obligations. Instead, they typically rely on a broker that specializes in order routing to reach those smaller venues. While major brokers still may rely on their own in-house networks to facilitate connections to various venues, the availability of third-party network providers, such as Savvis, BT, and more, has made it easier for firms to efficiently participate in the fragmented marketplace.

The need for connectivity business has also extended to the buy-side as low-touch, self-service execution tools such as DMA and algorithmic trading proliferate among the buy-side traders. Most large OMS/EMS vendors operate their own networks, connecting all major brokers and venues for buy-side firms. Typically, the brokers would pay for individual connections on behalf of buy-side firms. For certain vendors, the trading network business has become quite lucrative.

As mentioned earlier, the concept of order routing has been deeply rooted within the U.S. market structure, especially since the launch of first-generation ECNS. ECNs such as Archipelago and BRUT created their own private connections to other ECNs and exchanges to handle customer order flow. As a result, by the time intense fragmentation occurred following implementation of Reg NMS, various third-party services and broker-driven order routing

services were available for all interested parties. The concept of smart ordering routing itself can be traced back to Archipelago ECN during the late 1990s. As markets have become severely fragmented, with different pricing schemes, order types, latency levels, etc., most vendors and brokers have implemented SOR engines to ensure that appropriate trading decisions are being made. All order routing engines are programmable to fit the specific routing logic that might be required of by the client users.

Closely tied to costs associated with increased connectivity and order routing is colocation. Currently in the U.S. market, four largest exchanges host their matching engines in four different data centers:

- NYSE Euronext: Mahwah, New Jersey at NYSE-owned data center
- NASDAQ OMX: Carteret, New Jersey at Verizon-owned data center
- BATS: Weehawken, New Jersey at Savvis-owned data center
- Direct Edge: Secaucus, New Jersey at Equinix-owned data center

In the end, connectivity, telco, and routing fees are dependent on the decision of the broker-dealer to connect with the various matching engines in dispersed data centers.

U.S. CONSOLIDATED MARKET DATA

In other financial centers going through market fragmentation, one of the key issues that need to be addressed has been how to consolidate market data across the different competing venues. In the case of United States, however, market data consolidation has not been a major issue at all; in 1976, the SEC recognized early on that a unified national market structure was dependent in part on timely, widely distributed market data. To this end, the SEC instructed the exchanges to devise plans to report and distribute last-trade and current quote information across the SEC-registered market centers that traded in those securities.

The Consolidated Tape System (CTS), which disseminates last sale reports for all reporting market transacting NYSE, AMEX, and a variety of regional listings, was fully implemented in 1976. The Consolidated Quote System (CQS), reflecting available quotes in securities across exchanges, was launched in 1978. The Consolidated Tape Association (CTA) oversees the dissemination of real-time trade (CTS) and quote (CQS) information in NYSE (Tape A) and NYSE Arca, NYSE MKT (formerly AMEX), and other regional exchange (Tape B) listed securities. As a result, all SEC-registered exchanges and execution venues that trade Network A or Network B securities send their trades and quotes to a central consolidator, where CQS data streams are produced and distributed worldwide. Currently, NYSE is the administrator of Network A and NYSE MKT is the administrator of Network B.

On the NASDAQ-listed securities side, UTP SIP Plan represents the CTA equivalent, governing the collection, processing, and distribution of all NASDAQ-listed securities data. The UTP SIP data feed represents Tape C, which is the single source of consolidated market data for NASDAQ-listed securities. The UTP Trade Data Feed (UTDF) provides continuous last sale information, and the UTP Quote Data Feed (UQDF) provides continuous quotations from all venues trading NASDAQ-listed securities.

In terms of costs, while there have always been and will always be complaints from data users associated with overall cost of consolidated data feeds, it would not be accurate to argue that the cost of data has increased as a result of market fragmentation. As a result of Reg NMS's Market Data Rules, all venues and brokers have been given the right to provide their own market data and distribute it to the market for a fee or for free while continuing to meet their market data obligations of providing data back to both CTA and UTP plans for market-wide consolidated tape, before using the data for their own commercial efforts. While we have seen an increase in market data products from exchanges as a result of the implementation of the rule, it has not translated into a major revenue source for broker-dealers.

The proliferation of market centers and their ability to package their own proprietary data products has led to issues related to speed of data dissemination for regulators. One of the concerns of regulators in terms of the availability of consolidated data has been the potential latency difference between when consolidated data is available to the general public compared to certain market data products that might have a much lower latency. The fear is that this latency difference could provide information advantage for those firms relying on low latency data feeds to make trading decisions. On September 2012, the SEC charged the NYSE with improperly sending market data via two of its proprietary data fee products before sending data to the consolidated feeds. This had been going on since 2008. Ultimately, NYSE was penalized for failure to monitor the latency level of its proprietary data feeds in relation to the data transmission to the consolidated data feeds. This resulted in NYSE paying US\$5 million in penalty.

U.S. SELF-REGULATION AND RULE-MAKING

Self-regulation has been a vital element of the U.S. regulatory regime since the market crash of 1929. SROs are responsible for developing, implementing, and monitoring standards and procedures for their members to conduct business. The current U.S. regulatory landscape is driven by multiple SROs, most of which are also exchanges. One major exception to this is FINRA, which is the largest independent regulator for all securities firms doing business in the United States. FINRA was created in 2007, through the consolidation of NASD and the member regulation, enforcement, and arbitration operations of NYSE.

All SROs have four major sources for funding for their operations:

- Regulatory fees paid by members
- Transaction fees paid by those firms that use SRO facilities for executing, reporting, and clearing transactions
- Listing fees by corporate issuers
- Market data feeds paid by including all users of data, including broker-dealers, institutional and retail investors, third-party data vendors, and more

Perceived key benefits of self-regulation and rule-making are the following:

- Enabling an organization quite familiar with the inner workings of the industry to ensure that detailed operations and issues are understood

- Enjoying peer group supervision, leading to fewer intrusive, government-initiated directives
- Allows a government agency (i.e., SEC) to leverage its limited budget to effectively regulate a very complex market structure

Over the years, the continuing fragmentation of the U.S. equities market has placed the SRO framework under increasing strain. Another potential issue has been the demutualization of exchanges and their transformation into for-profit organizations, which may lead to conflict of interest in relation to the members that they regulate. Some of the challenges that that SRO structure experiences under market fragmentation include the following:

- **Regulatory arbitrage:** Lack of uniformity in terms of regulatory rigor may lead traders to send flow into a SRO with less-than-stringent regulatory rules.
- **Incentives for loosening regulations:** Exchanges faced with intensive competition and falling market share might be tempted to lower their regulatory barriers to attract additional business.
- **Selective client targeting:** Again, fighting for market share, exchanges might be driven to develop favorable settings for specific client types that can help them grow their market share.
- **Inherent conflict with members:** Today, broker-dealers are increasingly competing against exchanges for trading volume, and SROs' responsibilities over the member firms (i.e., broker-dealers) and their financial and operational affairs can be perceived as inherent conflict of interest.
- **Potential growing conflict between SRO regulatory function and market operations:** As exchanges continue to fight for dwindling trading volume, the market operations side of the business might be tempted to pressure the SRO side to minimize enforcement and increase market participation.
- **Conflict with issuers:** Driven by the need to get additional revenue via listings businesses, SROs might lessen regulatory requirements for listings or overlook struggling listed issuers for making de-listing decisions.
- **Multiple SRO duplication:** Without specific rules to eliminate duplicated responsibilities and hence duplicated regulatory burden, having multiple SROs can put significant compliance burden on those members with multiple SRO memberships.
- **Market surveillance:** It is tough enough to perform market surveillance and monitoring in a single market framework—when there are multiple venues involved, the changes for errors increase exponentially. The real issue is that even if a particular SRO is doing a perfectly good job with a specific member, the fragmentation issue makes it next to impossible to have a full view of the overall activities of that particular member. In the U.S. market, certain rules have been

harmonized so that, for instance, if a member is part of more than one SRO, the firm is only obligated to comply with one SRO per SEC regulation.

In the end, the reliance on the SRO regulatory infrastructure will not change in the U.S. equities market, as the overall market structure has changed so much and has become so complex that only the actual market practitioners truly understand the intricacies behind the overall market operations. Instead, the SEC will continue to focus on harmonizing different rules across SROs and look to eliminate duplication of compliance burdens that could add cost to members.

MARKET STRUCTURE EVOLUTION IN EUROPE

Since the explosive growth of alternative execution venues in the United States, many European exchanges have been bracing for similar competition during the last decade. Ill-fated attempts by foreign invaders, such as NASDAQ Europe, and homegrown European failures, such as Jiway, are some examples we can point to when speculating upon the competitive resiliency of existing exchanges in the vast European market.

To be fair, traders in Europe have always had to grapple with fragmentation. Prior to the Markets in Financial Instruments Directive (MiFID), there were a multitude of domestically dominant regional exchanges, which usually operated with their own unique post-trade requirements and processes. As a result, while individual financial centers within Europe functioned quite efficiently, market participant attempts to engage in efficient and frictionless trading across Europe were often prohibitively difficult and costly. Thus, MiFID, introduced by the European Commission in 2007, attempted to create a framework for accessible and efficient trading across a pan-European market, allowing Europe to compete with the U.S. market and other global financial centers.

Not unlike developments seen in the adolescent stages of U.S. fragmentation, MiFID also yielded unintended consequences, many of which are being addressed in the current MiFID review. Nevertheless, one of MiFID's primary goals—the creation of competition at the execution level—has been achieved. Since late 2007, we have seen multiple alternative execution venues emerge, including multilateral trading facilities (MTFs) and dark pools.

Despite the structural achievement of emergence, some of those venues have not survived in their original form or even at all. Several reasons exist for their demise, but one fundamental problem that has impacted the entire European equity market has been a downturn in market liquidity. Many of the execution venues were born 2007 and 2008, when equity volume was at its peak; their business models and likelihood of success, therefore, were predicated upon pre-financial-crisis liquidity levels, a materially different picture from today's European volume. Consequently, European venues have found themselves vying for increasingly elusive trading volume and struggling to survive in a condensed marketplace.

MAJOR REGULATORY EVENTS IN EUROPE

Since 1993, European Union member countries operated under the Investment Services Directive (ISD), which required all orders to be sent to regulated exchanges for execution. In November 2007, everything changed in the European market landscape when the European Commission adopted MiFID, enabling firms—for the first time—to bypass any existing concentration rules, thus allowing alternative trading venues to compete with existing exchanges. An ambitious piece of regulation, MiFID was designed, at the highest level, to accomplish the following goals:

- Provide pan-European harmonization in order to promote investor protection and the leveling of competition across borders
- Improve market transparency

- Create an environment for greater market competition and trade execution
- Create a pan-European mandate to uphold best execution

The arrival of MiFID was praised by some, feared by others, and misunderstood by nearly all. Some believed that MiFID would completely revolutionize every aspect of the European markets, while others expected MiFID to have very little impact. The reality rests somewhere in the middle of these two extremes. More precisely, MiFID has had little effect on some aspects of the European market (pan-European clearing and interoperability are still distant goals), yet has imposed a drastic effect on other areas (alternative trading venues).

Some of the most important elements of MiFID include the following:

- **Best execution burden:** Firms are required to formulate, maintain, and demonstrate their best execution policies and practices on behalf of their clients. They are also required to maintain a five-year history of customers' trades, own quotes and trade execution data, statistics on execution venues used to complete execution, etc. The ability to capture, store, and analyze accurate and timely trade and customer-related data are crucial elements of successful regulatory compliance—and a pivotal element of MiFID, which put additional pressure on the data management infrastructure of European market participants.
- **Bypassing concentration rules:** In certain European countries, under ISD, all orders were required to be sent to regulated exchanges for execution. MiFID enabled firms to bypass any existing concentration rules within specific domestic markets, which led to increased competition among the market execution venues. Related to this, off-exchange-executed trade information (i.e., internalized trades, upstairs trading, ATs, etc.) can be reported to other venues that are outside of the traditional exchanges. Other venues can include MTFs, market data consolidators, and more.
- **Mandate for firm public quotes and transparency requirements:** In the interest of enhancing pre-trade price discovery, MiFID mandated that those firms that are active internalizers publish firm public quotes. Also known as systematic internalizers (SIs), these firms were required to publish their quotes and trade execution data concerning those securities traded on regulated markets on a regular and continuous basis to meet pre- and post-trade disclosure mandates.

MiFID also defined three explicit categories of trading venues:

- **Regulated market (RM):** Regulated markets represent traditional stock exchanges, such as the London Stock Exchange (LSE), NYSE Euronext, and Deutsche Boerse. The regulated markets have seen a persistent trend of consolidation rather than fragmentation as they have attempted to diversify and globalize their operations in recent years in order to remain relevant and profitable throughout challenging market conditions.
- **Multilateral trading facility (MTF):** An MTF can be operated by an exchange or investment firm, and it has characteristics that closely resemble the ECNs of the U.S.

equities market. MTFs are fully electronic, anonymous execution platforms that emphasize speed, liquidity, and low execution prices.

- **Systematic internalizer (SI):** This category represents those investment firms (i.e., broker-dealers) that engage in significant internalization activities to meet the execution needs of clients that are outside of regulated markets and MTFs (i.e., market-making). The aim of the SI provision was to combat with increased pre-trade transparency the market fragmentation that ensued from the abolishment of the concentration rule.

MIFID AND ITS UNINTENDED CONSEQUENCES

It was clear soon after its implementation that MiFID had resulted in some unintended consequences that were having a detrimental impact on the European marketplace. As mentioned above, MiFID had a variety of goals, with the key theme of creating a single, harmonized European marketplace. The aim of competition at the execution level was to reduce the cost of trading for market participants and to nurture innovation and creativity in trading technology and trading processes.

Another goal of MiFID was to harmonize pre- and post-trade transparency requirements for equities across the European markets. Post-trade transparency requirements were set up for RMs, MTFs, and investment firms transacting in shares outside of a RM or MTF. Investment firms were given a number of possibilities for obliging with their post-trade disclosure, including:

- Reporting to any RM or MTF that trades the instrument in question
- Reporting to any third-party reporting entity
- Reporting to their own website or other proprietary arrangements

In the end, MiFID completely overhauled the trading landscape in Europe; unfortunately, alongside its good intentions came some unanticipated consequences. The majority of market participants, if not all, believe these unintended consequences have negatively impacted the European trading landscape. This has frustrated many market participants, and most believe it has reduced liquidity in the European markets. Further frustration has been caused by the fact that it has been six years since these unintended consequences appeared and market participants are still waiting for a solution. Some of the high-profile unintended consequences include the following:

- **Fragmented data:** Coupled with competing trade reporting venues, increased market fragmentation has created a disparate, fragmented market data reality in the post-MiFID world. With no single venue responsible for trade reporting in a market, there was no one to check the accuracy of data. As a result, during the first few months of MiFID, some trades were being reported at up to three different venues because many firms adopted the attitude that over-reporting was better than under-reporting. This fragmented-data issue has created a negative scenario around fragmented liquidity, and the lack of a consolidated tape makes a fragmented liquidity landscape difficult to navigate, leading to some frustrated European market participants.

- **Confusion over OTC trade reporting:** The rise of dark pools and alternative trading venues post-MiFID has been one of many changes experienced by the European equities market, leading to a complete transformation of the institutional trading environment. A large number of broker crossing networks and other types of dark pools report their trades as OTC trades. As a result, OTC trading market share has come under considerable scrutiny since the inception of these types of trading venues. Fierce debate rages in Europe about the market share of dark pools and OTC trading in the equities markets. The Federation of European Securities Exchanges (FESE) released a paper in 2010 stating that 40% of equities trading was being conducted OTC by brokers internally. The Association for Financial Markets in Europe (AFME) disputed this number, arguing that only 16% of equities trading was real OTC liquidity. In summary, dark pool trades may print as OTC, but not all OTC prints are dark pool trades. It is important that market participants and regulators understand the true meaning of OTC and all it encompasses before introducing any legislation to curb dark trading and crossing networks. Dispute aside, various types of trades currently fall under the OTC umbrella in Europe. Incorrectly, many market participants believe that the majority of these OTC trades are being conducted in dark pools and broker crossing networks.
- **Confusion over SI:** Another contributing factor to the confusion around the OTC number is the ineffectiveness of the SI regime, which, post-MiFID, has not been universally applied across brokers throughout Europe. A year after MiFID, only a couple of brokers were registered as SIs; many others were not because the definition was slightly ambiguous and there was no element of enforcement for brokers that did not register but that provided market-making on a regular basis. Universal application of the SI regime would see the number of OTC trades decrease because market-making trades between brokers and clients would fall under the SI trade reporting flag. Definitions for technical reporting trades and standardization of post-trade reporting flags across reporting venues—created by regulators that are aware of the distinctions between different types of OTC trades—would provide a clear picture of liquidity in Europe and help traders accurately understand where and how trades are being executed.

MIFID II

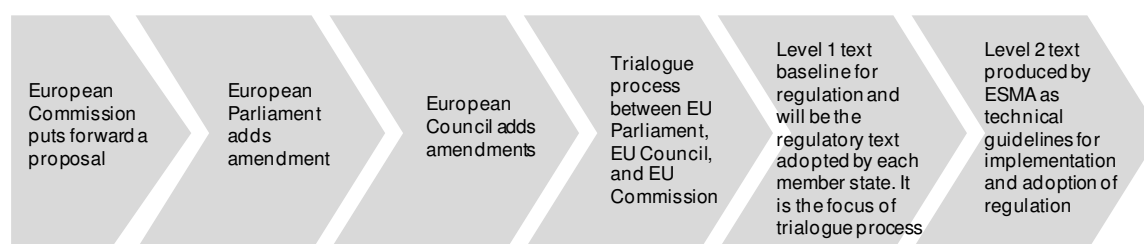
After reviewing the overall impact of MiFID, the European Commission released a reviewed directive (MiFID recast) as well as a regulation, the Markets in Financial Instruments Regulation (MiFIR), in October 2011. Together, they are known as MiFID II.

