



SIFMA Insights:

US Equity Market Structure Primer

July 2018



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SIFMA Insights Primers

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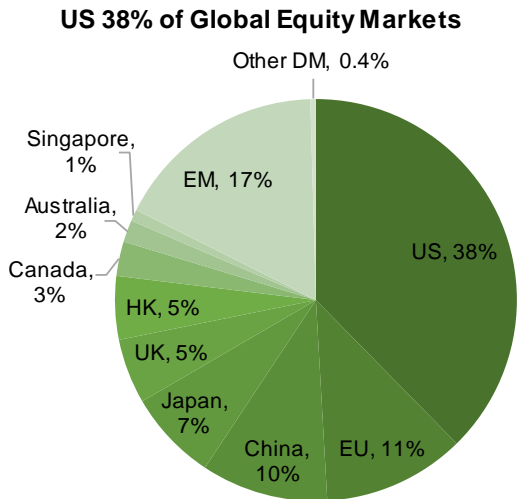
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Executive Summary

The U.S. equity markets are the largest in the world, representing around 38% of the \$85 trillion in global equity market cap, or \$32 trillion:



Source: World Federation of Exchanges, SIFMA estimates

Note: As of FY17. Market capitalization of listed domestic companies. EU = European Union 27 countries; UK = United Kingdom; HK = Hong Kong; EM = emerging markets; DM = developed markets

On average, around 6.7 billion shares are traded on U.S. equity markets every day. The U.S. equity markets continue to be among the deepest, most liquid and most efficient in the world, with investors enjoying narrow spreads, low transaction costs and fast execution speeds. There is also plenty of opportunity for price improvement, especially for retail investors.

That said, one can always strive to improve. Efficient and resilient market structure is key to sustaining investor confidence and participation underpinning the equity markets. The goal of regulators and market participants is to promote market resiliency and ensure the U.S. equity markets continue to benefit investors and play an essential role in capital formation.



Source: World Federation of Exchanges, SIFMA estimates
 Note: US companies only, listed on NYSE and Nasdaq

Drivers of Market Volumes

Volume is the number of shares traded indicating the overall activity of a security, or the market in aggregate, over a specified period of time. For investors, volumes can be used as a technical indicator¹ to identify a trend or reversal, signaling when to buy or sell a stock. For example, a stock continuing a run upward should see volumes move similarly. On aggregate, up markets are an indicator of investors' views of confidence in or a sign of a strong U.S. economy, i.e. companies are performing well.

While some people like to look at aggregate volumes as an indicator of liquidity, volumes may not always represent real liquidity. Aggregate volumes include on-exchange trading and off-exchange trading, roughly 63% and 37% on average over the last 12 months respectively. Within off-exchange trading, you have trading on alternative trading systems (ATS; ~12% in 1Q18) and the remainder in over-the counter (OTC) trading.² All equity trading – both on-exchange and off-exchange – is reported to the tape.

Off-exchange volumes can come in many forms, and the delineations are not always black and white. Broker-dealers serve many types of clients and therefore have multiple options to find the path for best execution – agency crossing, upstairs trading, execution on their own or another ATS, etc. While almost all of these forms can be termed internalization, we describe it and point out a few sub categories as:

- **Internalization** – Brokers and market makers use internal automated books to execute trades; trades print to the tape as off-exchange. Typically brokers process trades this way to offset market making risk or optimize trading across desks.
- **Wholesaling** – Retail flow routed to market makers, who generally provide better execution than on-exchange (with more opportunities for price improvement). Some external liquidity providers, operating single dealer platforms, also interact with institutional flow.
- **Upstairs Blocks** – The trading of high-touch blocks, a form of capital commitment trading, will print to the tape as off-exchange.
- **ATS** – ATS transactions that are not block trades. Clients may choose to route to an ATS because of lower costs and a greater probability of confidentiality (less information leakage).

¹ Analysts and investors also use fundamental analysis on companies to make investment decisions.

² As per Cboe Global Markets and FINRA data.

Historical Volumes

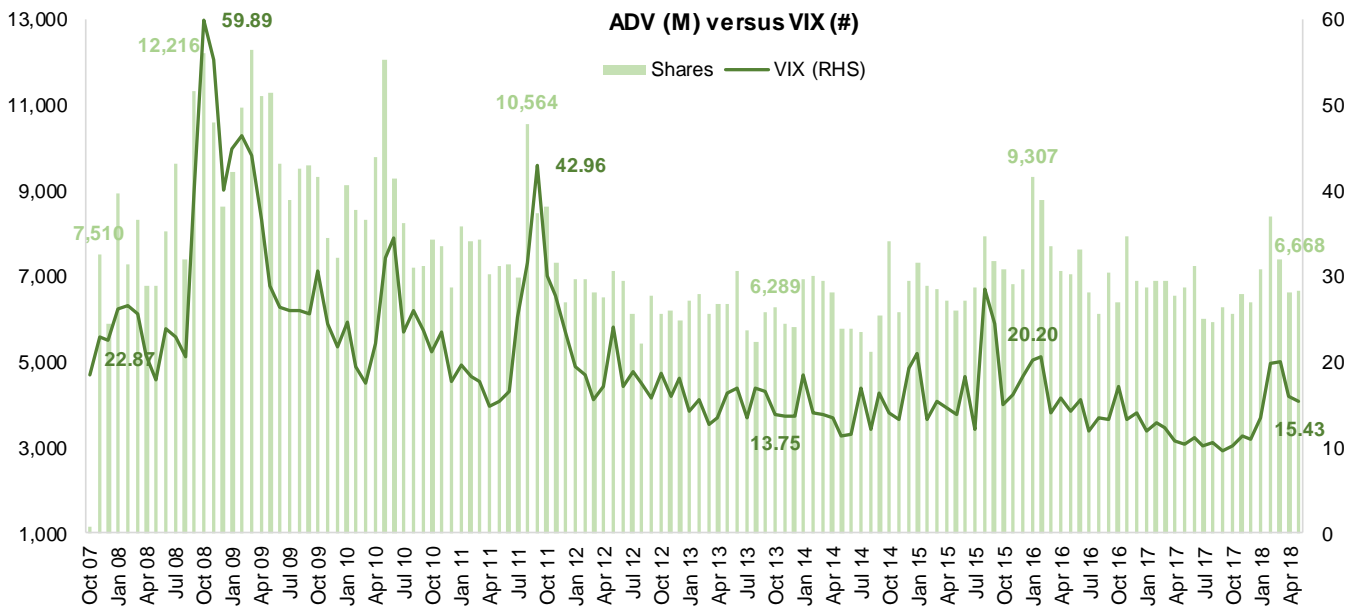
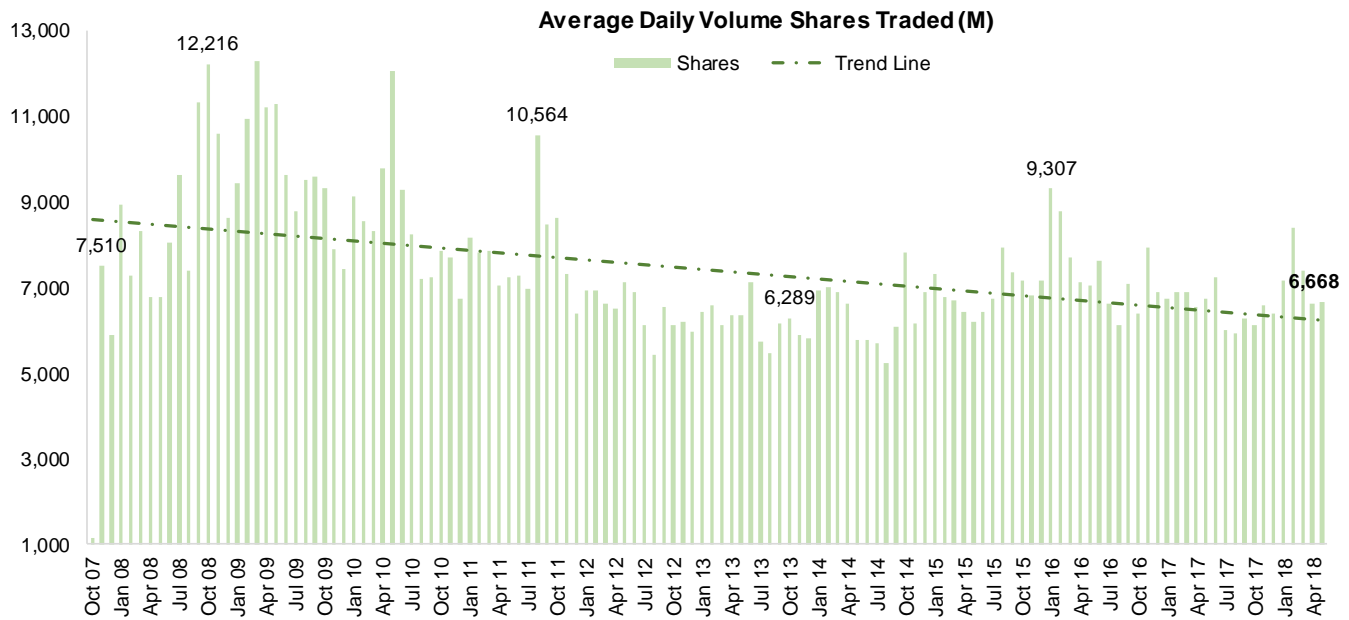
Looking at historical volumes since the fall of 2007, the following charts show:

- ADV 6.7 billion in May 2018, down slightly from 7.5 billion in November 2007
- The low was 5.2 billion in August 2014; the high was 12.3 billion in March 2009
- 6.7 billion to 6.8 billion on average for the last 12 to 24 months; six month average was 7.1 billion given the February peak (8.4 billion ADV; volatility increased significantly over inflation and other economic concerns)

These declining volumes are linked to:

- **Passive Investments** – Increased usage of index funds, which change holdings infrequently (limiting increases in trading volumes) versus active funds or individual stock trading.
- **Trading Strategies** – Growing usage of more advanced trading strategies by individual (retail) investors, using futures and options which allows them to leverage their position with less capital to bolster returns.