European legislation can be enforced under two mechanisms:

- **A directive**, once adopted by the European Parliament and European Council, is then passed down to each member state. The directive essentially provides a framework for the legislation, and the practical implementation elements are left to the member states to decide upon themselves. This in effect leaves elements of the legislation open to interpretation by individual European regulators.

- **A regulation**, on the other hand, once adopted by the EU Parliament and EU Council, comes into effect immediately for all European individuals and is adopted across the European markets consistently. Some European markets, such as Spain, have not abided by the MiFID directive while the rest of Europe has, so it is understandable that the EU Commission has proposed a regulation as well as a directive. Points that are crucial to the EU Commission are included in the regulation to ensure that every financial institution follows them. The European Securities and Markets Authority (ESMA) is the Europe-wide regulatory body that has the power to enforce the regulation across all European member states. The process of European legislation is displayed in Figure 16.

Figure 16: The European Legislation Process



Source: Aite Group

Within the MiFID II legislation, the European Commission has tackled some of the unintended consequences of MiFID I, including:

- A clearer definition for SIs
- A solution for a consolidated tape
- Creation of a new trading venue, the organized trading facility (OTF), that will reduce the amount of trading conducted OTC; within this new category, a subsection was created for BCNs.

The European Commission defines an OTF as:

any system or facility, which is not a regulated market or MTF, operated by an investment firm or a market operator, in which multiple third-party buying and selling interests in financial instruments are able to interact in the system in a way that results in a contract in accordance with the provisions of Title II of Directive [new MiFID].

The OTF category is a broadly defined execution venue that seeks to encompass trading that takes place OTC (i.e., outside of a RM or MTF).

Because the creation of the OTF category is in the new MiFIR regulation, it will be applied immediately across all member states once adopted by the European Parliament and European Council. To ensure a level playing field between RMs, MTFs, and OTFs, the proposal notes that these venues will have identical pre- and post-trade transparency as well as organizational and

market surveillance requirements. The main differentiator of an OTF to other trading venues is that the operator of an OTF has an element of discretion as to how a trade will be executed. RMs and MTFs lack an element of discretion regarding how orders are transacted on their platforms. Subsequently, OTFs will offer an alternative functionality or service to market participants (as compared with existing venues).

This element of discretion associated with how trades are executed in OTFs does raise some concern that operators could possibly profit from how they execute their client trades. OTF operators will be running these venues abiding by investor protection, conduct of business and best execution rules, and legislation, but the EU Commission feared that this was not enough. As a result, the EU Commission's proposal states that the proprietary capital of an operator is banned from its OTF venues. This means that a broker operating an OTF will not be able to use its own capital to execute against client orders.

The EU Commission created this category to apply to all asset classes, including equities, bonds, and derivatives, and it encompasses different types of trading, including order book and quote-driven systems. For different types of instruments with varying degrees of liquidity, appropriate and calibrated organizational and transparency rules will apply. For equities, the EU Commission created a subsection under the OTF category for BCSs. The EU Commission defines a BCS as an "internal electronic matching system operated by an investment firm which executes client orders against other client orders."

The EU Commission believes that the use of proprietary capital to execute client orders is akin to market-making services. It is clear to distinguish between a crossing venue, which falls under a BCS, and market-making, which falls under SI. The EU Commission proposal states that an SI should not be allowed to bring together third-party buying and selling interests as is permitted for RMs, MTFs, and OTFs. An SI is not a trading venue.

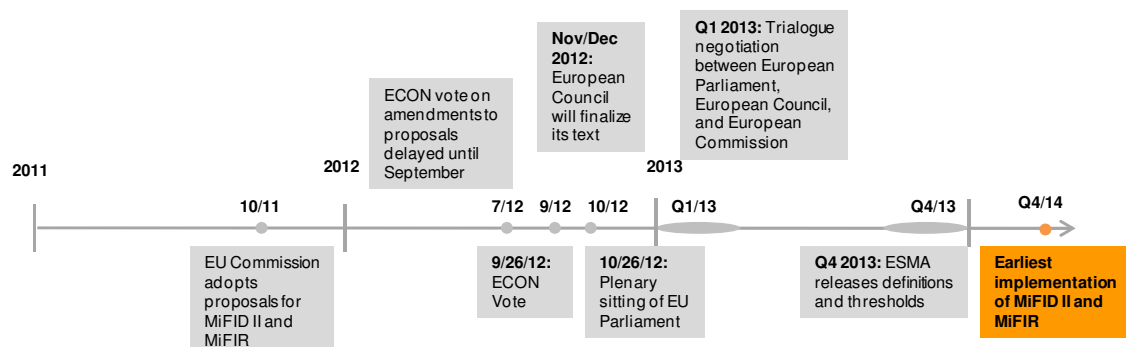
The German Member of European Parliament (MEP), Markus Ferber, is the rapporteur for MiFID II; in this capacity, his duty is to essentially guide the legislation through the legislative process. Throughout 2012, Markus Ferber has highlighted his desire to omit OTFs from the equities market. Other MEPs, such as Kay Swinburne, have, however, expressed their support for the OTF category in equities, highlighting the need for an additional category to encompass broker crossing facilities. Other MEPs, such as Arlene McCarty, have said that the OTF category should be removed completely from all asset classes as it is ill defined and would add complexity to the European securities markets. On October 26, 2012, the European Parliament as a majority decided that the OTF category should exist only for bonds, structured finance products, emissions allowances, and derivatives.

NEXT STEPS IN THE REGULATION TIMELINE

The review of MiFID began in 2011, but there is still a long way to go before the final legislation is implemented. The European Parliament has finalized its amendments, and the European Council is in the process of finalizing its own texts for the directive and regulation. Once the texts have been finalized, the European Parliament, Council, and Commission will begin negotiations to determine the final directive and regulation. Next, ESMA will be charged with putting together technical advice for the regulation that will give information on definitions, thresholds, and the application of the regulation. Once this is complete, the MiFID II and MiFIR texts can be

adopted—they are expected to go into effect during late 2014 or early 2015. A summary of the estimated regulation timeline for MiFID II/MiFIR is displayed in Figure 17.

Figure 17: Estimated Timeline for MiFID II/MiFIR



Source: Aite Group

SPREAD OF MARKET FRAGMENTATION IN EUROPE

In 2006, a trader looking to execute a trade in Europe had few options in terms of where to place that order. Traditional, long-established exchanges ruled Europe with a strangle hold, giving traders few options but to use their venues to place orders. Further, those venues were far from inexpensive, and their speed and efficiency were less than stellar. By summer of 2008, things had changed drastically, with MiFID bringing about radical change in the European exchange landscape, throwing open the doors to allow MTFs to start up. At that point in time, it appeared that old-school exchanges would be overwhelmed and conquered by the more nimble, efficient, and less costly MTFs. New MTFs were sprouting up faster than investment firms could keep track of them (Table D), and even more announced that they would set up shop in the near future.

Table D: First-Generation European MTFs, Post-MiFID

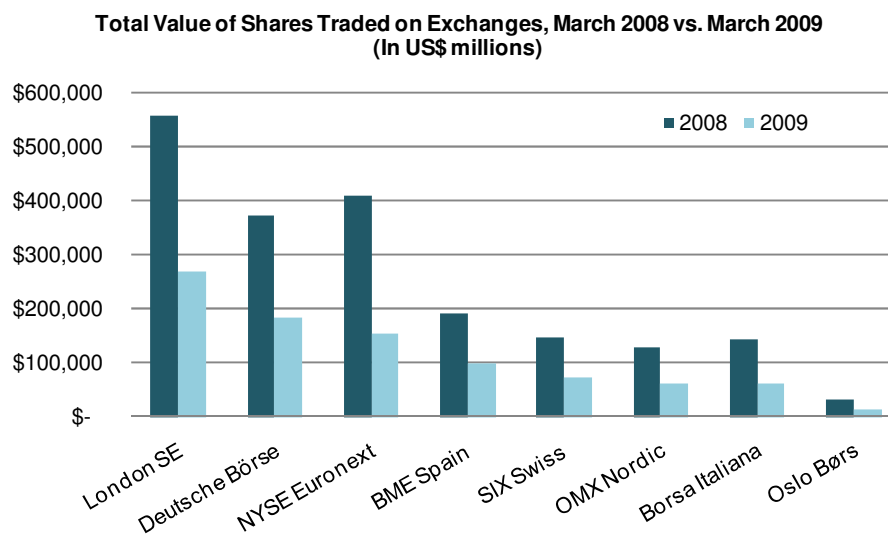
Firms/Projects	Launch Date	Ownership	Type
Chi-X Europe	April 2007	Instinet, BNP Paribas, Citadel, Citi, Credit Suisse, Fortis, GETCO, Goldman Sachs, Merrill Lynch, Morgan Stanley, Optiver, Societe Generale, UBS, Van der Moolen	Displayed
Equiduct	2008	Borse Berlin	Displayed and non-displayed
Euro Millennium	Q2 2008	NYFIX	Non-displayed
ITG Europe	1986	ITG	Non-displayed
Liquidnet	2006	Liquidnet	Non-displayed
Project SmartPool	Q2 2008	NYSE Euronext, BNP Paribas, HSBC	Non-displayed
Turquoise	Q3 2008	Citi, Credit Suisse, Deutsche Bank, Goldman Sachs, Merrill Lynch, Morgan	Displayed and non-

Firms/Projects	Launch Date	Ownership	Type
		Stanley, UBS, BNP Paribas, and Societe Generale	displayed
BATS Europe	Q4 2008	BATS	Displayed

Source: Firms

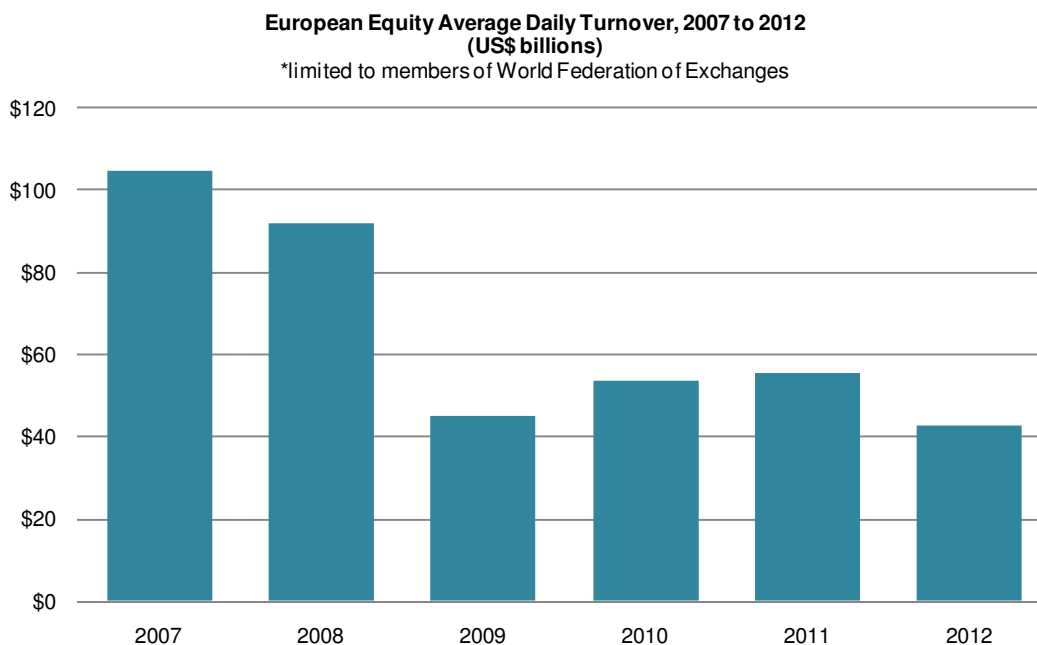
Then the bottom fell out of the markets, and all predictions of which MTFs would rule Europe were rendered void. By summer of 2009, with markets in a tailspin, the ultra-thin margins that had allowed MTFs to survive by having relatively high trading volume in a very narrow range of securities (usually the securities included in the major indexes, such as the FTSE-100) had begun to dry up as the value of securities being traded had shrunk along with the volume decline. MTFs, which in 2008 looked poised to put up a good fight against established exchanges such as the LSE and Deutsche Boerse, were struggling to hold onto the market share they had gained. When comparing the value of shares traded on the European exchanges with those of the previous year, it is easy to see just how drastically markets suffered (Figure 18).

Figure 18: Collapsing Trading Volume in Europe Post-Credit Crisis



Source: Aite Group

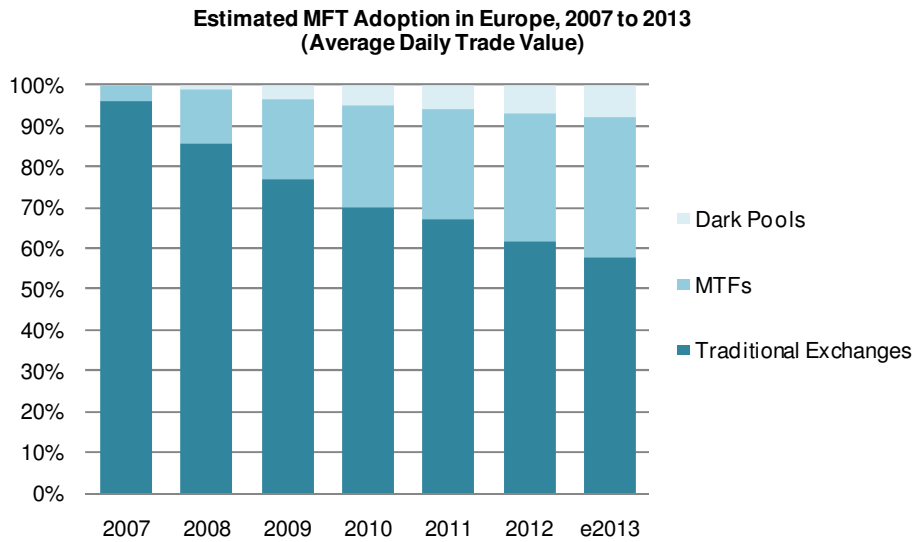
Since the precipitous decline in 2009, European equity volume has not truly recovered, making the competition for market share even tougher (Figure 19). For larger, traditional exchanges, this downturn was difficult to bear, as they generally have a much higher cost structure (i.e., a much larger number of full-time employees) than newer, smaller MTFs. The established exchanges, however, having been in existence for decades, also had a more diversified source of revenue—including transactions, market data, listing, and, more often than, not technology—to help sustain them through this lean period.

Figure 19: European Equity Volume

Source: World Federation of Exchanges, Aite Group

Since 2009, numerous new MTFs have entered the marketplace, either as independent new MTFs or (more typically) launched by incumbent exchanges to compete against the likes of BATS and Chi-X. While the lack of volume may have presented itself as barrier to entry to potential new venues, over the last four years, alternative execution venues have made their presence felt in the European trading arena.

In the first four months of 2009, 15% of European equity orders were traded on MTFs. Chi-X led the pack of MTFs in percentage of European equity trades, with an average of 9.4% of market value traded in the first four months of 2009. Turquoise peaked at 5% of LSE trade volume earlier in 2009 but quickly slumped to only 2.5% once the liquidity agreements it had in place with its nine co-owner banks expired. Part of the volume that was lost by Turquoise moved to Chi-X in April, helping Chi-X's impressive increase. By the end of 2012, MTFs and dark pools in the European market accounted for 38% market share of all pan-European trading volume (Figure 20).

Figure 20: Market Share of Traditional Exchanges vs. MTFs

Source: Exchanges, MTFs, broker-dealers, World Federation of Exchanges, Aite Group

One could also argue that continuing volume stagnation has dampened market fragmentation, leading to some consolidation in the marketplace as venues struggled to justify their existence in a low-volume environment. Two notable consolidations have had a huge impact on Pan-European market competition:

- LSE acquisition of Turquoise in early 2010
- BATS Europe acquisition of Chi-X in late 2011

While LSE's acquisition of Turquoise can largely be seen as a defensive move to shore up its declining market share in FTSE 100, the new combination of BATS/Chi-X has clearly established itself as the largest pan-European execution venue (Figure 21).

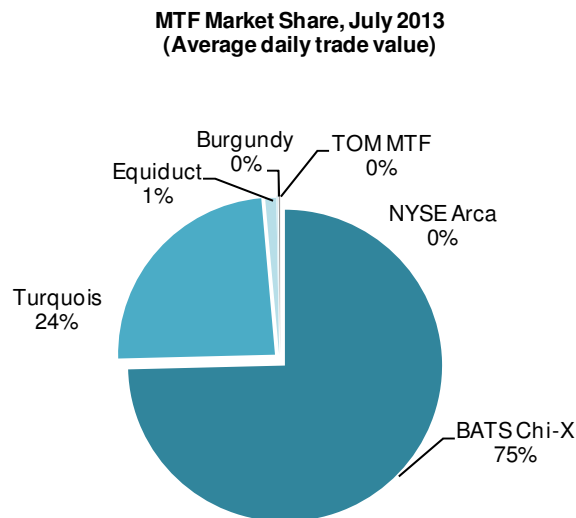
Figure 21: BATS Chi-X European Market Presence



Source: Fidessa Fragmentation Index

Focusing on the MTFs, BATS Chi-X, not surprisingly, has become the dominant player, accounting for 75% of all volume represented by MTFs. Once-promising MTF Turquoise is a distant second, at 24% of market share. Most other venues each account for less than 1% of market share (Figure 22).

Figure 22: Market Share Analysis of MTFs in Europe

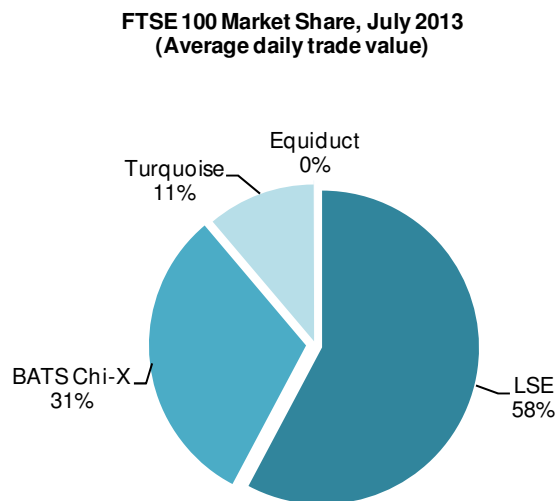


Source: Fidessa Fragmentation Index

While the battle for pan-European trading market share remains highly competitive, competition within specific market centers illustrates varying degrees of success by alternative trading venues. Still, the fact remains that the monopolistic nature of local markets no longer exists, and the penetration of MTFs into major financial centers has been a huge success in several countries since the implementation of MiFID.

- **United Kingdom:** The most liquid and largest equities market in Europe, the penetration of MTFs remains the highest within the LSE-listed stocks, with the LSE accounting for slightly less than 58% of market share. Including Turquoise, which is owned by the LSE, the combined market share of the LSE currently stands at 69%. BATS Chi-X has an impressive market share of 31% (Figure 23).

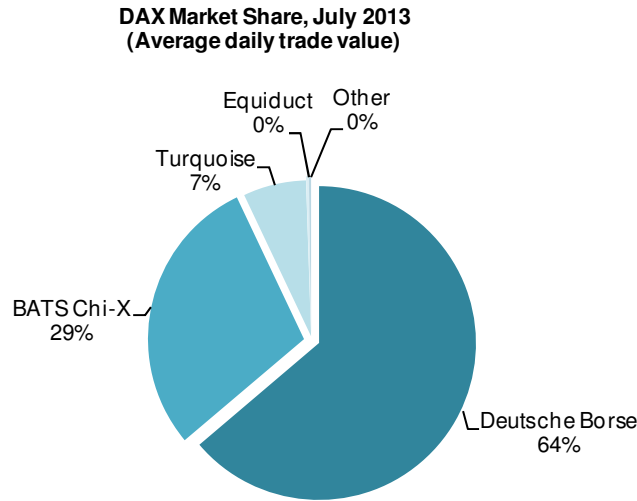
Figure 23: Market Share for FTSE 100



Source: Fidessa Fragmentation Index

- **Germany:** Deutsche Boerse currently accounts for 63% of the German market share; another strong presence, BATS Chi-X, holds 29% (Figure 24). Turquoise is a distant third at 7%, making the German market truly a competition between two execution venues.

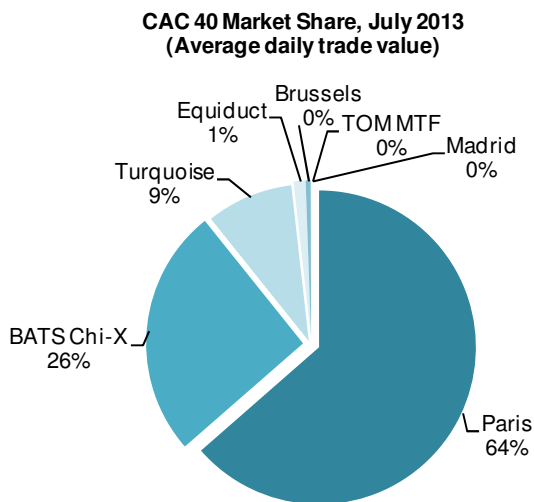
Figure 24: Market Share for DAX



Source: Fidessa Fragmentation Index

- France:** The market share battle for French equities looks quite similar to the German market, with Paris (part of Euronext) accounting for 64% of market share and BATS Chi-X holding a strong second place at 26% (Figure 25). While Turquoise has nearly 10% of market share, the market share of Turquoise remains quite minor when compared to its main MTF competitor, BATS Chi-X (this construct is similar to that of other markets).

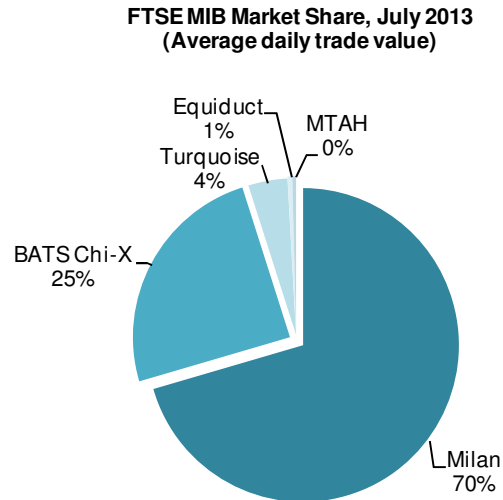
Figure 25: Market Share for CAC 40



Source: Fidessa Fragmentation Index

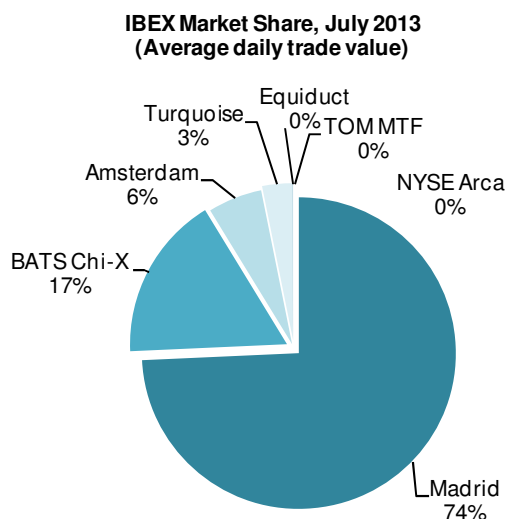
- **Italy:** Borsa Italiana has managed to hold onto 70% of market share in Italian equities, followed once again by BATS Chi-X at an impressive 25% market share. Turquoise once again rounds out the top three with 4% of market share (Figure 26).

Figure 26: Market Share for FTSE MIB



Source: Fidessa Fragmentation Index

- **Spain:** One of the last markets to actually implement MiFID, Bolsa de Madrid did not face real competition until early 2012, almost five years after MiFID came into existence. Not surprisingly, then, Bolsa de Madrid has held onto 74% of Spain's equities market share. As in markets, BATS Chi-X has the second position, with 17% of market share. The position for third place remains tight, with Amsterdam and Turquoise at 6% and 3%, respectively (Figure 27). Considering that true market fragmentation did not occur until 2012, the overall penetration of MTFs into the Spanish market has been quite impressive to date.

Figure 27: Market Share for IBEX

Source: Fidessa Fragmentation Index

KEY IMPLICATIONS OF MARKET FRAGMENTATION IN EUROPE

This section will focus on implications of market fragmentation for four specific areas:

- Best execution
- Connectivity and routing
- Consolidated tape
- Self-regulation and rule-making

EUROPEAN BEST EXECUTION

Under the original MiFID directive, firms are required to formulate, maintain, and demonstrate their best execution policies and practices on behalf of their clients. They will be required to maintain a five-year history of customers' trades, own quotes, and trade execution data, as well as statistics on execution venues used to complete execution, etc. The ability to capture, store, and analyze accurate and timely trade and customer-related data was seen as the key to successful regulatory compliance. This key element of MiFID put additional pressure on the data management infrastructure of all major European market participants.

Europe's best execution regulation has been an area of contention since MiFID I, as many market participants were concerned that it was not as stringent and prescriptive as required. MEPs have included a separate clause under best execution which specifically applies to retail investors in Europe. Since MiFID I, market participants, including Knight Capital, Citadel, and Equiduct have campaigned for best execution for the retail investor. They were concerned that retail investors were not being given access to alternative venues that may provide them with better executions.

MEPs have included an amendment specific to this point: Brokers are now required to declare the top five execution venues on a quarterly, rather than annual, basis.

They have also replaced the word "reasonable" with "necessary" in the definition of best execution. MEPs also mention that advances in technology related to monitoring of best execution should be considered when applying a best execution framework, but there is no clear stipulation for what technology or methodology should be applied for monitoring best execution. The clause now reads:

Member States shall require that investment firms take all *necessary* steps to obtain, when executing orders, the best possible result for their clients taking into account price, costs, speed, likelihood of execution and settlement, size, nature or any other consideration relevant to the execution of the order.

EUROPEAN CONNECTIVITY AND ROUTING

The need for connectivity and routing (especially SOR) grew in magnitude of importance as fragmentation infiltrated the major European financial markets. Most of the European brokers also recognized the direct relationship between best execution and establishing the appropriate connectivity and routing capabilities. As market competition increased across Europe, brokers found that ensuring connectivity to all major venues had become a competitive necessity. A crucial element of achieving competitive connectivity has been overall development of SOR capabilities.

Due to the complexity involved in aggregating data and defining appropriate routing parameters within the SOR engine, the evolution of the SOR market in Europe has not been simple. In fact, the lack of a consolidated tape to represent the pan-European market, along with the convoluted nature of the European post-trade landscape, has made leveraging SOR for best execution quite difficult. Even if one were to focus on a single factor of capturing best price, the dispersed nature of the European market and varying local interpretations of MiFID have made it so that working out where the best (all in) price is at any instant is actually a real technical challenge. MiFID I also stopped short of mandating brokers to find the best price, which meant that all they had to do was establish a written execution policy and stick to it. As an extreme example, a German broker could write in its policy that it guaranteed at least as good as the Deutsche Boerse price (irrespective of the stock), and that was perfectly acceptable and legally compliant, even if it was a foreign stock and the investor would have gotten a much better price elsewhere.

With a weak regulatory "stick" for SORs and a very complex technical implementation, the market in pure-play SOR vendor market appears fairly small for Europe. Most people simply rely on broker algos for their smart routing (they do not at present typically carry much of a premium over pure DMA). There are also market centers that provide SOR service, but only BATS Chi-X does that consistently.

In addition to the brokers, European money managers are responding to MiFID requirements with SOR implementations, both to prove best execution and to keep up with the expanding pool of liquidity choices, and they have proven to be an eager market for providers. HFT firms have also been exploring SOR providers.

Similar to other major markets, compliance with best execution requirements is a major driver for European firms, which makes the reporting capabilities of SOR a key piece of functionality.

EUROPEAN CONSOLIDATED MARKET DATA

Decreased transparency for buy-side traders—which is directly related to the lack of consolidated market data—is one of the major unintended consequences of MiFID I. Additionally, with no standardization surrounding condition codes (trade flags) or data format, creation of a consolidated tape was impossible. On top of this, many incumbent exchanges only offered market data in a bundled package of pre- and post-trade data. Pre-trade data is redundant for a consolidated tape, but paying for it in a bundled fee makes the cost of a consolidated tape drastically more expensive.

Longer term, adoption of electronic trading in Europe has been severely limited without the organization of a consolidated tape. This fragmented-data issue has created a negative scenario around fragmented liquidity, and the lack of a consolidated tape makes a fragmented liquidity landscape difficult to navigate, leading to some frustrated European market participants. This issue has been present in Europe for five years; many firms have attempted to create a solution, but the ideal scenario has yet to appear. We have, however, seen some movement toward solving this problem—incumbent exchanges now offer their market data in an unbundled form, allowing the purchase of post-trade data. Additionally, a working group of market participants has agreed upon standards related to condition codes and data format of market data.

Three consolidated tape options were proposed to the industry: the U.S. model, which involves a single tape produced by a non-profit entity, a single tape following public tender, or multiple competing tapes. The European Commission has proposed to allow multiple competing commercial tape operators, but buy-side firms have raised fears that the data will merely be fragmented across multiple—potentially incomplete—tapes under this model.

Creation of a consolidated tape in Europe would have a massive impact on best execution and market participants' ability to measure whether they are actually meeting best execution. The latest attempt at creating a consolidated tape was initiated by the COBA Project, launched in late 2012 with the vision of creating a framework for establishing a pan-European consolidated tape (focused only on post-trade data). Three key tenets of the COBA Project included the following:

- Establishing an independent consolidated tape administrator (CTA)
- Defining unified tape specifications
- Developing a pricing schedule for consolidated tape and a revenue-allocation model

This ambitious initiative ultimately failed, despite the fact that there is overwhelming recognition of a pan-European consolidated tape. Ultimately, lack of support from the key market participants made it impossible for the COBA Project to continue. Hurdles to pushing ahead with the project include the following:

- European exchanges' hesitancy to share pre-trade quote data, which they view as vital part of their current revenue stream in their local markets

- Lack of strong support from sell-side firms, which are more concerned about the impact of adopting best practices for OTC trade reporting and looking for reduction in market data costs
- Buy-side firms' unwillingness to incur additional costs for development of consolidated tape
- Data vendors were willing to adopt common technical specification and standards to enhance consolidated data quality and consistency but not fully convinced that the market would be willing to pay for just post-trade data without pre-trade quote information
- Regulators unwillingness to endorse any commercial ventures associated with consolidated tape

To a certain degree, the European market currently faces a classic chicken-or-egg dilemma: Regulators want data vendors to lead the movement toward creating a pan-European consolidated tape, but vendors are looking for a regulatory mandate to lead the way.

EUROPEAN SELF-REGULATION AND RULE-MAKING

In contrast to the U.S. regulatory regime, the concept of self-regulation has not been widely accepted in Europe. Driven by demutualization of exchanges (turning them into for-profit commercial entities) as well as the overarching regulatory framework of the EU to create a harmonized, single financial market, the major trend within the European securities market has been the overall consolidation of regulatory and supervisory market functions in the hands of government agencies.

Directives enacted by the European Commission have mandated local government regulators to assume various regulatory functions that were at one point the responsibility of exchanges. These include the following:

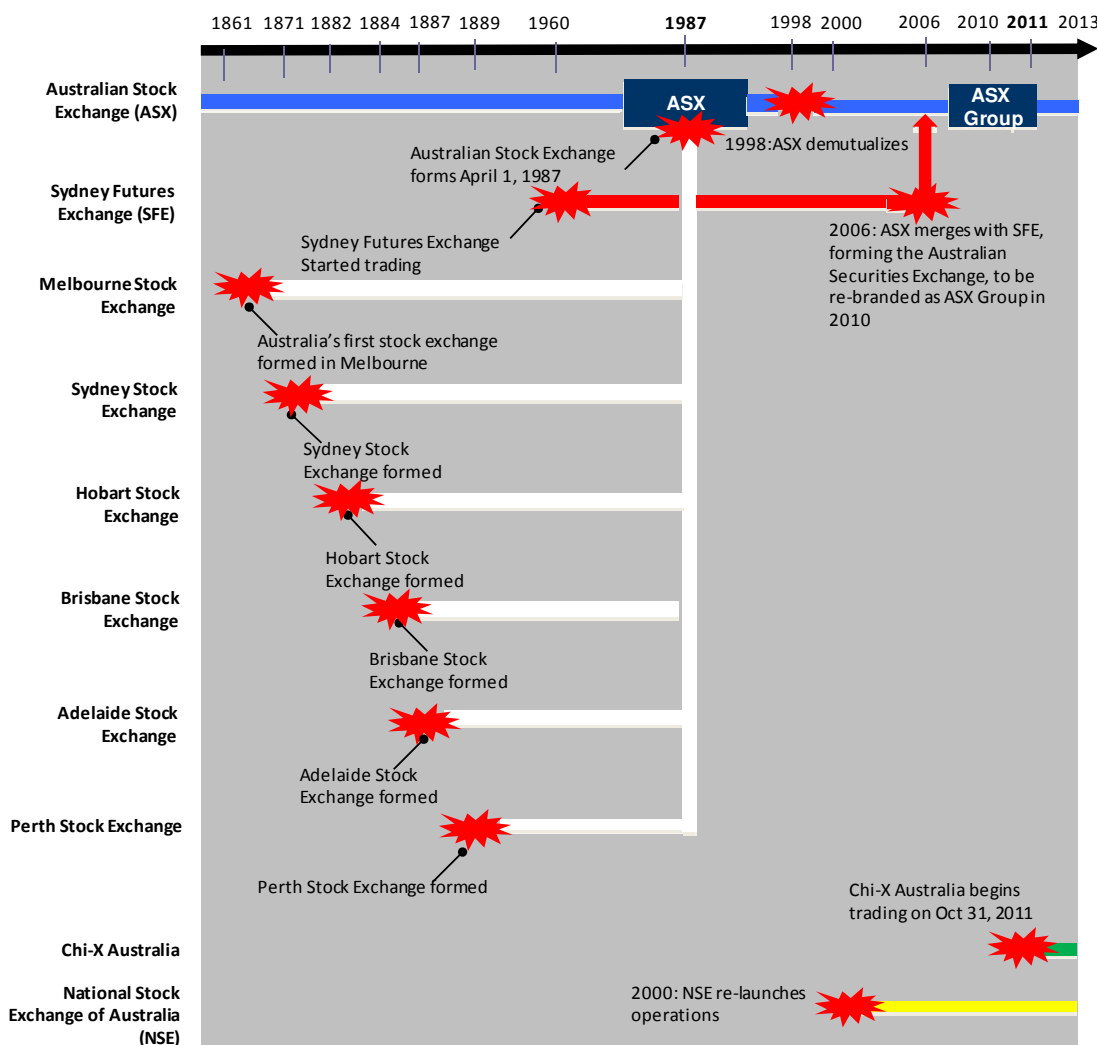
- Taking over primary responsibility for addressing market conduct
- Assuming responsibilities for approving prospectuses and for many listing functions
- Through MiFID, regulatory agencies establishing a common framework for regulating exchanges and their members

The general view within the European market has been that as exchanges continue to face competition and become public companies themselves (looking to maximize their own profit margins), it would be inappropriate for these exchanges to hold onto significant regulatory responsibilities. This separation of the commercial and regulatory aspects of running a market center is the core foundation of regulatory regimes across most of the major European financial centers. Having exchanges also performing the role of SRO has been viewed as conflict of interest potentially hindering increased competition. Still, it should be noted that most European exchanges, even without an official SRO status, continue to provide limited supervisory functions related to their markets. For example, exchanges will share the role of market surveillance to identify potential trade abuse but will typically defer to the regulator to take the lead role in the actual investigation.