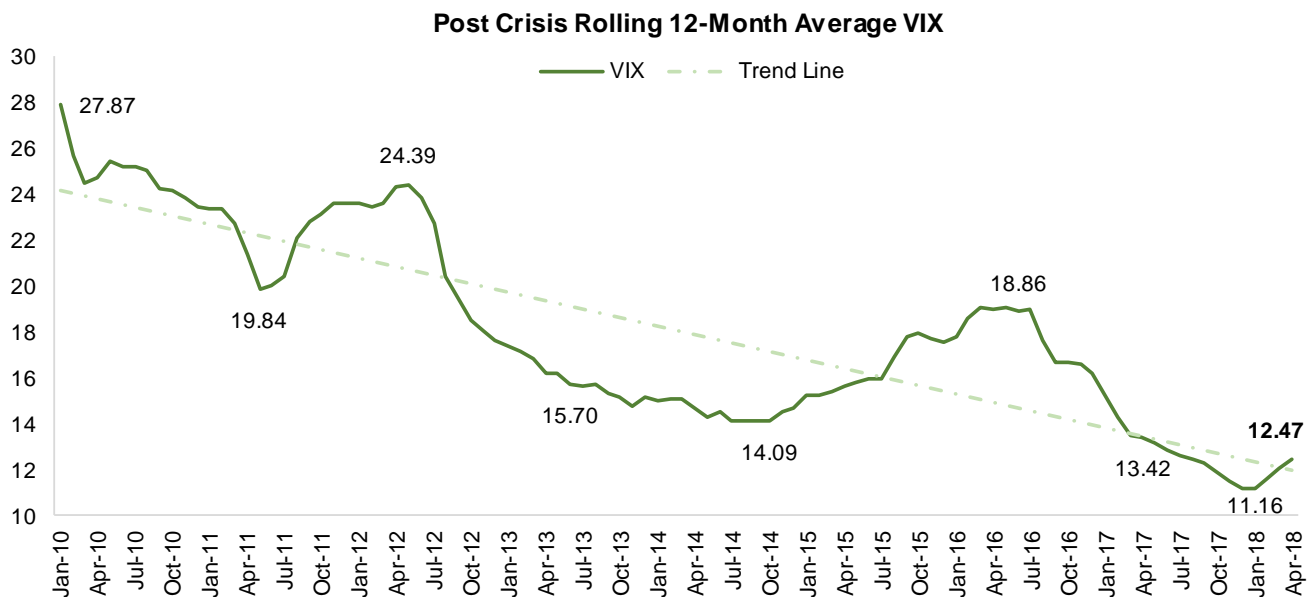
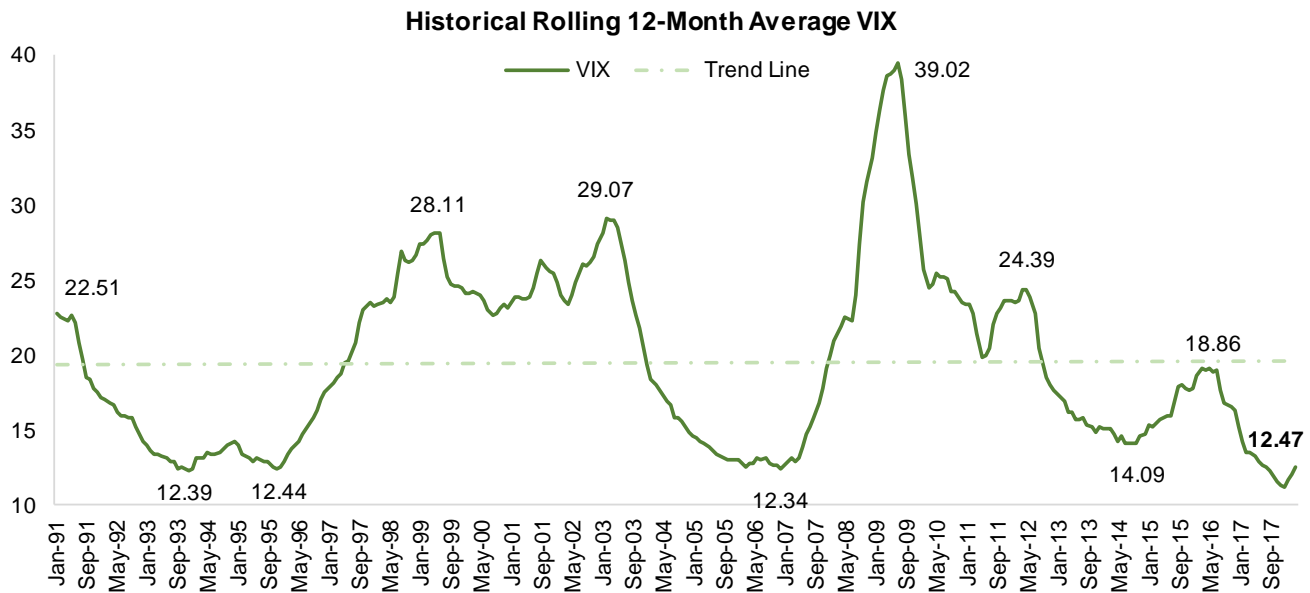
In May 2018, ETF volumes represented 18% of total volumes. Of the 6.7 billion ADV for the period, 5.5 billion was in single stock trading. In 1Q18, 21% of total volumes was in ETFs, with 6.0 billion out of the total 7.6 billion aggregate ADV in single stock trading. ETFs are often correlated with volatility, which peaked in February of this year (1Q18 averaged 17.79, versus FY17 average 11.05). This indicates 18% to 20% of aggregate volumes are not accessible to institutional investors to provide for single stock liquidity.



Source: Cboe Global Markets, Bloomberg, SIFMA estimates

Market Volumes and the Relationship to the VIX

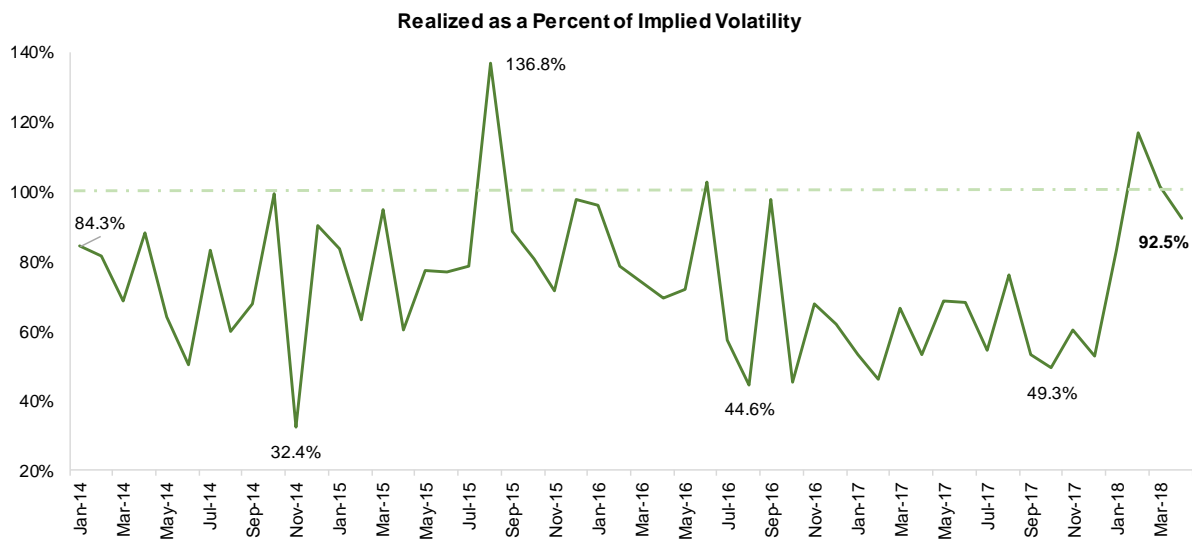
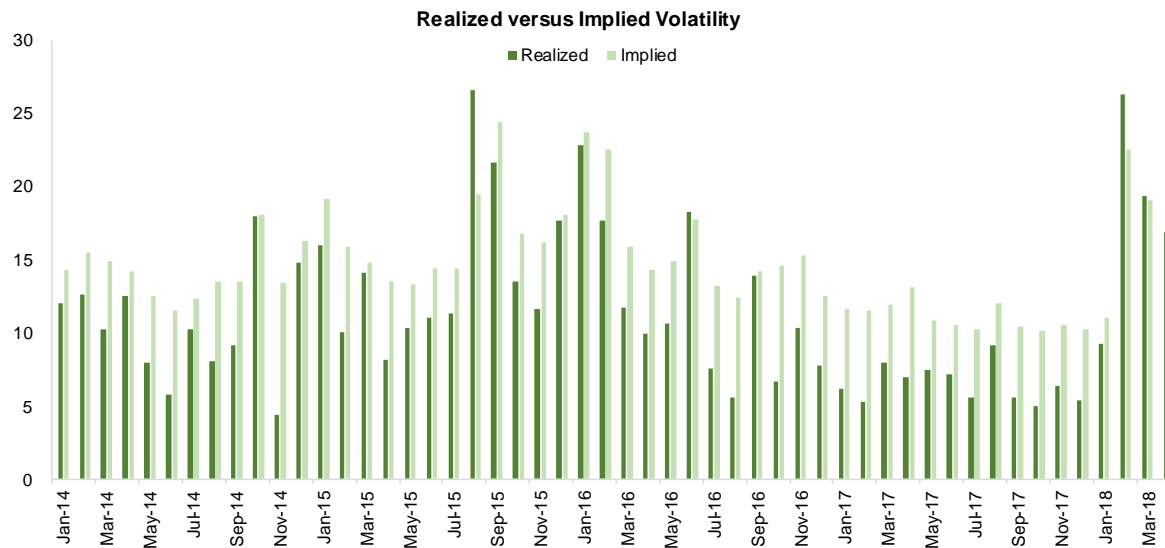
Volatility is a driver of U.S. cash equities. Volatility has been well below historical rates since the financial crisis – the rolling average VIX has ranged between 12 and 13 since 2017 – feeding through to lower volumes.



Source: Bloomberg, SIFMA estimates

Realized versus Implied Volatility

An additional factor to look at is implied versus realized volatility. The VIX, or the CBOE Volatility Factor, shows the market's expectations of 30-day volatility. It is a forward looking indicator of market risk, constructed from implied volatilities on S&P 500 index options, both puts and calls. It is often referred to as the investor fear gauge. Realized volatility shown below is as measured by Virtu Financial. Since 2014, realized volatility has most frequently come in below implied, with the cushion referred to as the volatility risk premium. Until the recent pop in February, realized has been less than half of implied volatility over the last 12 to 18 months.

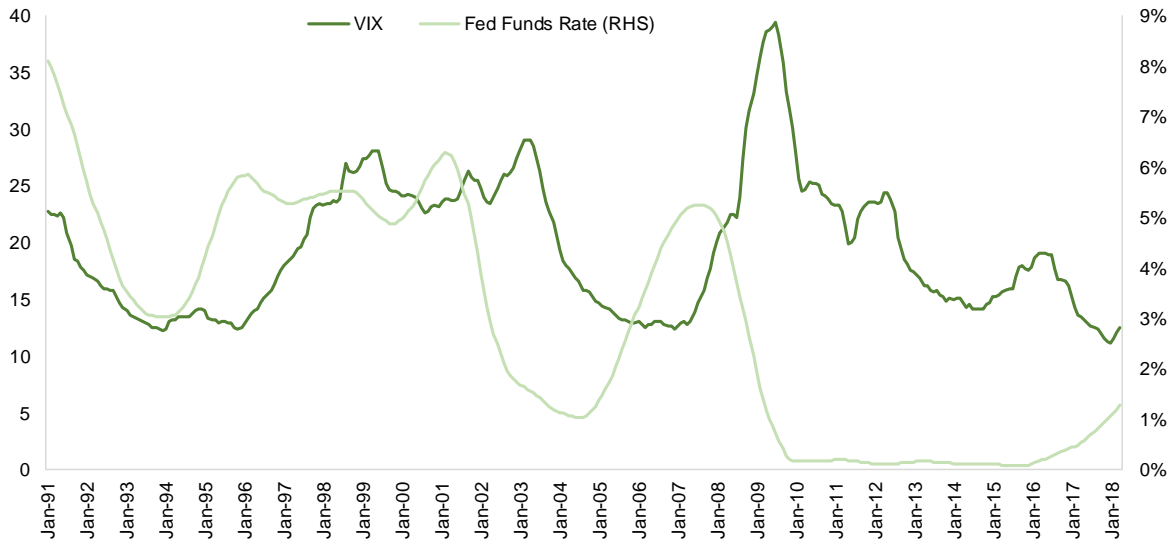


Source: Virtu Financial, SIFMA estimates

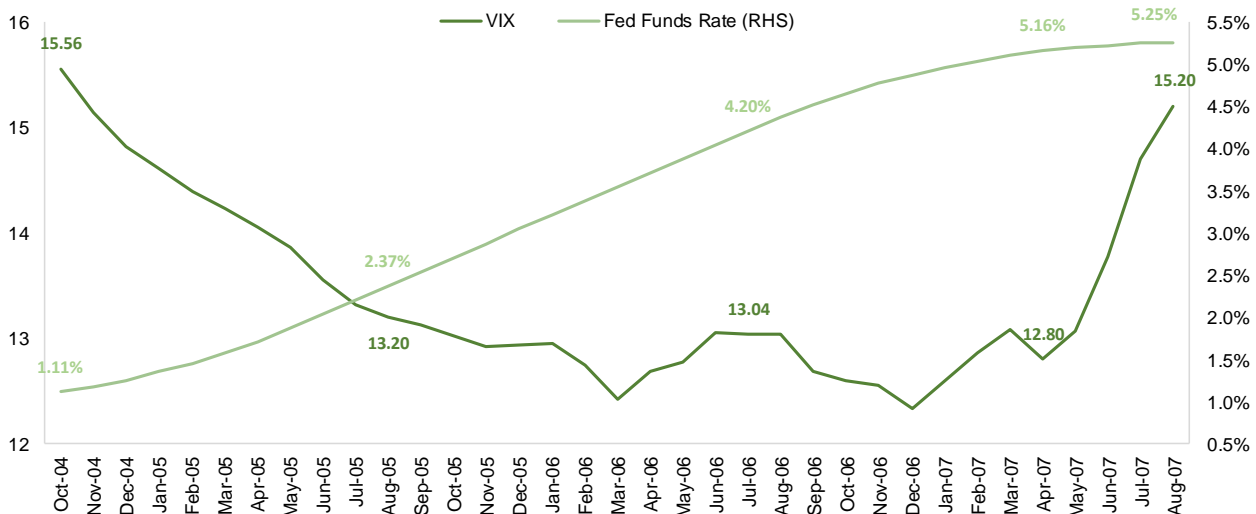
VIX and the Fed Funds Rate

Finishing up our assessment of macro factors impacting market volumes, the VIX tends to rise and fall with rate cycles. With a steady, continual rise in rates, the VIX historically increases (after a lag period).