MARKET STRUCTURE EVOLUTION IN AUSTRALIA

Fragmentation is still in the relatively early stages in Australia, which is one of the most recent and unique markets in which we can observe significant market structure evolution. From 1987 until 2011, Australian equity trading was almost entirely dominated by the Australian Stock Exchange (ASX), which has shared only a small portion with the state-owned National Stock Exchange (NSE) since 2000. ASX was created through legislation by the Australian Parliament that provided for the incorporation of the six previously existing stock exchanges located in the cities of Adelaide, Brisbane, Hobart, Sydney, Melbourne, and Perth.

Figure 28: Australian Market Structure Evolution



Source: Aite Group

ASX made history in 1998 when it became the fourth exchange worldwide to demutualize and the first to list on its own market—a development that was subsequently emulated by many

exchanges around the globe. After demutualization, ASX pursued a number of strategic commercial initiatives, including a successful merger with the Sydney Futures Exchange (replacing the name Australian Stock Exchange with Australian Securities Exchange), and proceeded to evolve into a fully vertically integrated business, down to the clearing and settlement level. ASX's monopoly on the Australian capital market remained until October 2011, when Chi-X Australia opened its doors to market participants. While market participants are generally still undecided on whether the ultimate costs of fragmentation will outweigh the benefits, most have accepted the recent market structure changes, signifying the end of ASX's monopoly as inevitable.

MAJOR REGULATORY EVENTS IN AUSTRALIA

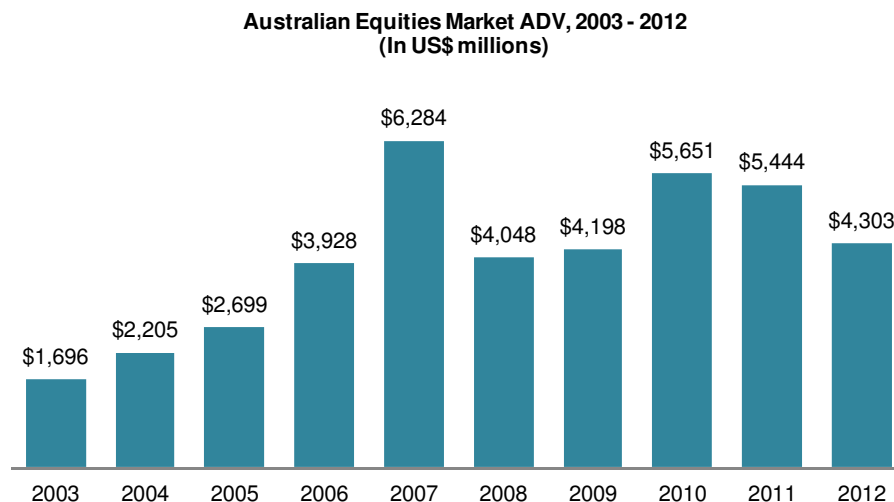
The first significant regulatory change that set the Australian market on the path leading to today's reality involved consolidation instead of fragmentation, when the Australian Parliament legislated the amalgamation of the country's existing six securities exchanges. This development birthed the modern Australian securities market and allowed ASX to emerge as the trading center for the equities market. At this time, the newly formed ASX launched the Stock Exchange Automated Trading System (SEATS), one of the first fully automated trading platforms of its kind, thus providing an ideal environment to grow the freshly amalgamated Australian market's liquidity.

The next regulatory milestone for the Australian market opened the door for the demutualization of ASX. In December 1997, regulatory authority the Australian Securities and Investments Commission (ASIC), augmented the existing Corporations Law to allow for the possibility of demutualization. This development arrived in response to proposals from ASX and over 96% approval of demutualization from ASX members, with the goal of allowing the exchange to increase flexibility, funding, and its ability to take advantage of commercial opportunities. Essentially, ASX would have the opportunity to grow as a business.¹ For market structure and regulation, the key effects of this legislative change involved introducing the concept of shifting supervisory responsibilities to ASIC (which operates with legislative authority)² instead of ASX in order to prevent conflicts of interest. This concept of regulatory transference was later codified in the Corporations Act of 2001.

More than a decade after demutualization, Australian trading had grown sufficiently in liquidity and sophistication to spur serious regulatory discussions regarding the viability of introducing competition in the exchange space (Figure 29). In August 2009, the Australian Government announced the decision to transfer supervisory responsibility to the umbrella of ASIC, resulting in an amendment to the Corporations Act of 2001, the Corporations Amendment (Financial Market Supervision) 2010—the key piece of legislation ultimately facilitated market structure fragmentation. Passed in March 2010 and implemented in August 2010, the Financial Market Supervision Act provided the legal basis for ASIC to issue a series of Market Integrity Rules (MIRs) governing ASX and any other eventual entrants in the exchange landscape.

1. "Market Demutualisation and Cross Border Alliances," Jillian Segal, ASIC, April 2002.

2. Regulations set forth by ASIC must be given Ministerial consent and may be disallowed by Parliament.

Figure 29: Australian Equities Market ADV Evolution

Source: WFE

Placing oversight of the capital markets entirely in the hands of the government-backed regulatory body was the crucial first step toward building a market structure conducive to new entrants, and thus allowed ASIC to responsibly license Chi-X Australia as an exchange operator. As a result of this mandate, ASX was compelled to overhaul several of its operating rules as well as rebrand certain subsidiary entities, including ASX Market Supervision, which became ASX Compliance.

ASIC's Market Integrity Rules were not written with the intention of dramatically changing the existing functional regulatory regime. Rather, the regulations were issued with the intention of creating fairness in a fragmented marketplace, specifying risk management as a guiding fundamental principle. Table E summarizes ASIC's market integrity legislation for existing venues of all types, although ASX and Chi-X Australia are the only significant equity trading venues in terms of market share.

Table E: Australian Market Integrity Rules

ASIC Regulation	Venue(s)	Key Components
Market Integrity Rules (ASX Market) 2010	ASX	Participants and representatives, client relationships, records, trading, takeovers, market operators, capital requirements, accounts and audit, futures market transactions, capital liquidity requirements, net tangible asset requirements, risk requirements (counterparty, large exposure, positions, underwriting)
Market Integrity Rules (ASX 24 Market) 2010	ASX 24 (SFE)	Market participants, trading principles, market operator, capital requirements, accounts and audits, margins and right of close out
Market Integrity Rules (Chi-X)	Chi-X	Participants and representatives, client relationships, records, trading, takeovers, market operators, capital requirements, accounts and audit,

ASIC Regulation	Venue(s)	Key Components
Australia Market) 2011	Australia	futures market transactions, capital liquidity requirements, net tangible asset requirements, risk requirements (counterparty, large exposure, positions, underwriting)
Market Integrity Rules (APX Market) 2010	APX Energy Exchange	Market participants, trading responsibility of market participants, conduct of others
Market Integrity Rules (IMB Market) 2010	IMB Ltd.	Market participants
Market Integrity Rules (NSXA Market) 2010	NSXA	Market participant business and activities, discretionary accounts and managed funds, trading principles, financial requirements and recordkeeping
Market Integrity Rules (SIM VSE) 2010	SIM VSE	Market participants, financial records and arrangements, trading requirements, market participant business

Source: ASIC

In addition to the regulatory documents covering specific venues, ASIC also released Market Integrity Rules for Competition in Exchange Markets (2011), setting out overarching regulatory principles applicable to all market participants and covering following areas:

- Extreme price movements—including order entry, extreme cancellation range, and transparent cancellation policies
- Best execution
- Pre-trade transparency—including reporting requirements for crossing systems
- Post-trade transparency
- Market operators— including trading suspensions, information sharing, synchronized clocks, and tick sizes
- Participants—including transactions, trading suspensions, and single trade confirmations in multiple markets

HFT activity has been increasingly falling under ASIC's radar. Estimated at comprising 20% to 25% of total market turnover, Australian HFT is facing growing scrutiny, as is HFT in many other markets. In March of 2013, ASIC released proposed amendments to the Market Integrity Rules (governing Competition, ASX, ASX 24, and Chi-X Australia), which are specifically written to cover dark pools and HFT. The proposed regulation covers client relationships, trading, pre- and post-trade transparency, and crossing systems.

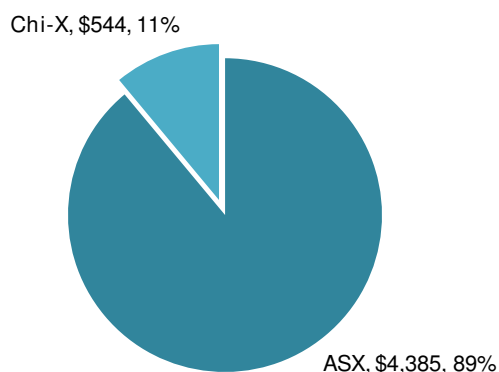
SPREAD OF MARKET FRAGMENTATION IN AUSTRALIA

Without question, the Australian equities market has transformed since the introduction of competition a mere 20 months prior to this writing. Of the markets included in this study, Australia is unique in its experience of fragmentation; moreover, its market structure evolution is still in the relatively early stages. Unlike the United States, Europe, and Canada, the Australian market greeted the introduction of competition with only one existing exchange dominating 99% of trading and equity ADV accounting for only 2% of global volume. Additionally, the structural shift has brought only bilateral trading, resulting in a duopoly instead of a heavily fragmented market. These unusual characteristics also provide us with interesting results to consider—results that could infer a relevant precedent for other markets with similar characteristics.

Chi-X Australia launched trading on October 31, 2011, offering six equity listings and two ETFs during an initial testing period.³ The remaining ASX200 constituents and ASX-listed ETFs were incorporated nine days later, with all ASX-listed stocks trading on Chi-X Australia by May 2013. Market share for the competitor moved in tandem, slowly reaching by 5% in August 2012, but doubling to 10% by the end of the year. Chi-X Australia market share now represents 12% to 17% of Australian value traded and 15% to 18% of shares traded. Figure 30 and Figure 31 display the fragmentation of Australian trading during Q1 2013.⁴ Chi-X Australia speculates that its market share could rise to 20% by the second half of 2013.

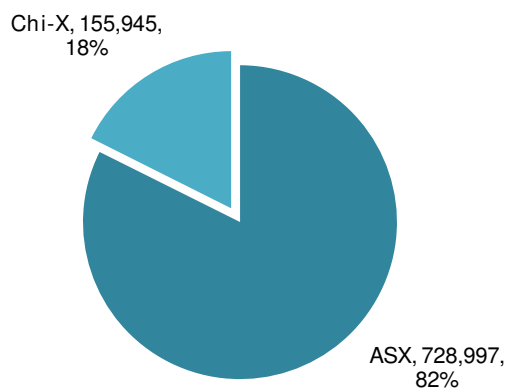
Figure 30: Australian Equities Market Share, Value Traded

Australian Equities Market Share by ADV, 1Q13
(In US\$ millions)



Source: ASIC, WFE

3. Consisting of Australia's six most liquid stocks, BHP, CSL, LEI, ORG, QBE, WOW, and two ETFs, STW and ISO.
4. The National Stock Exchange (NSX) also trades Australian equities but accounts for less than 1% of ADV, so it has not been included here.

Figure 31: Australian Equities Market Share, Number of Trades**Australian Equities Market Share by ADT 1Q13
(Number of trades)**

Source: ASIC, WFE

A sizeable part of Chi-X Australia's success can be attributed to its significant retail investor participation, reported at 31% of aggressive order flow, or more than double the equivalent proportion on ASX. Much of this popularity is due to Chi-X Australia's efficient midpoint order system, which has allowed retail investors to see tangible price improvement.

Not all Australian liquidity is represented by official trading data, however; there is still unlit activity to account for. In addition to the execution venues offered by ASX (Table F: ASX Additional Execution Venues), a number of dark crossing systems are provided by market participants and other third parties, such as Liquidnet, in addition to networks that automatically match client order flow, such as Price Improvement Network (UBS), CrossFinder (Credit Suisse), and Sigma X (Goldman Sachs).

Table F: ASX Additional Execution Venues

Name	Description
VolumeMatch	An ASX-operated venue that facilitates the matching of large orders (over US\$1 million)
CentrePoint	An ASX-operated venue that references the midpoint of the bid-ask spread on ASX's CLOB; they are anonymous unpriced orders that are executed in time priority
PureMatch	A parallel CLOB aimed at HFTs and other users of high-speed trading technology, it allows trading in the 200 most liquid securities and seeks to encourage HFTs

Source: ASX

KEY IMPLICATIONS OF MARKET FRAGMENTATION IN AUSTRALIA

This section will focus on implications of market fragmentation for four specific areas:

- Best execution
- Connectivity and routing
- Consolidated tape
- Self-regulation and rule-making

AUSTRALIAN BEST EXECUTION

At the highest level, ASIC has defined the meaning of best execution to be that "participants must take reasonable steps to obtain the best outcome for [a] client" during the order and execution process. The maximum penalty for violators of the best execution policy is A\$1 million. ASIC differentiates between retail and institutional clients when delineating the specifics of this definition:

- **Retail clients:** For retail clients who have not given specific instructions, ASIC defines the "best outcome" as the best Total Consideration.
- **Institutional clients:** For institutional clients who have not given specific instructions, ASIC defines the "best outcome" as either or any combination of price, costs, Total Consideration, speed, likelihood of execution, or other relevant outcome.

For both retail and institutional clients, ASIC has provided exceptions to the best execution obligation in the case of conflicting specific instructions given by the client. The participant must take the same "reasonable steps" to execute the order as the client specifies as long as those instructions meet certain criteria:

- The conflicting instructions are expressed clearly and unambiguously in writing or verbal recording (if the instructions are verbal, the recording must be retained for seven years).
- The conflicting instructions must also be specific to an order:
 - There are no exceptions to this for retail investors—conflicting instructions cannot be accepted in the form of any standing agreement.
 - For institutional clients, conflicting instructions can be accepted as standing instructions but must be separate from the standard terms and conditions of a client agreement; additionally, the conflicting standing instructions must be reviewed periodically and must be renewed after a one-year period.
- The participants cannot in any way encourage or induce clients to give conflicting instructions.

ASIC also specifies additional requirements and restrictions for participants, which must document the process of complying with all policies and procedures, specifically:

- Order books or equivalents
- Methods of handling and executing client orders, and circumstances under which parts of the process will be automated or manual
- Agreements to monitor compliance policies

Pricing between the two exchanges tends to work in tandem due to the market forces of arbitrage, and best execution means slightly different things to retail vs. institutional customers. For retail brokers, their mandate is to deliver the best end result to the customer, whereas institutional brokers' mandate is to dictate their cost basis.

AUSTRALIAN CONNECTIVITY AND ROUTING

The launch of Chi-X Australia operations understandably triggered speculation regarding prospects for SOR technology and additional connectivity in Australia, compounded by the market's healthy level of participation by high frequency traders. Given that ASX has used the automated trading system SEATS since its formation in 1987, when the technology was among the first of its kind, most participants were already using updated connectivity infrastructure when the arrival of an additional exchange revitalized market opportunities. Nearly immediately after ASIC's intention to facilitate market fragmentation became clear, ASX collaborated with Fidessa to launch ASX Best, an SOR platform that upgraded the existing ASX Workstation by providing routing and data consolidation capabilities.

Chi-X Australia experienced relatively few hurdles related to connectivity, as it was met with multiple favorable conditions upon commencing operations. Australia's market has always tended toward a high concentration of institutional investors, a result of its sizeable pension fund assets, which naturally attracts a high number of global brokerage houses with enhanced connectivity infrastructure, thus requiring little investment to connect to the new market entrant. Additionally, Chi-X Australia benefitted from its existing relationships with many global brokerages, formed during the course of the exchange's experience in other markets. The exchange also reports success with retail brokerages as a result of the attractiveness of its fee structure and midpoint crossing services for retail investors. In addition to Australian market leader IRESS, which has been connected to Chi-X Australia since the start of trading, many leading global providers now provide connectivity to the new venue, including SunGard, Broadridge, Fidessa, and Equinix (the primary data center for Chi-X Australia's matching engine).

SOR capabilities will become increasingly essential as Chi-X Australia's market share expands. Many Australian broker-dealers, particularly the larger banks, are considering or are in the process of developing proprietary SORs, hoping to develop new differentiating products. Moreover, many Australian buy-side firms are said to be considering near-term adoption of TCA platforms, which should serve to compound the demand for accurate and timely execution data extraction.

AUSTRALIAN CONSOLIDATED MARKET DATA

When ASIC began issuing the Market Integrity Rules to set the stage for the introduction of competition, the regulator also recognized that producing consolidated pre- and post-trade data is necessary in a fragmented marketplace in order to achieve best execution. Departing from the Canadian model of a single, regulator-chosen provider, ASIC decided that multiple private consolidators would be allowed to provide consolidated tape offerings, a framework overwhelmingly favored by market participants. In order to be sold to the marketplace, however, consolidated feeds must meet certain regulatory standards that⁵ govern the following areas:

- **Minimum service standards:** ASIC has defined the minimum service for data consolidators as top five bids and offers as well as all post-trade information.
- **Fairness in availability and fees:** Data must be offered equally to all customers, and fees for individual components should be offered separately; additionally, data should be available at no charge after a short delay.
- **Quality of data:** Data should be validated in real-time.
- **Systems and technology:** Providers must ensure control over their systems and procedures to manage disruptions.
- **Organizational governance:** Providers must have procedures in place to prevent conflicts of interest.
- **Data security:** Appropriate measures should be in place to ensure data security and integrity.

Interesting, developing quality consolidated data after fragmentation is notably less of a challenge in the Australian market than it has been in certain other markets, due to participants' longstanding emphasis on the ability to view full market depth. Likewise, ASX market data products have never differentiated between Level I and Level II data – the default offering has always been Level II with full market depth, providing a panorama of both light and dark trading. Not surprisingly, ASX market data has also historically been more expensive in comparison to other exchanges around the world. Chi-X Australia currently does not charge for market data.

AUSTRALIAN SELF-REGULATION AND RULE-MAKING

As described earlier in this section, the first transformation in the self-regulatory regime maintained by ASX since its formation in 1987 occurred in order to manage potential conflicts of interest stemming from the demutualization and self-listing of ASX. The Parliamentary legislation that made demutualization possible introduced the concept of shifting regulatory burden, which was later codified in greater detail in the Corporations Act of 2001. Key areas brought to attention included:

- Market surveillance obligations of exchanges
- Reporting and compliance requirements for exchanges

5. Explained in detail in ASIC Regulatory Guide 223.283

- Enhanced regulatory powers related to auditing and exchange compliance
- Appointment of ASIC as the listing authority for ASX, while ASX fulfills this role for other listed entities

Adopting all formerly self-regulatory obligations in 2010 to facilitate the introduction of competition imposed significant costs for ASIC and ultimately the Australian government. Table G displays a summary of additional regulatory obligations.

Table G: ASIC Responsibilities Before and After Assuming Regulatory Obligation

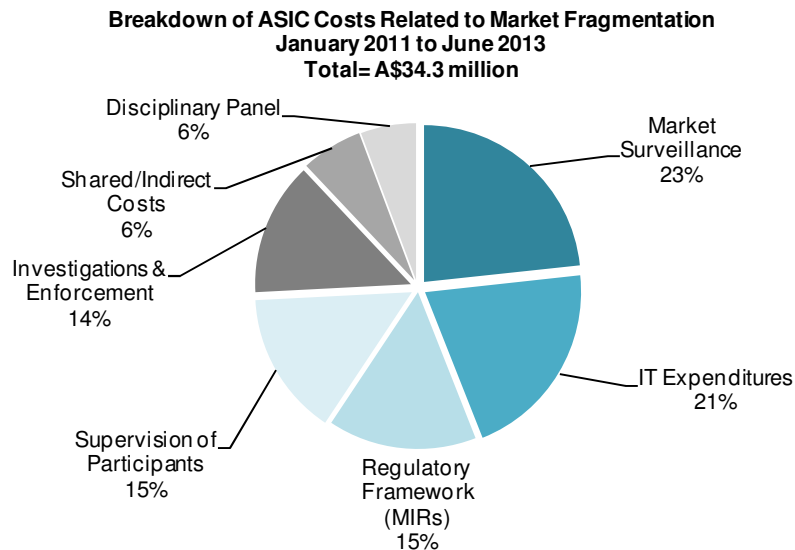
Before Obligation	Additional After Obligation
Assessing and undertaking preliminary reviews of referrals from exchanges	Real-time market surveillance and post-trade analysis to identify breaches of MIRs
Investigations on enforcement actions on cases referred by the exchange	Monitoring compliance with MIRs
Enforcement actions against breaches of Corporations Act	Administering disciplinary framework for breaches of MIRs
Monitoring participant conduct against their obligations under the Corporations Act, including licensing requirements	

Source: ASIC

From January 2011 to June 2013, ASIC's total additional costs incurred as a result of the new regulatory functions necessitated by market fragmentation stood at A\$34.3 million, which was somewhat evenly split between the cost of implementing the policy to promote market competition and the transfer of supervision. Unsurprisingly, the largest individual portion of these expenditures encompassed either direct or indirect related to market surveillance needs.

Technology infrastructure, which includes continuing upgrades to ASIC's Integrated Market Surveillance System (IMSS)⁶, necessitated the largest portion of spending, followed closely by direct costs related to executing the market surveillance function (including real-time surveillance). Figure 32 provides a detailed breakdown of ASIC's expenditure allocation during the period of January 2011 to June 2013. We note that ASIC reports an additional A\$7.7 million spent from August 2010 to June 2011, bringing the total cost of introducing competition to the Australian exchange to A\$42 million.

6. ASIC purchased the IMSS, provided by NASDAQ SMARTS, in March of 2010.

Figure 32: Costs Incurred by ASIC Related to Market Fragmentation

Source: ASIC, Aite Group

To recoup the expenditures associated with its new role in market supervision, ASIC instituted a cost-recovery policy by activating a charge-back mechanism put in place by the Australian Government in 2002. The cost-recovery schedule is levied in the form of fees and varies by market participant, with the variance related to the portion of costs incurred by the specific participant. Chi-X Australia and ASX also pay additional fixed and variable fees on a quarterly basis. The types of charges required by ASIC are summarized below:

- **Fixed fees for market centers:** Both Chi-X Australia and ASX are charged certain fixed fees per quarter, although they are not equal (Chi-X Australia pays 64% more per quarter). Quarterly fees relate to specific costs, such as:
 - Setting up real-time surveillance with the ASIC IMSS
 - Connecting the ASIC IMSS to trading platforms
- **Variable fees:** ASIC charges activity-based fees based on the number of transactions and number of messages reported during a period. Each participant's responsibility is determined by market share and portion of costs.
- **Minimum trading fees for participants:** Beginning in July 2013, ASIC imposed a flat minimum trading fee of A\$ 1,835 per quarter on market participants in addition to the variable fees, reasoning that the pool of regulatory resources is available to all direct participants regardless of activity.
- **Futures market fee:** ASX 24 pays a separate fixed fee per quarter.
- **Smaller markets fee:** NSX, SIM, IMB, and APX each pay a minimal fixed fee for market surveillance, which is not real-time.

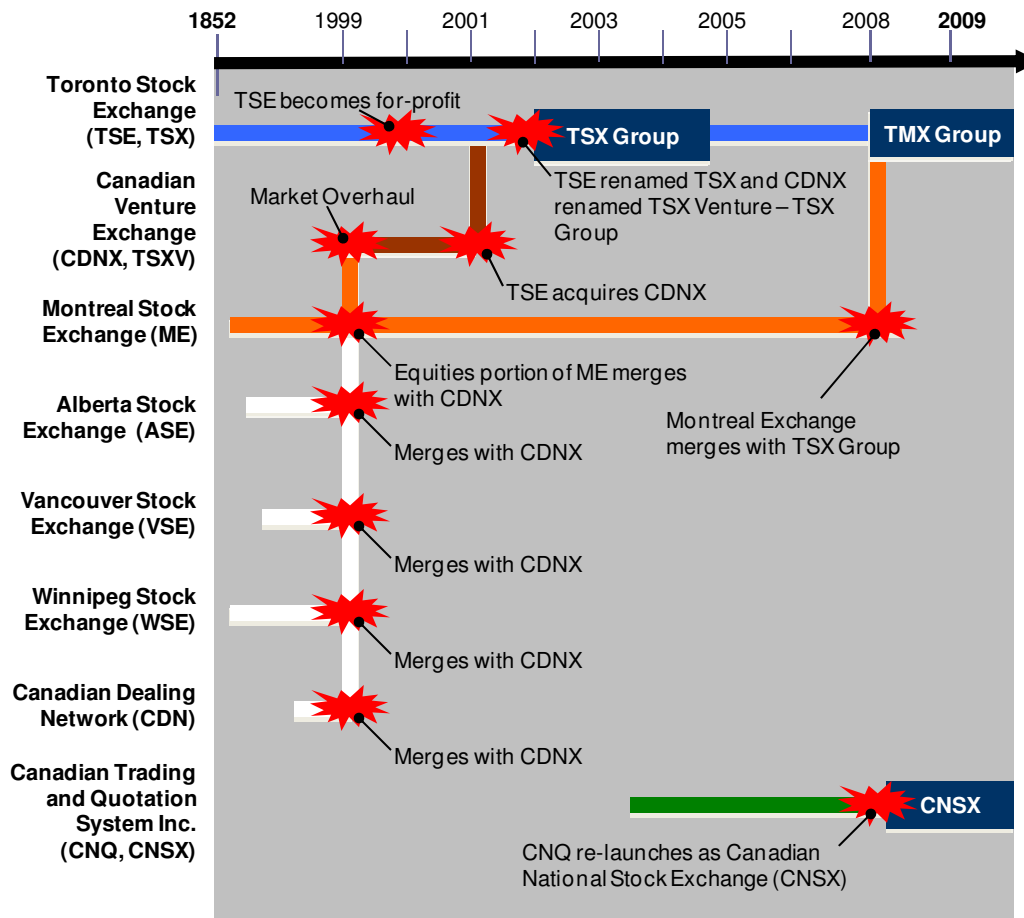
Market participants are divided as to whether the costs of introducing competition have been worth the benefits. While some recently produced academic studies argue that the answer is yes—in terms of improved price discovery and smaller bid-ask spreads—institutional players in Australian trading tend to be somewhat agnostic about whether the costs have been justified, although most consider the new multi-market structure to be a long-term positive development. However, we note that many smaller domestic participants are strongly and vocally displeased with the total cost burden, particularly since ASIC's recent introduction of a quarterly minimum trading fee. Indeed, in an environment of limited trading volume, the ultimate cost-benefit outcome of fragmentation is likely to be more favorable for Australia's global institutional market participants.

MARKET STRUCTURE EVOLUTION IN CANADA

The landscape of the Canadian equities market has gone through several drastic changes in the past decade. Almost 10 years ago, the Canadian exchanges overhauled their entire market structure, leaving the domestic market with a sole exchange for senior equities: the Toronto Stock Exchange (TSX). This restructuring also left Canada with two national exchanges for junior equities: the Canadian Venture Exchange (CDNX) and the Canadian Trading and Quotation System (CNQ, Figure 33).

Approximately two years after the restructuring of the Canadian exchanges was completed, the TSX began leveraging its dominance in senior equities and acquired the small junior equities exchange CDNX, which was renamed TSX Venture Exchange (TSXV). The TMX Group—a Canadian exchange conglomerate comprising the TSX, the TSX Venture Exchange, and the Montreal Exchange—was formed in 2008. Despite what is essentially a monopoly held by the TMX Group in the Canadian market, the exchange consolidations were in part a strategic move, accelerated by the arrival of ATSS.

Figure 33: Consolidation in the Canadian Exchange Market



Source: TMX, CNSX

The Canadian equities market currently resembles the U.S equities market in terms of competitive structure. While the consequences of market fragmentation and overall adoption of electronic trading have become growing concerns in the Canadian equities market for regulators and market participants alike, it has not hindered the rise and growth of ATSS in Canada.

MAJOR REGULATORY EVENTS IN CANADA

The entrance and operation of ATSS in Canada would not have been possible without a change in equities market regulations opening the doors for such platforms. In July 1999, shortly after the reorganization of the Canadian stock exchanges, the Canadian Securities Administrators (CSA) proposed and passed legislation to this effect. Called the National Instrument Marketplace Operations 21-101 (NI 21-101) and the National Instrument 23-101 (NI 23-101), or the "ATS Rules," the legislation allowed ATSS to operate in Canada and created a framework for the operation of exchanges and ATSS. (The success of ATSS in the neighboring United States and the European markets positively influenced the decision.) ATS rules were enacted in December 2001, creating the framework for the regulation of these alternative trading systems.

Canada's main set of trading rules governing equities trading was enacted in 2002 by Market Regulation Services Inc. (RS), the predecessor to the Investment Industry Regulatory Organization of Canada (IIROC). All trading of equity securities in Canada became subject to this new trading rules, called the Universal Market Integrity Rules (UMIR). Prior to implementation of UMIR, each exchange had its own set of rules to regulate its market. Because of expected increased competition in the Canadian equities market, UMIR was established to ensure universal set of rules that can govern activities across the different venues and eliminate the chances of potential regulatory arbitrage. Ultimately, UMIR was developed to ensure "integrity, and a fair, orderly marketplace."

The CSA decided to go with a competitive market model, which calls for competing pools of liquidity that operate as separate entities and are required to report to a regulatory body. The proposed plan was executed in a two-step process:

- The first phase got all pre- and post-trade data among all liquidity pools reporting to one system to provide BBO prices on equity trades. This single system is responsible for consolidating and maintaining all the data for public record and trading benchmarks.
- The second phase involved market integration, in which all stock exchanges were permitted to route orders through all trading systems.

In terms of operational guidelines, ATSS in Canada have the option of becoming an exchange or becoming a dealer or member of an exchange. If the ATS is a member of either an exchange or dealer, it must become a member of IIROC.

Similar to the U.S. and European markets, Canadian regulators are contemplating various potential regulatory changes in the marketplace in light of increased market competition and overall changes in market structure, driven by previous regulatory changes, technology

innovation, and the entrance of new market participants. Some of the key regulatory issues related to institutional equities trading include the following:

- **Change in trade-through rule responsibility:** The trade-through rule (aka order protection rule), mandates that an order needs to be routed to an execution venue with the best price. Previously in Canada, the broker-dealer had the responsibility of upholding the trade-through rule. Starting in February 2011, the obligation now resides with execution venues, requiring them to develop and maintain specific policies and procedures to ensure order protection. While trade through rule also exists in the U.S. market, one major difference is that this applies to depth of book in the Canadian market; in the U.S. market, it only applies to top of book.
- **Dark pool regulation:** In April 2012, CSA and IIROC released their final regulations related to dark pools, mandating the following:
 - All visible orders must have priority over dark orders if interacting on the same venue.
 - Executions taking place in dark pools whose shares are 5,000 or less must give the active participant at least a full-tick price improvement over the Canadian NBBO (or half a tick if the spread is only a single-tick wide).
 - Price improvement is not mandated for those orders whose value is greater than C\$100,000.
 - Dark orders meeting the characteristics of under 5,000 shares and less than C\$100,000 and originating from Canada cannot trade on U.S. dark pools unless they also receive a full single-tick price improvement.
- **Broker preferencing:** Very unique to Canadian market structure, the practice of broker preferencing enables brokers to cross buy and sell orders on exchanges and ATs while jumping the queue of other orders that may have entered the market first. TMX has been providing broker preferencing since the late 1990s to attract flow from large Canadian brokers, which has also helped maintain overall market transparency (the resulting trades are printed directly to TMX). Broker preferencing in essence enables large Canadian brokers to internalize on various execution venues, a practice that could potentially disadvantage smaller brokers that lack enough liquidity to internalize. The major issue here is that if the regulator bans broker preferencing, all of the major Canadian brokers may be tempted to develop their own crossing platforms, leading to a huge increase in dark pool activities in Canada.
- **Directed action order:** Parties initiating orders have the ability to select the venue where the trade is to be executed. The "directed action order" acts as an instruction to the marketplace on which the order is entered not to check for better-priced orders on other marketplaces and to immediately execute or book the order (in which case the Participant or Access Person entering the order assumes the responsibility for the execution or booking of the order not to result in a trade-through). In using a directed action order, the

Participant or Access Person assumes the obligation for trade-through protection, and the marketplace executes the order without delay or regard to any other, better-priced orders displayed by another marketplace. In order to be able to use a directed action order, the Order Protection Rule requires that the person entering the order must "establish, maintain and ensure compliance with written policies and procedures that are reasonably designed to prevent trade-throughs."

- **NI 23-103:** Essentially, under NI 23-103, market participants are required to establish, document, implement, maintain, and enforce risk management policies and supervisory controls, reasonably designed in accordance with prudent business practices, to manage "the financial, regulatory and other risks associated with marketplace access or providing clients with direct electronic access." These policies and procedures must ensure that all trades are monitored; specifically required are automated pre-trade controls and regular post-trade checking. Marketplace participants must regularly assess the effectiveness of their risk management program, including services provided by independent third parties or delegated to an investment dealer. (Conditions are attached to delegating control over risk management activities to a dealer.)

The CSA also singles out automated order systems for special attention: Their use must not interfere with fair and orderly markets, participants must understand them sufficiently well to manage the risks they pose, they must be tested at least annually, and participants must "have controls in place to immediately and at any time disable the automated order system to prevent orders generated by the automated order system from reaching a marketplace."

CSA made final amendments to the existing NI 23-103 in July 2013, which governs electronic trading and market access. The CSA first published NI 23-103 for comments in April 2011 finalized it in June 2012 without the direct electronic access (DEA)-related provisions to allow the CSA sufficient time to align these requirements with amendments to IIROC's UMIR. Prior to this, rules regarding DEA were being set by individual execution venues but not necessarily uniformly. Amendments made to NI 23-103 essentially ban naked access and require dealers to ensure that proper controls are in place to monitor risks associated with trading on a market-wide basis.