Historical Relationship Between VIX & Fed Funds Rate Cycles



VIX Movements During Last Rate Hike Cycle



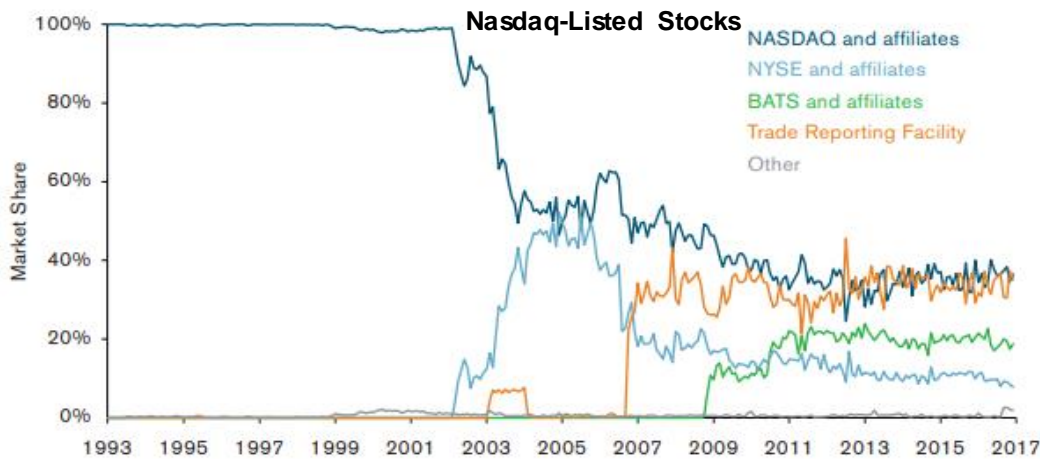
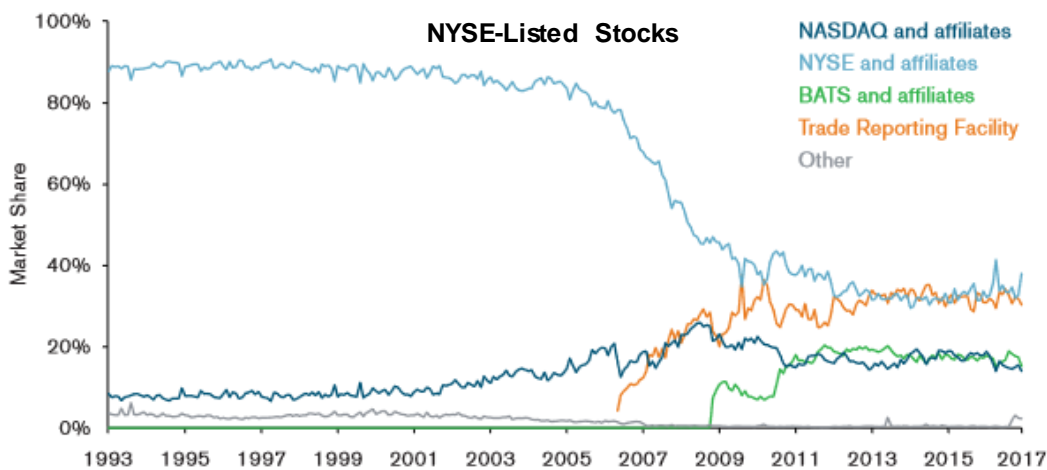
Source: Bloomberg, SIFMA estimates

Evolution of the Market Landscape

Above we discussed the macro factors impacting volumes and the equities markets. This section assesses the evolution of the landscape and the current structure of the markets.

Markets Were Previously Dominated by a Few

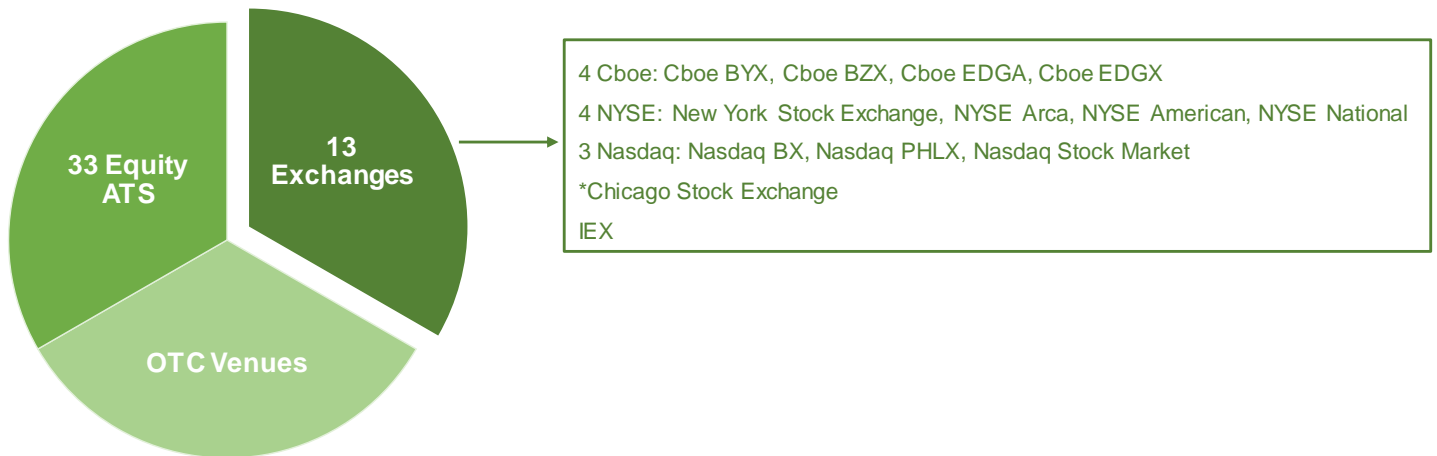
Prior to the 2000s, the U.S. equities markets were dominated by NYSE and Nasdaq, particularly in trading of their own listed stocks: NYSE held ~90% share of trading in its own listed stocks and Nasdaq 100%.



Source: As shown in the U.S. Treasury [report](#), "A Financial System That Creates Economic Opportunities – Capital Markets". This report sources: Office of Financial Research analysis, U.S. Equities Trade and Quote (TAQ), calculated (or derived) based on data from Daily Stock File ©2017 Center for Research in Security Prices (CRSP®), the University of Chicago Booth School of Business.

Now Markets Have Fragmented

Today, we have 13 exchanges, predominantly under three main parent groups, 33 equity ATS and OTC venues. One may ask why a parent group needs to hold multiple exchange licenses (each individual exchange must be approved by and registered with the SEC). Different exchanges are set up to serve the various needs of end users, mainly based on pricing model.