SPREAD OF MARKET FRAGMENTATION IN CANADA

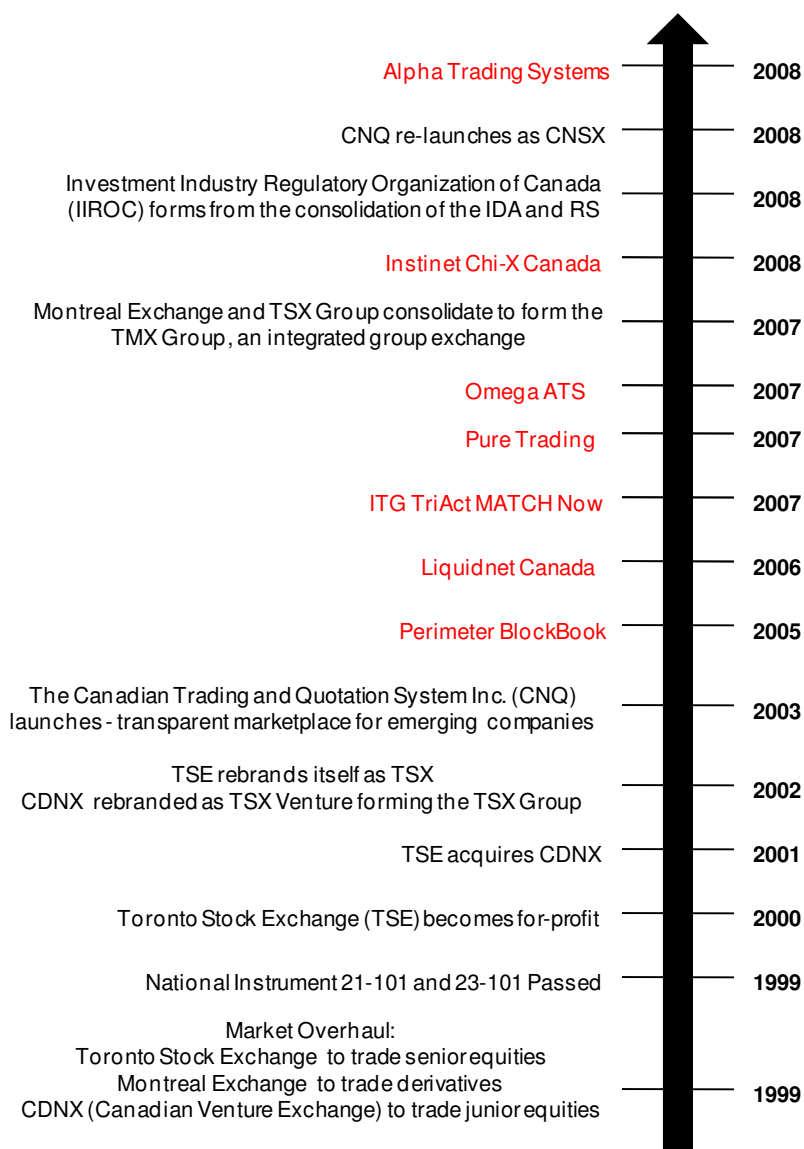
The Canadian equities market has been quietly going through major market structure changes over the last five years. Often overlooked by its much larger neighbor down south, the Canadian market has nonetheless transformed considerably since the introduction of first ATS in the market in 2005. Most recently, after spurning the courtship of the LSE, the TMX Group was ultimately acquired by the Maple Group,⁷ a consortium of major market players in Canada.

7. Maple Group members include Toronto Dominion Bank, CIBC, National Bank of Canada, Bank of Nova Scotia Canada, Alberta Investment Management Corp, Caisse de depot et placement du Quebec,

Maple Group also acquired Alpha Trading, the largest ATS in the Canadian market, which also happened to be a broker-owned platform.

Initially though, the overall adoption of ATSs in Canada had a slow start due to the fact that both buy-side and sell-side firms were reluctant to participate. Dealers were hesitant to invest in order routing technology needed to participate in ATSs, and the advantages for clients were simply not embraced. As first set of ATSs emerged, the TMX took notice right away based on the experience of its peers based in the United States. The market overhaul and the various TMX acquisitions leading up to 2008 can be viewed as a pre-emptive measure to face the competition. In an attempt to avoid losing drastic amounts of market share, the TMX Group took measures to decrease trading costs and develop competitive technologies. In October 2008, the TMX Group announced a series of changes to its fee schedule for equity trading as well as a new Electronic Liquidity Provider (ELP) incentive program for the TSX. The ELP program offers aggressive fee incentives to experienced high-velocity traders who use proprietary capital and passive electronic strategies on the TSX Central Limit Order Book. These changes were intended to enhance trading activity and liquidity on TSX and TSX Venture Exchange, and to provide cost savings for all marketplace participants.

Canada Pension Plan Investment Board, Fonds de solidarite des travailleurs du Quebec, Ontario Teachers' Pension Plan Board, Desjardins Financial Group, GMP Capital, Dundee Capital Markets, and Manulife Financial.

Figure 34: Canadian ATS Timeline

Source: Aite Group

Since 2005, there has been an emergence of alternative execution venues outside of the exchanges in Canada: Alpha Trading Systems, Chi-X Canada, Liquidnet, MATCH Now, Omega ATS, and Pure Trading. Liquidnet Canada began operations in 2006. ITG TriAct's MATCH Now, Omega ATS, and Pure Trading launched in 2007, and Alpha Trading Systems and Chi-X Canada came into the market in 2008.

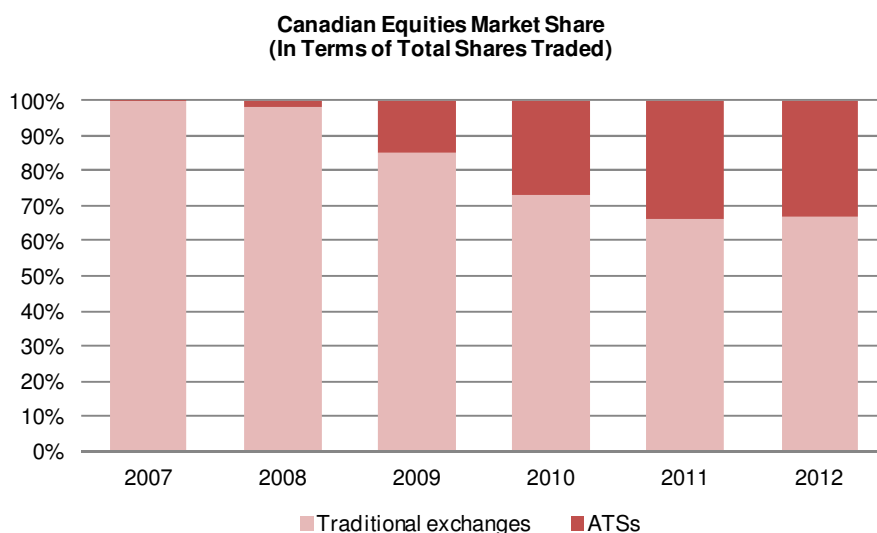
Though the much-anticipated arrival of Alpha Trading Systems (due to its broker ownership structure) and Instinet's Chi-X Canada (due to Chi-X's enormous success in Europe) signaled a new wave of competition in Canada, the competition within the Canadian equities market has not been a smooth one for ATSs when compared to the U.S. market. In fact, Perimeter Financial's BlockBook was the first ATS to begin operations in the Canadian equities market in 2005, but it

ceased operations as of February 2009. Block trading ATs has simply not taken off in Canada, with Liquidnet showing very little growth over the last few years.

Even so, the impact of competition in the Canadian equities market has been clearly felt. Canadian ATs gained about 10% of the market share in March 2009 alone. This may not sound astounding overall when compared with the United States and Europe, but it showed that the grip once tightly held by the TMX was beginning to loosen rather quickly.

The overall market clout of Canadian ATs continues to increase with a gradual buildup from 2008 to today. Regarding the overall market share of ATs in the Canadian equities market, 2009 was the pivotal year in which the dominant position of TMX started cracking, getting below the 90% market share. By the end of 2012, TMX's market share had declined to less than in shares traded (Figure 35).

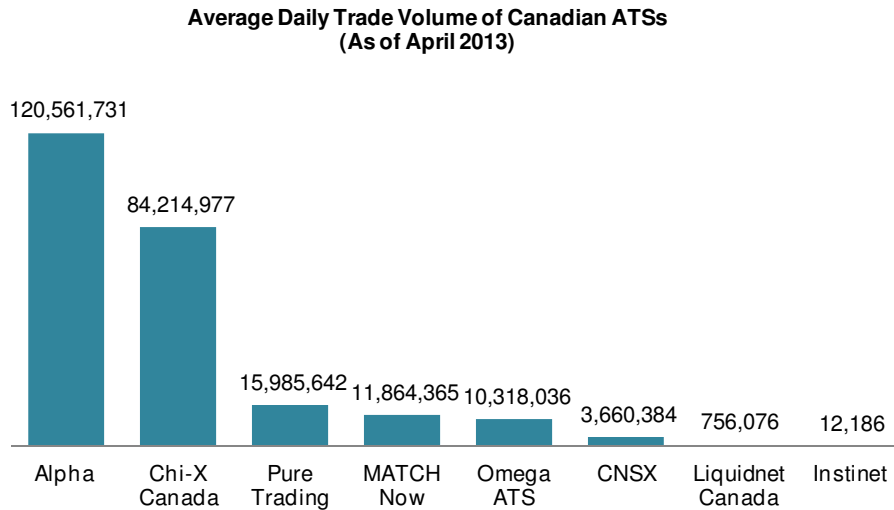
Figure 35: Growth of Canadian ATS Market



Source: IIROC

Focusing on individual ATs, Alpha Trading System outpaces the rest of the firms in terms of average daily share volume, averaging approximately 120 million shares per day as of April 2013. At that time, the second-largest ATS was Chi-X Canada, with 84 million shares per day. There is a huge drop off in volume after the top two ATs, with Pure Trading representing a very distant third place at 16 million shares per day (Figure 36).

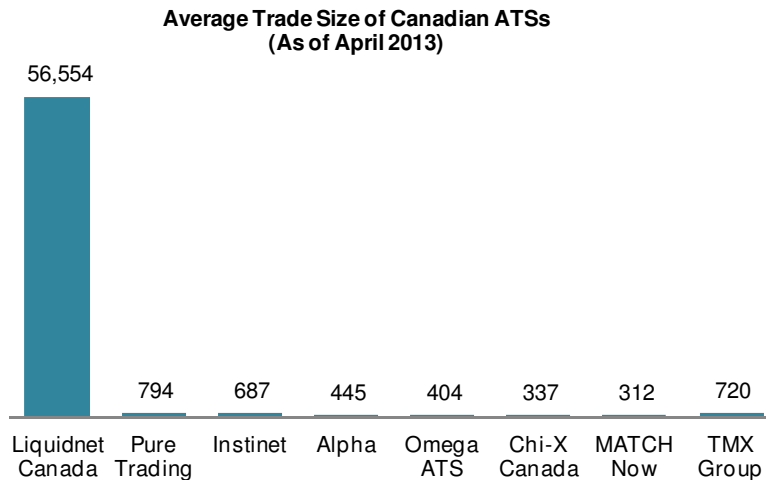
Figure 36: Average Daily Share Volume of Canadian ATs



Source: IIROC

Not surprisingly, Liquidnet Canada has the highest average trade size (approximately 58,000 shares per trade), but it has struggled to achieve significant market share, as mentioned earlier. Pure Trading is the next highest, with 794 shares per trade. Match Now, on the other hand, had the smallest average trade size, with 312 shares per trade. As a comparison, TMX's trade size was 720 shares (Figure 37).

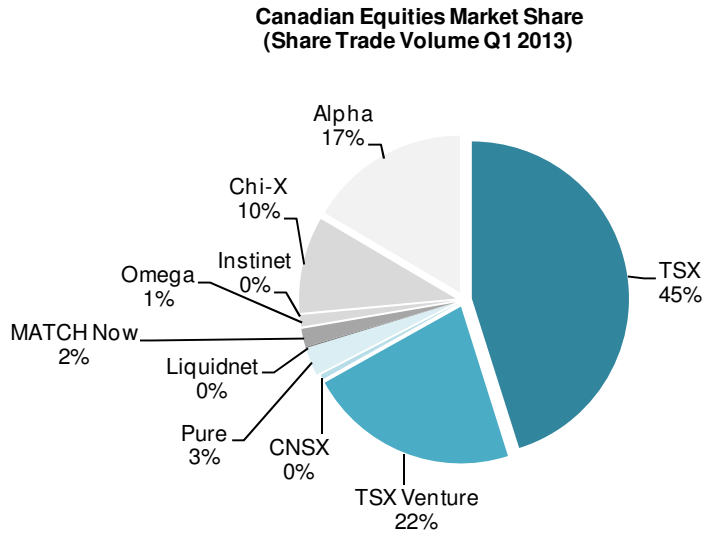
Figure 37: Average Trade Size of Canadian ATs



Source: ATs, IIROC, Aite Group
 TMX Group figure only representing TSX average trade size

With growing competition, TMX accounted for 67% of the Canadian equities market in February 2011 by volume of shares traded, followed by Alpha, with 17% market share. Chi-X has been rapidly gaining momentum since the acquisition of Alpha by the Maple Group, and it currently represents a healthy 10% market share (Figure 38).

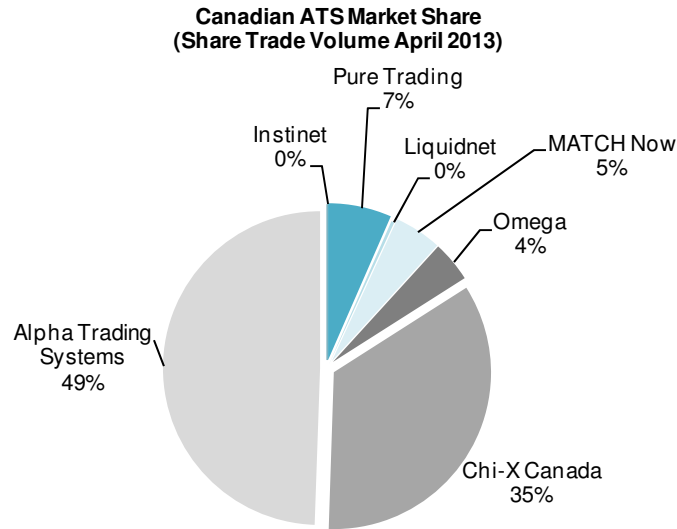
Figure 38: Market Share of Canadian Equities Market



Source: IIROC

Examining the market share battle within the ATS market alone, as of April 2013, Alpha currently occupies 49% of the market, followed by Chi-X Canada with 35%. Pure Trading represents 7% of the ATS market (Figure 39).

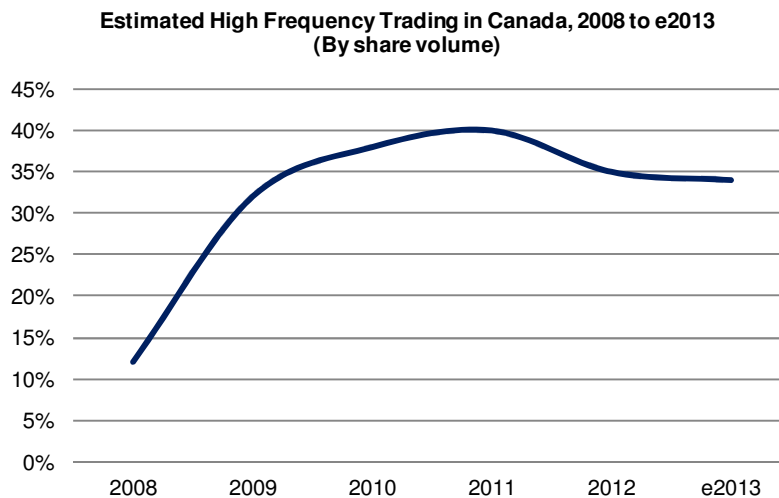
Figure 39: Market Share Analysis of Canadian ATS Market



Source: IIROC

One of the key industry discussions taking place in Canada is the role of HFT in equities market structure. The basic foundation for HFT took place starting in 2006 with emergence of alternative execution venues and introduction of maker-taker fee model in the Canadian equities market. The real influx of HFT in Canada began in earnest in 2008, with the TMX rollout of the ELP program designed to attract mostly U.S. high frequency firms into the Canadian market. The impact of HFT has been felt overnight, with 40% of the Canadian equities volume currently considered as high frequency at one point in 2011. HFT presence has gradually declined over the last couple of years as volume has declined in the Canadian equities market (Figure 40).

Figure 40: Estimated HFT Adoption in Canada



Source: Aite Group

KEY IMPLICATIONS OF MARKET FRAGMENTATION IN CANADA

This section will focus on implications of market fragmentation for four specific areas:

- Best execution
- Connectivity and routing
- Consolidated tape
- Self-regulation and rule-making

CANADIAN BEST EXECUTION

No longer dominated by a single exchange, the Canadian equities market has gone through a major transformation over the last five years since the emergence of Alpha Trading System in 2008. With the market share of TMX dipping below 70% in shares traded, Canadian buy-side traders face a drastically different market structure that has led to growing technology innovation and market complexity. Increased adoption of sophisticated trading tools required for DMA and broker-provided algorithms continues, while a certain level of uncertainty exists in the market due to potential regulatory changes.

For best execution, similar to other markets, there is high-level guidance in terms of setting policies and evaluating conditions to ensure reasonable levels of execution. More specifically, UMIR provides a list of factors that market participants need to take into consideration. A few sample factors follow:

- Execution price
- Speed of execution
- Certainty of execution
- Overall cost of transaction
- Direction of the market for the security
- Posted size on bid/offer
- Size of spread
- Liquidity of security
- Consideration for any specific client instructions

And similar to the U.S. market, Order Protection Rule does exist in Canada but that does not necessarily equate to best execution obligation. As mentioned earlier, order protection obligation, which once existed only at the broker level, is now also at the execution venue level, which has made routing capabilities among venues that much more important.

The ultimate impact of upholding the best execution obligation in a fragmented marketplace reduces down to connectivity and order routing services that can be supported by the brokers to ensure that they are meeting the necessary requirements and guidelines. While most of the

large U.S. brokers chose to build much of this infrastructure in-house, the major difference in the Canadian market has been that brokers have typically opted to use third-party vendor solutions. This divergence is largely due to timing – by the time Canada started experiencing market fragmentation, plenty of reliable third-party vendor solutions had emerged as a result of increased market fragmentation in the U.S. market.

CANADIAN CONNECTIVITY AND ROUTING

As the Canadian market has become increasingly fragmented, the need for sophisticated order routing has accordingly grown in importance. More specifically, firms now rely on SORs to make appropriate trading decisions. First-generation SORs in the Canadian market tended to focus on preventing trade-throughs, given that trade-through responsibilities initially resided with the brokers instead of the venues. As the market has continued to evolve, with the appearance of new automated trading firms (i.e., HFT), differentiated pricing schemes, and proliferation of order types, the overall functionality of SORs in the Canadian market has improved tangibly. Current leading vendors in this space are Integrated Transaction Services, IRESS, and Fidessa. Market centers such as Chi-X and Alpha have also joined this group as potential providers of SOR.

CANADIAN CONSOLIDATED MARKET DATA

The initial push for consolidated market data in Canada did not gain much traction, as most market participants believed that competition would naturally lead to multiple providers of consolidated data. In the absence of centralized, U.S.-style SIP, market centers published their data to different data vendors, leading to fragmentation in the market data space. Consolidating these various market data sources consumed many resources from vendors as well as market participants seeking to consolidated data internally. Vendors such as IRESS Canada and Thomson Reuters have also built Canadian consolidated market data solutions.

In 2009, after some years of uncertainty, the CSA selected TMX Group to assume the role of information processor, tasking the appointee with collecting, processing, and distributing consolidated market data for a period of five years. But the CSA action lacked details regarding a potential provision of revenue sharing, such as the framework that exists in the U.S. market. As part of the TMX Datalinx unit, TMX Group created the TMX Information Processor (TMX IP) to fulfill the role of data consolidator.

Despite the designation of TMX IP as the central IP, open competition continues to exist for consolidated market data, and competing products are available for market participants. At one point, Alpha collaborated with Thomson Reuters to develop a competing consolidated market data solution.

With the acquisition of Alpha, TMX Datalinx has emerged as the widely accepted collector and distributor of consolidated market data. The uncertainty in the consolidated market data space that had created pre-trade and post-trade transparency issues has been largely addressed in recent years. Establishing a stable consolidated market data source was a crucial step toward cost efficiency in this area, as relying upon a regulator-sanctioned IP to collect and distribute consolidated data ensures uniformity and eliminates the need to maintain multiple consolidated feeds. While there is nothing theoretically wrong with leveraging competing consolidated feed

vendors within a marketplace, in this case, the regulator-appointed model is the most efficient method of ensuring that best execution methods are met.

CANADIAN SELF-REGULATION AND RULE-MAKING

Unlike other major financial markets, Canada lacks a centralized, national securities regulator. The CSA, a highly proactive organization that brings the provincial securities commissions together to develop harmonized regulations, has energetically mobilized resources to address a range of issues meriting coordinated attention.

To be clear, the CSA is not a regulatory authority. The organization was formed by regulators from all the provinces and territories, and appreciating its collegial role is essential to gaining an understanding of Canada's regulatory apparatus. The CSA's stated mission is to "give Canada a securities regulatory system that protects investors from unfair, improper or fraudulent practices and fosters fair, efficient and vibrant capital markets, by developing a national system of harmonized securities regulation, policy and practice."

From a regulatory viewpoint, however, the organization's principal contribution is to provide a forum through which provincial regulators can jointly develop consistent approaches to emerging issues. The CSA's work is exemplified in the development and implementation of Passport, a system of mutual recognition through which issuers and registrants are automatically granted access to capital markets in other participating jurisdictions by obtaining a decision from their principal regulator and meeting the requirements of a single set of laws.

IIROC and the Mutual Fund Dealers Association of Canada (MFDA) are the country's major SROs:

- **IIROC:** Created in 2008 through the merger of the Investment Dealers Association and Market Regulation Services Inc., IIROC oversees all investment dealers and trading activity on Canadian debt and equity marketplaces, including exchanges and alternative trading systems. It operates under CSA oversight. Alberta, British Columbia, Newfoundland and Labrador, and Saskatchewan have delegated to IIROC the authority to register dealer firms and their individual employees or agents, while Ontario and Québec have delegated authority only to register individuals. IIROC members include TSX, TSXV, CNSX Markets, and numerous alternative trading systems.
- **MFDA:** MFDA oversees the distribution side of the Canadian mutual fund industry. It is recognized as an SRO by the regulatory authorities in Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, and Saskatchewan, and, in cooperation with the Autorité des marchés financiers, it actively participates in mutual fund regulation in Québec.

Unlike the exchanges in the U.S. market, TMX Group is not an SRO, and certain companies within the group are regulated by various securities regulatory authorities in Canada as marketplaces:

- Ontario Securities Commission (OSC): TSX, Alpha, TMX Select
- Autorité des marchés financiers (AMF): Montreal Exchange
- Alberta Securities Commission (ASC): TSX Venture, NGX

- British Columbia Securities Commission (BCSC): TSX Venture

IIROC has in recent years purchased NASDAQ SMARTS market surveillance technology platform to effectively monitor Canadian trading activities.

GLOBAL TECHNOLOGY COST IMPLICATIONS OF MARKET FRAGMENTATION

There are many potential costs associated with market fragmentation, such as the implicit cost of participating in a fragmented trading environment. Instead of analyzing what Aite Group views as intangible aspects of spending, however, this section will purely focus on potential technology cost implications for major market participants that are trying to stay competitive as well as to ensure that they are meeting best execution obligations in a fragmented market environment.

One thing to note is that most of the cost analysis in this section is based on data gathered from global broker-dealers, exchanges, and buy-side firms with worldwide presence that actively compete in numerous fragmented markets. As a result, tangible costs associated with fragmentation for smaller market participants or those market participants competing in less market fragmented marketplace can expect to see lower costs points for various components, assuming that such technology infrastructure components are readily available locally and that there are no hidden costs for those vendors to enter these markets.

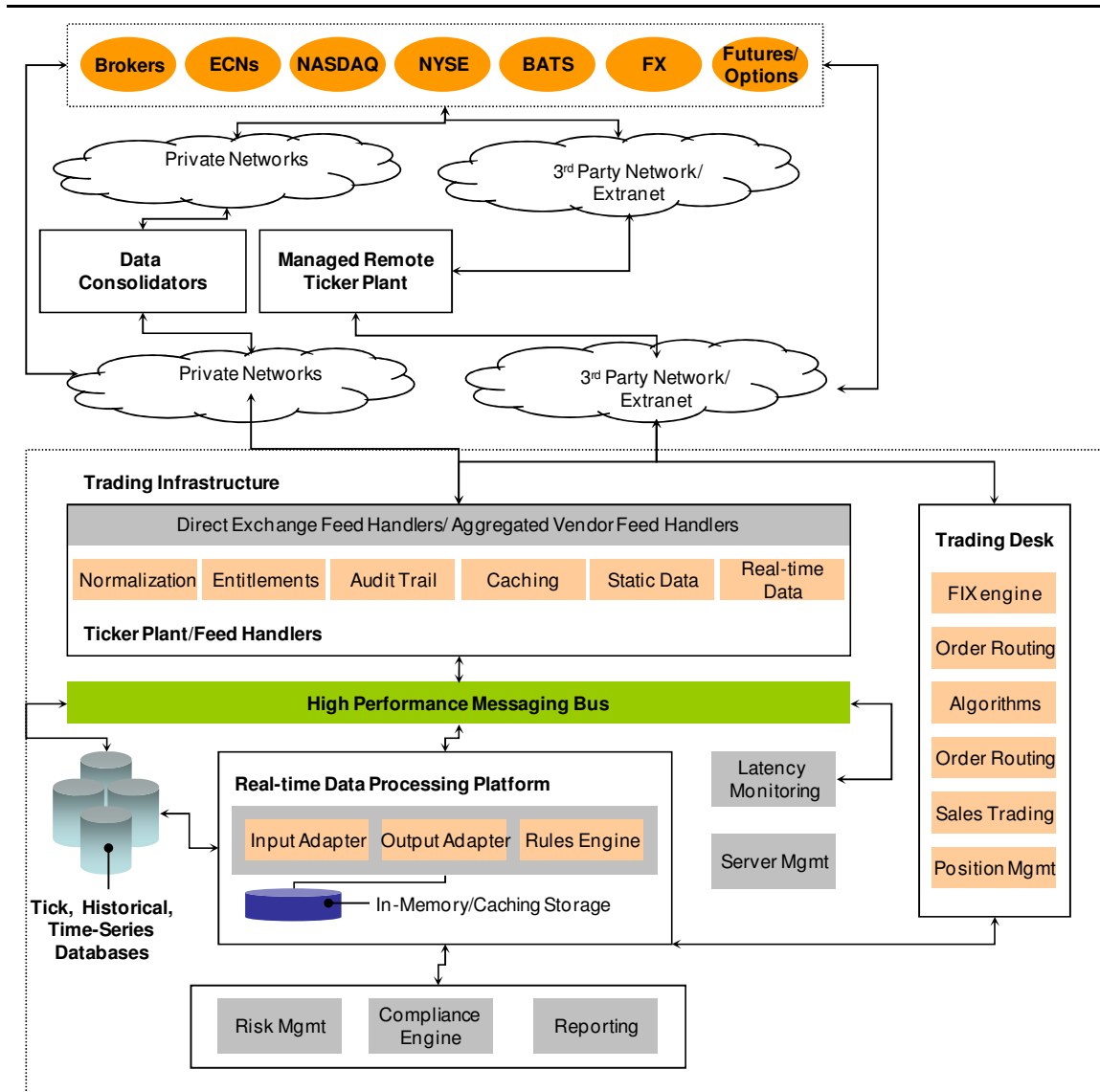
CLOSELY TIED TO BEST EXECUTION OBLIGATION

There is no doubt that the majority of the required spending in a fragmented marketplace is geared toward virtually consolidating the fragmented market so that proposed best execution obligations can be met effectively. Key technology components involved in today's fragmented market include the following:

- **Market data infrastructure:** One of the biggest challenges in a fragmented market is capturing, normalizing, aggregating, analyzing, and storing market data to feed trading platforms. In a single market scenario, receiving feed from a single source takes the complexity out of the picture, regardless of how clean or accurate that particular data feed could be. In a multi-market environment, on the other hand, dealing with multiple data feeds that have different formats, latency levels, and quality requires much commitment from the technology side (robust and flexible feed handlers, ticker plant, low latency messaging middleware, storage capabilities, and more). Building a market data infrastructure from scratch is typically one of the more expensive endeavors a market participant can undertake.
- **Consolidated data:** While large market participants would typically opt to rebuild a consolidated view of the market by subscribing to direct feeds from specific market centers (a much more expensive proposition), the need for cost effective and timely consolidated data feeds is universal and crucial to addressing best execution.
- **Colocation:** As latency associated with trading continues to decline, driven by increased adoption of automated trading, colocation or proximity hosting has become an essential component of an actively trading firm's overall trading infrastructure.

- **Connectivity:** Connectivity is the basic foundation for electronic trading, for receiving market data and routing orders at various market centers would not be feasible without the core pipes that connect all of the major market participants.

Figure 41: High-Level Trading Infrastructure



Source: Aite Group

- **SOR:** As markets fragment, leveraging SOR has become not only an operational efficiency play but also a reliable compliance support as firms program SOR engines to align with their best execution policies.
- **Pre-trade risk management:** Monitoring and controlling market center access in a single market environment is relatively straightforward, and allows the market center and member firms to have a holistic view of their clients' overall trading activities (and the various risks associated with them). In a multi-venue market,

monitoring and measuring trading risk across different venues becomes quite complicated, creating a need for reliable pre-trade risk capabilities.

- **Trade surveillance and compliance:** Electronic trading currently occurs in microseconds in most developed financial centers, and monitoring these trading activities requires real-time trade compliance technology for brokers, market centers, and regulators alike.

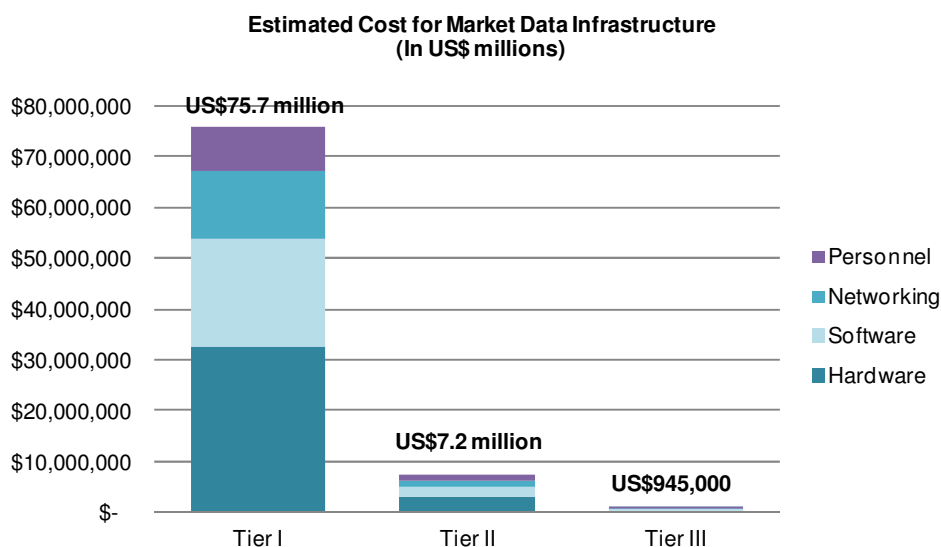
The remainder of this section focuses on estimated costs associated with specific technology components stemming from market fragmentation.

MARKET DATA INFRASTRUCTURE

The cost of market data infrastructure varies depending on the type of broker. Tier-1 brokers are the top 10 global brokers that have operations worldwide, and they have typically built market data infrastructure internally. Annual spending for Tier-1 brokers for market data infrastructure is conservatively around US\$75 million per firm (Figure 42), excluding cost of market data. A few of the largest Tier-1 brokers currently spend close to US\$200 million annually per firm, including market data.

Tier-2 brokers tend to be more domestically oriented, with enough resources to have a competitive electronic trading offering. They also tend to leverage vendor solutions and services for market data infrastructure. Tier-2 brokers are currently averaging approximately US\$7 million per firm annually on market data infrastructure. Tier-3 broker spending on market data infrastructure, typically outsourced, currently stands at less than US\$1 million annually per firm.

Figure 42: Estimated Spending on Market Data Infrastructure Per Broker

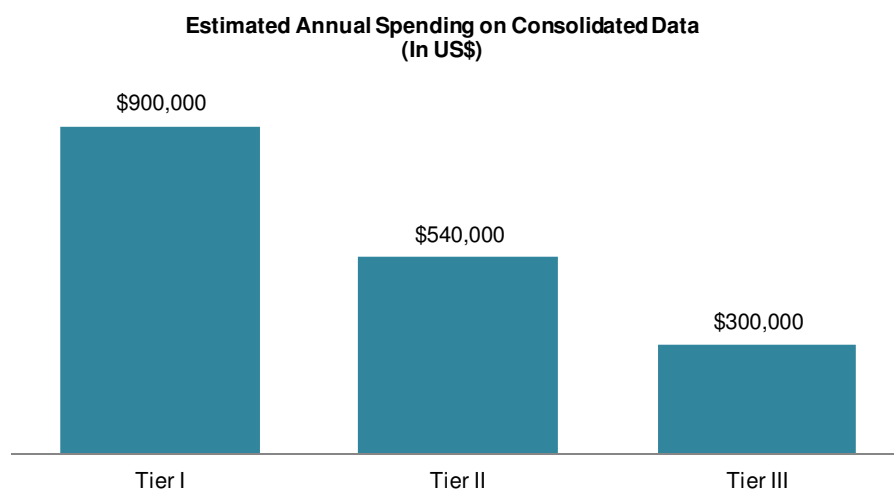


Source: Aite Group

CONSOLIDATED DATA EXPERIENCE IN THE U.S. MARKET

Costs associated with consolidated data will vary quite a bit depending on the number of markets, speed of feed, depth of market, and more. A few of the larger brokers may take in direct feeds and build their own proprietary consolidated feeds, while others may opt to take in more than one consolidated data to ensure accuracy and redundancy. Assuming the brokers are taking in a vendor-provided data solution, Tier-1 brokers will typically spend US\$900,000 annually on consolidated market data per firm. Tier-2 spending is considerably lower, at US\$540,000 per firm (Figure 43).

Figure 43: Consolidated Data Spending Per Broker



Source: Aite Group

GENERAL COSTS ASSOCIATED WITH COLOCATION

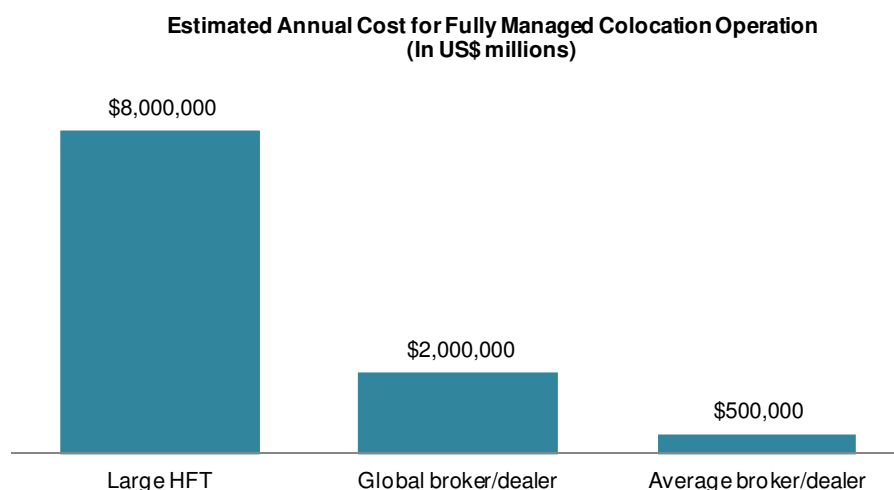
As markets continue to become electrified and the level of latency associated with trading plummets (as it has over the last decade), the information advantage that firms used to enjoy has been replaced by competitive edge based on latency. For electronic market-makers and large brokers dealing with massive amounts of client order flow, operating in a colocated environment has become a competitive requirement. The overall costs of colocation can vary quite a bit depending on the strategy of market participants as well as the physical fragmentation of matching engines:

- **Physical fragmentation of matching engines:** Even within a fragmented market, if all of the competing market centers' matching engines are located in a single data center, much lower telecommunication costs can be expected, as well as the availability of more cost-effective way of cross-connecting matching engines to substantially lower connectivity fees. The reality is, however, that most major matching engines tend to be physically fragmented as well; a good example of this is the U.S. equities market, where the top four market centers' matching engines are in four separate data centers.

- **Market participant strategy:** While larger firms may opt to collocate into as many data centers as possible to maximize their latency edge, others may select a single data center for collocation, being closest to the market center where they do most of the trading.