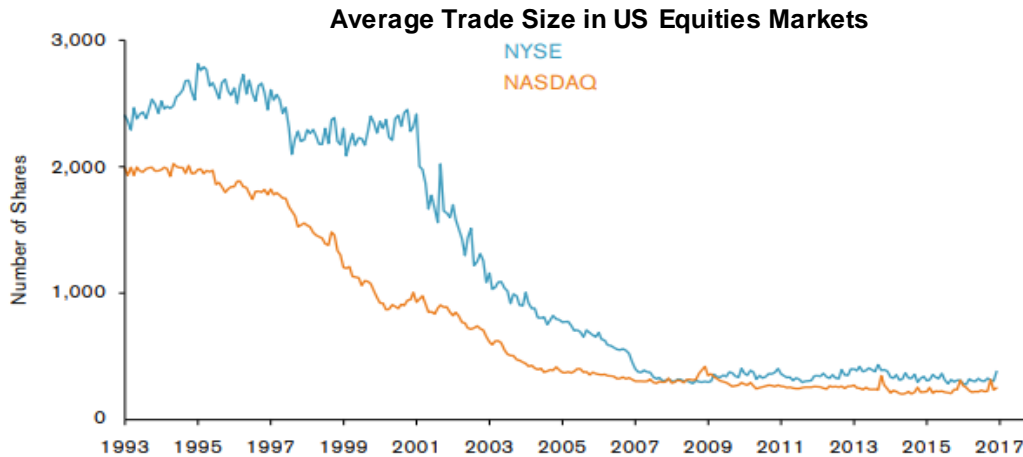
Source: Cboe Global Markets, FINRA, SIFMA estimates

Note: Intercontinental Exchange (ICE) owns the NYSE exchanges, as well as other exchanges and clearing houses across the globe. In April 2018, ICE announced it entered into an agreement to acquire the Chicago Stock Exchange (CHX), pending regulatory approval.

Some market participants consider this the “fragmentation” of the markets, brought on over the decades by regulations and electronification of markets. Brokers, on behalf of investors, now must send orders to multiple trading venues, which then compete with each other for that order flow. There is a balance between concentrated and fragmented markets. Concentrated markets can provide greater depth of book and higher probability of order execution at the terms stated by the client. Yet, it can lead to monopolistic behavior in terms of pricing and limit innovation. On the other side, fragmented markets can be more competitive and geared toward innovation to win business. However, this can lead to lower probability of order execution and increased total trade costs, as brokers must search multiple trading venues to find the best price (a requirement of their best execution obligations).

And Trade Sizes Have Come Down as Well

As markets fragmented, we saw the average trade size come down as well, from being in the thousands in the 1990s and early 2000s to around 200 on average today.

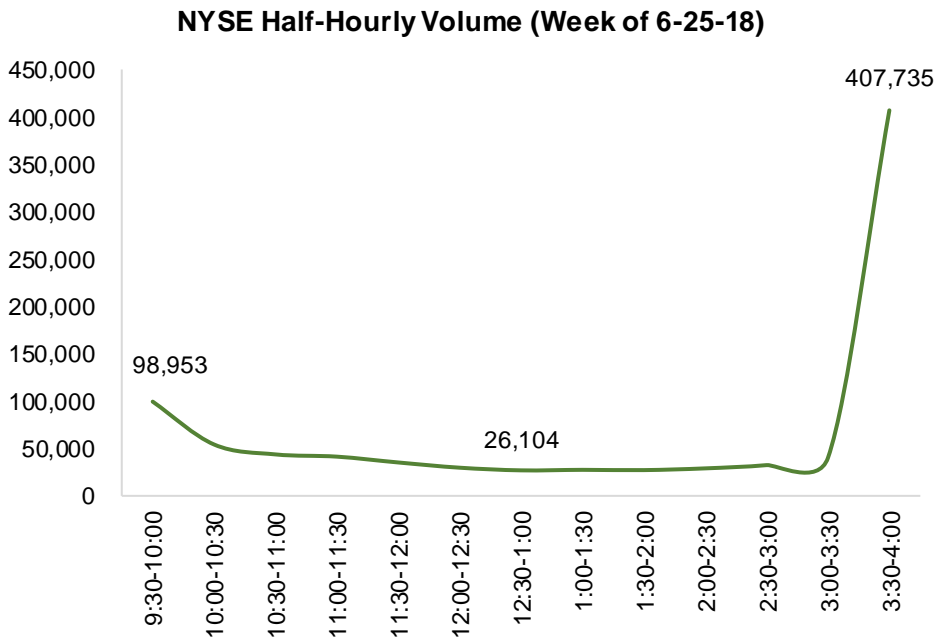


Source: As shown in the U.S. Treasury [report](#), “A Financial System That Creates Economic Opportunities – Capital Markets”. This report sources: Office of Financial Research analysis, Muzan Trade and Quote Data

With this fragmentation – along with the increase in passive investing discussed above, ETF trading volumes representing 18% to 20% of total volumes in 2018 – volumes have become concentrated around the closing auctions at NYSE and Nasdaq, the two main single stock listing exchanges in the U.S.³ According to NYSE, its closing auction now represents around 7% of total NYSE-listed volume, roughly twice the share versus five years ago, as market participants choose to participate at a time when the maximum number of buyers and sellers are coming together.

³ BATS, now owned by Cboe Global Markets, listed its own stock when it IPOd in 2016, but its strategic focus is listing ETPs rather than single stocks. IEX received listing approval and plans to test the process in 2018.

Traders describe the congregation of volumes at the close, and the open, as the “smile curve” (albeit a lopsided smile). During the 9:30 AM to 4:00 PM trading day, there is typically higher volumes at the open and particularly at the close, with lower volumes during the middle of the day.