A typical large global broker currently spends approximately US\$2 million annually on collocation. A smaller broker may spend a fraction of that, at US\$500,000. Plenty of collocation options are being provided by outsourced managed trading services, and smaller firms looking for more cost-effective options could certainly get the benefits of collocation for less than US\$100,000 annually. In comparison, a very large HFT firm can spend upwards of US\$8 million annually on its collocation environment (Figure 44).

Figure 44: Estimated Collocation Costs Per Firm

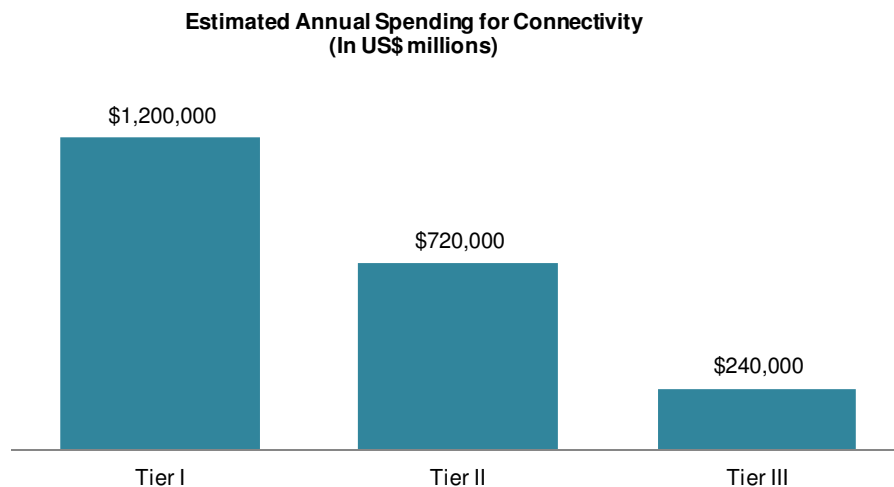


Source: Aite Group

GLOBAL CONNECTIVITY COSTS

Cost associated with connectivity is completely dependent on how important it is for the broker to have a global footprint. Even for the largest brokers, it is pretty rare for them to connect to every single venue out there, simply because the costs of connecting with certain markets (i.e., those with minimal trading activity) would outweigh any benefits of actually maintaining that particular connection. As a result, a handful of small-broker-licensed routing services function as the order router for small market centers.

Overall, Tier-1 brokers typically spend well over US\$1 million annually on connectivity per firm, while Tier-2 brokers are burdened with approximately US\$700,000 per firm. Tier-3 firms currently stand at around US\$250,000 per firm (Figure 45).

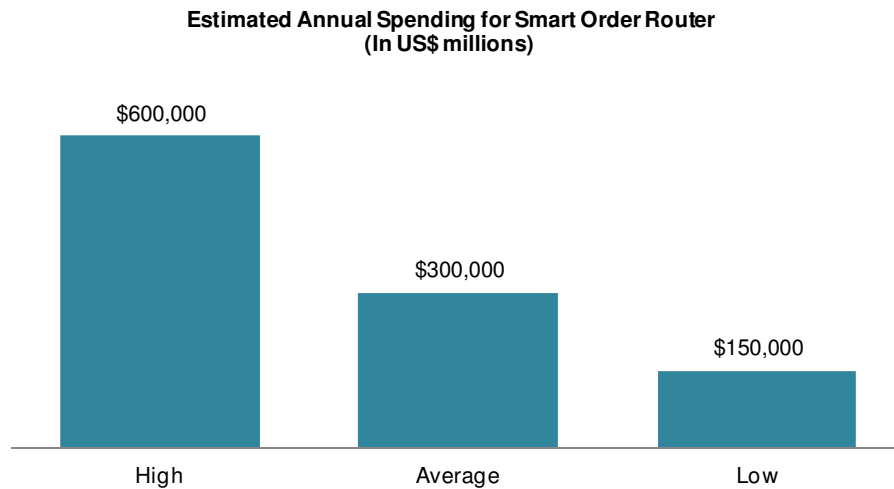
Figure 45: Estimated Connectivity Spending Per Broker

Source: Aite Group

SMART ORDER ROUTING

SOR platforms play a pivotal role in fragmented markets, enabling both brokers and market centers to make sub-millisecond order routing decisions based on preset parameters, typically aligned with best execution obligation. In fact, one could reasonably argue that usage of SOR itself can be viewed as complying with best execution obligation (assuming the SOR logic is aligned with best execution policy). Similar to other technology components, cost for SOR can also vary widely, depending on the total number of routable venues (also on access to dark pools), ability to handle order types, latency levels, and complexity of data input and analysis. SOR capabilities are offered by brokers, market centers, and vendors; pricing schedules can be either on a fixed-cost basis (i.e., license fee) or per share (if the provider has a broker license). The per-share approach would have a lower fixed cost, but overall pricing can be a lot higher than the fixed-cost pricing schedule if overall trading volume is high.

On the higher end of the spectrum, SOR can cost approximately US\$600,000 annually per firm; on the lower end, it can go for a relatively affordable US\$150,000 per firm. Average cost currently stands at US\$300,000 per firm (Figure 46).

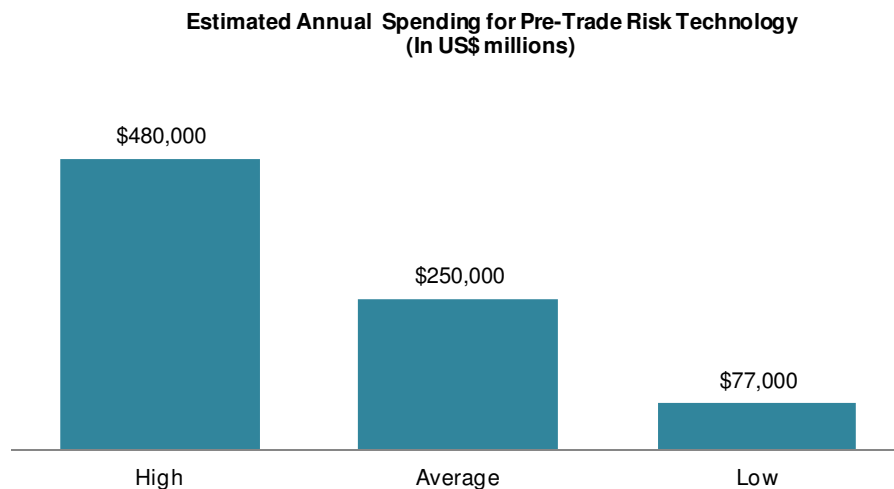
Figure 46: Estimated SOR Spending Per Firm

Source: Aite Group

PRE-TRADE RISK MANAGEMENT

One of the major issues surrounding electronic trading (and automated trading in a particular) over the last three years in the U.S. equities market has been the practice of enabling non-member firms to use the MPIDs of members to directly access market centers with the non-members using their own trading infrastructure (and hence no direct real-time supervision from the member firms). Regulators became concerned that this lack of supervision by market center members could potentially increase systemic risk. As a result, tighter supervision of pre-trade risk management has been mandated, and similar rules have been implemented outside of the U.S. market.

Cost of pre-trade risk platforms depends on number of venues, number of trading rules checked, level of latency, and reporting capabilities. On the higher end, one could expect to pay close to US\$500,000 annually per firm on maintaining this function, whereas on the lower end, certain vendor products will support pre-trade risk management for under US\$80,000 annually per firm (Figure 47).

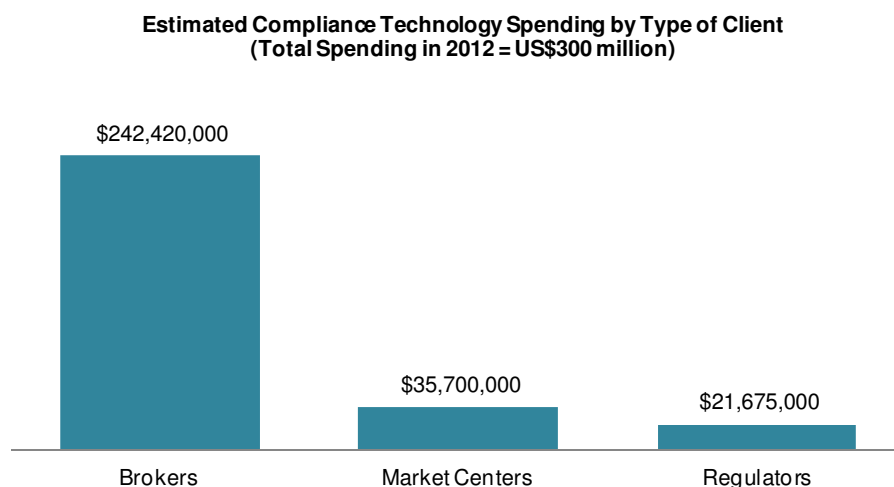
Figure 47: Estimated Spending on Pre-Trade Risk Per Firm

Source: Aite Group

MARKET SURVEILLANCE AND MONITORING COMPLIANCE

Another crucial part of operating in a fragmented marketplace is the growing premium on sophisticated, real-time market surveillance and trading compliance platforms. Ability to take in data from multiple venues and analyze through the noise to identify any suspicious trading activity has become a requirement for all major market participants, including brokers, market centers, and regulators. The good news is that there are plenty of vendor options when it comes to compliance technology, and there really is no need for any firm to try to build this capability from scratch.

Average cost for trade compliance platform for a broker currently stands at US\$250,000 annually. This is typically a subscription-based, hosted service. On the market center and regulator side, the cost a lot more expensive, at US\$750,000 and is typically installed on-site. At the end of 2012, total IT spending in trade compliance reached US\$300 million, with a majority of the spending being represented by the broker community (Figure 48).

Figure 48: Estimated Total IT Spending on Trade Compliance

Source: Aite Group

ESTIMATED IMPACT BY MARKET PARTICIPANT TYPE

As discussed above, costs related to market fragmentation will vary quite widely depending on several factors:

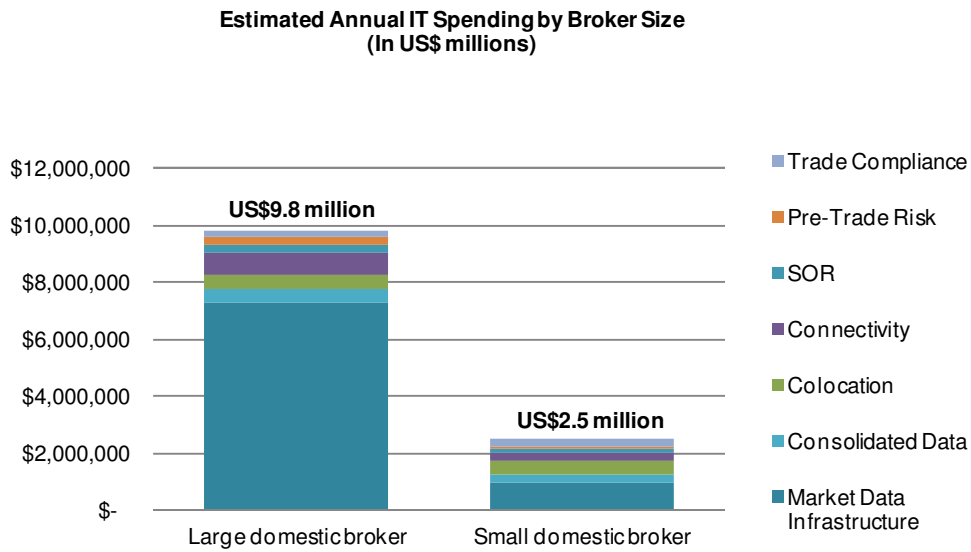
- **Extent of market fragmentation:** Costs associated with operating in a market with two competing venues will be markedly cheaper than operating in a market with more than 40 execution venues.
- **Availability of third-party vendor solutions:** Enough advancement has been made on the vendor side to accommodate fragmentation much more affordably than a decade ago. If such solutions are not available in a given market, however, costs of fragmentation would certainly go up.
- **Any hidden taxes or legal barriers:** Any unforeseen local taxes or legal barriers for any of the solutions to enter local markets can inadvertently increase the overall cost of fragmentation.
- **Sensitivity to latency:** Basic correlation exists between high costs and low latency. If a market participant is willing to live with a certain level of latency for cheaper costs, this can drastically lower the overall costs.

Assuming no hidden costs and unforeseen local market conditions (both business and legal), the rest of the section analyzes the overall potential cost for specific types of market participants.

BROKER-DEALERS

For brokers, IT costs associated with navigating a fragmented market environment will vary quite dramatically depending on how active the broker wants to be in terms of facilitating overall trading activities. Market data infrastructure forms the core foundation of every operation. For a large domestic broker with extensive connectivity to most major market centers and robust collocation infrastructure, the overall cost can easily reach US\$10 million annually per firm. A small broker with selective connections that is willing to live with certain level of latency can compete effectively with a US\$2.5 million annual cost per firm (Figure 49).

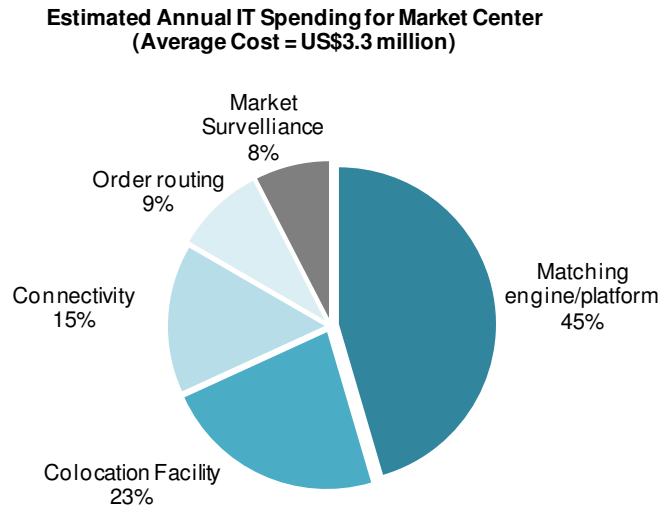
Figure 49: Estimated Average Cost for Broker-Dealers



Source: Aite Group

MARKET CENTERS

For market centers in moderately fragmented marketplaces, the cost of a matching engine and its annual maintenance would be one of the higher costs to ensure that it can compete at the appropriate latency level. Reliability and consistency of the matching engine are equally important to latency figures. Market centers can expect to spend approximately US\$3.3 million annually per firm to remain competitive in a fragmented marketplace (Figure 50).

Figure 50: Estimated Average Cost Per Market Center

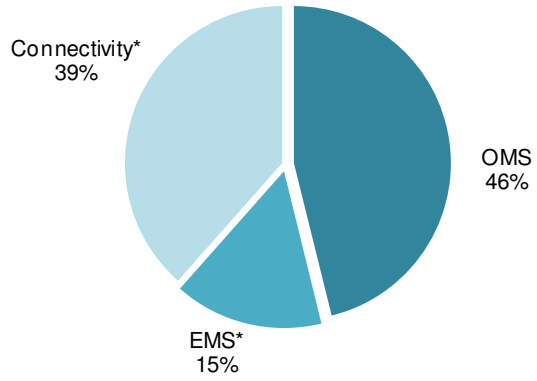
Source: Aite Group

BUY-SIDE FIRMS

While this study did not evaluate the overall cost for buy-side firms in detail, typical core technology components can be viewed as trading platforms and connectivity. Buy-side firms' compliance and reporting capabilities are typically embedded in the price for order management systems (OMS). An actively trading buy-side firm operating in a fragmented market environment can expect to spend approximately US\$325,000 annually per firm, with more than half that actually being paid for by its brokers (Figure 51).

Figure 51: Estimated Average Cost Per Buy-Side

**Estimated Annual IT Spending for Buy-Side Firm
(Average cost = US\$325,000)**



**Typically paid by the broker*

Source: Aite Group

CONCLUSION

Market fragmentation has become a reality in different financial markets worldwide. Based on a decade's worth of analysis across several regions, Aite Group finds that there is nothing intrinsically positive about market fragmentation. It is true that fragmentation has been accompanied by a decline in explicit trading costs and increased market innovation, but negative, unintended consequences have also led to the creation of a complex trading environment—one that might not be beneficial for any investor. Overall, the following concluding remarks can be made about key implications for the four major areas of consideration:

- **Best execution:** The definition of best execution globally is very high level, at best, and currently left open to much interpretation. While price is always an important variable to consider, it is never the sole factor. Still, complying with best execution obligations is often the leading driver for investment in IT infrastructure, as doing so allows firms to remain competitive and compliant at the same time.
- **Connectivity and routing:** If best execution should be viewed as specific written policy and procedure, connectivity and routing represents the necessary plumbing and logic to fulfill the promise of best execution. Currently, there are ample providers of both connectivity and routing services, and these will continue to lower the price of entry into a fragmented marketplace.
- **Consolidated market data:** Other than in the U.S. market and, to a lesser degree, in the Canadian market, the provision of consolidated data has been wrongfully overlooked and can be viewed as one of the reasons for increased costs for operating in markets such as Europe. Lack of consolidated market data also adds unnecessary complication to complying with best execution.
- **Self-regulation and rule-making:** While the U.S. market has fully embraced the SRO model, the rest of the world looks quite different. Regulators in non-U.S. markets have simultaneously viewed exchanges as necessary SRO and potential conflict of interest. In those markets, exchanges still remain active in terms of identifying potential compliance failures, but the investigation of and, ultimately, disciplining of illegal activities resides firmly in the hands of the government regulators.

ABOUT AITE GROUP

Aite Group is an independent research and advisory firm focused on business, technology, and regulatory issues and their impact on the financial services industry. With expertise in banking, payments, securities & investments, and insurance, Aite Group's analysts deliver comprehensive, actionable advice to key market participants in financial services. Headquartered in Boston with a presence in Chicago, New York, San Francisco, London, and Milan, Aite Group works with its clients as a partner, advisor, and catalyst, challenging their basic assumptions and ensuring they remain at the forefront of industry trends.

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