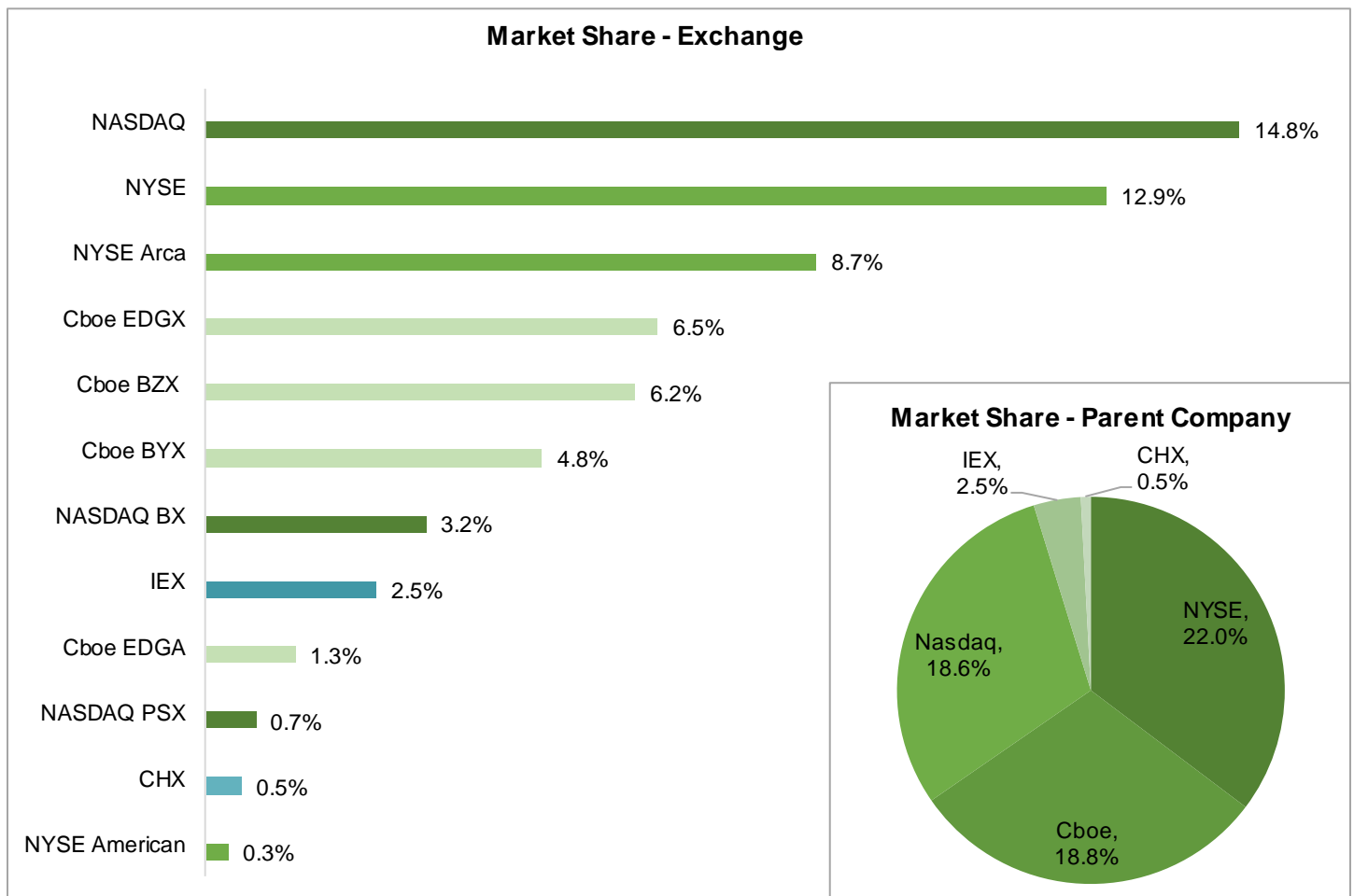
Source: Barron's, SIFMA estimates

Note: Averages of the daily volumes for the week

Market Shares Across Exchanges and Off-Exchange Venues

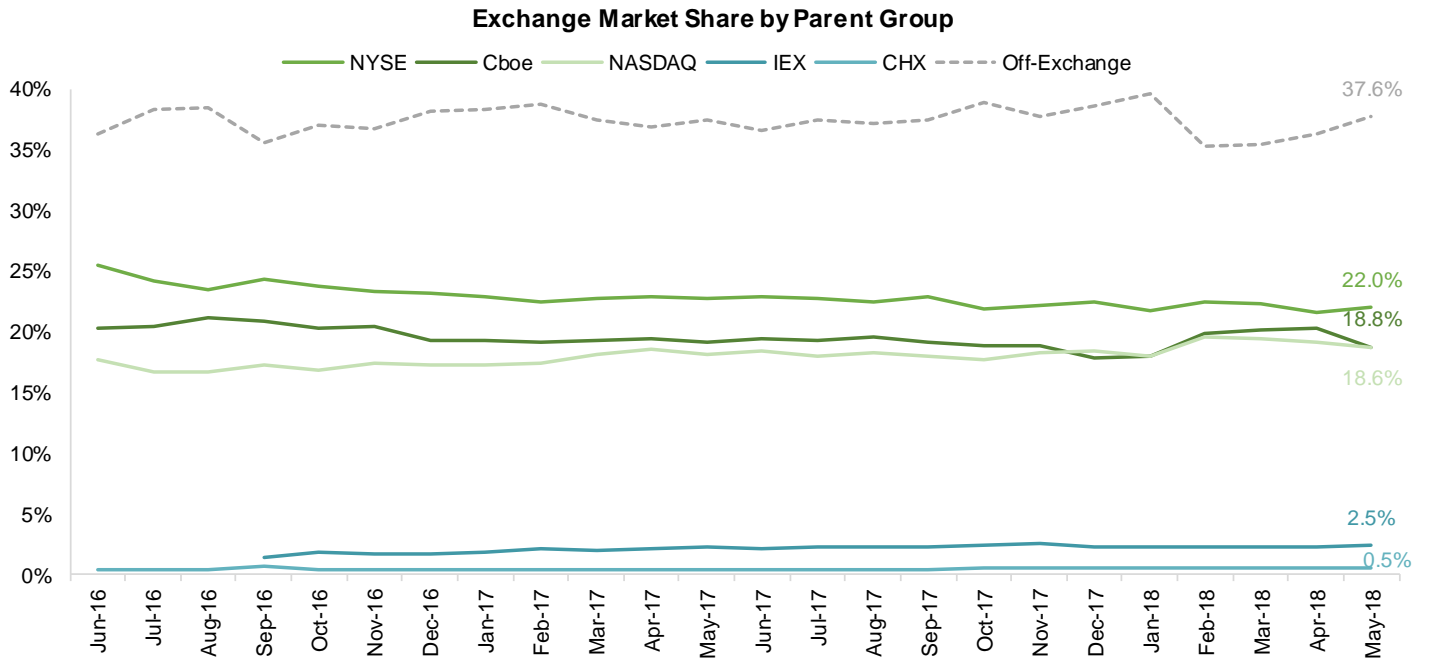
On-Exchange Trading

Within trading on exchanges, the top three exchange groups each hold around a 20% market share in aggregate across all their individual exchanges. Market share can vary within each exchange group's individual exchanges, as shown in the following charts. Off-exchange trading represents around 38% of the total.



Source: Cboe Global Markets, SIFMA estimates
 Note: As of May 2018

Market Shares Across Exchanges and Off-Exchange Venues

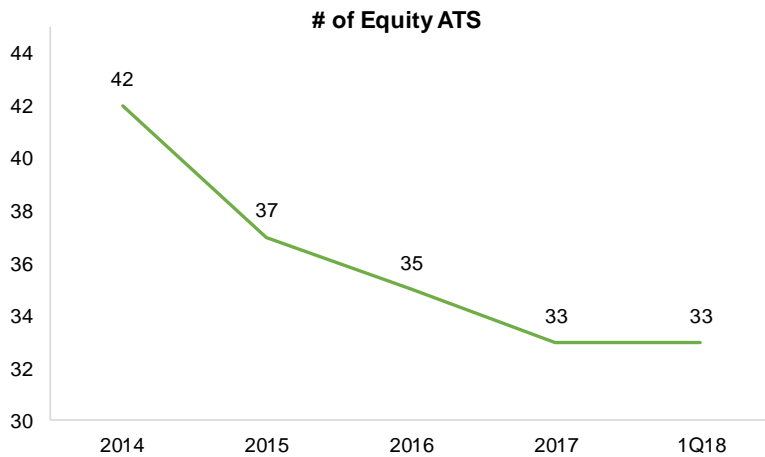


Source: Cboe Global Markets, SIFMA estimates

Off-Exchange: Alternative Trading Systems (ATS)

Within off-exchange trading, the number of equity ATS dropped to 33 from 42 since 2014 (-21%). Yet ATS, often called dark pools, continue to provide important functionality for the markets, particularly for block trades. Block trades are considered trades containing 10,000 or greater shares.⁴ Execution of these trades can be complicated. With trades of this size, the client needs its position to remain anonymous to prevent other market participants from attempting to replicate its trading strategy and thereby moving the market price of the stock. Trades of this size can significantly move market prices – often changing the economics of the trade – if not executed properly.

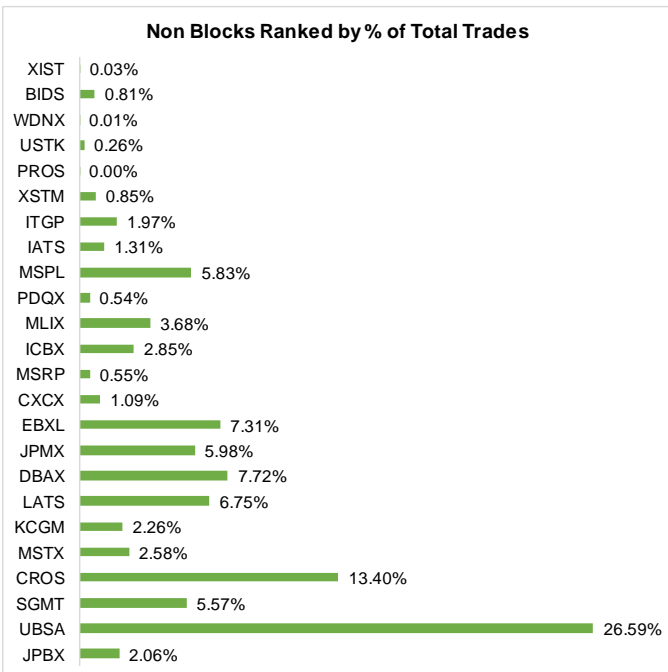
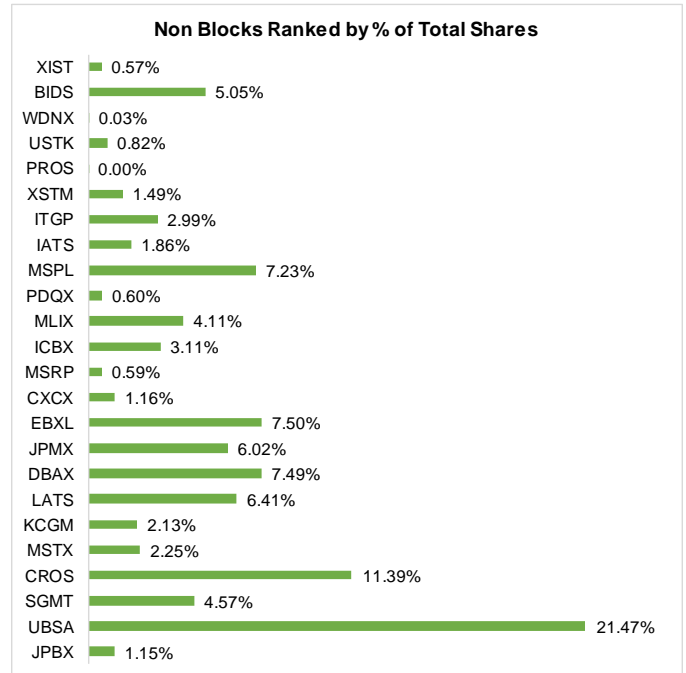
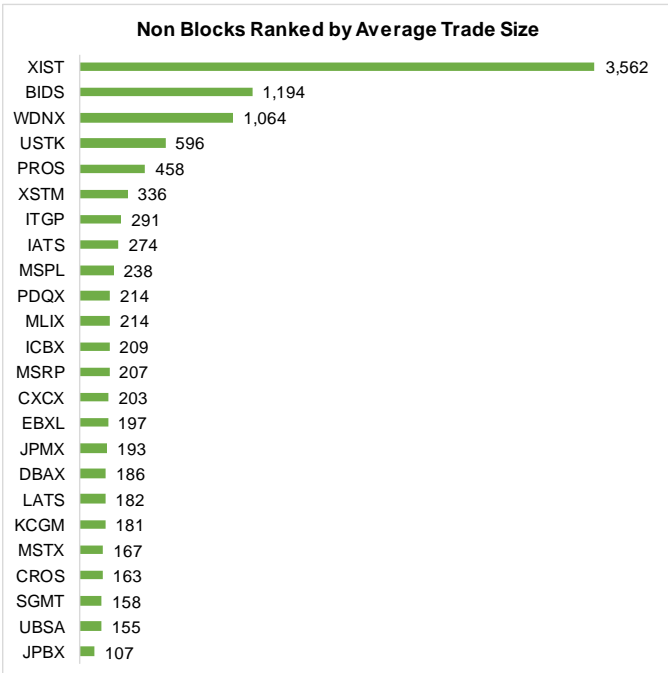
Interestingly, when analyzing equity ATS, it is not a one-size-fits-all approach. The average trade size for all equity ATS is 204, essentially in line with that of exchanges. The average trade size for blocks is 25,079 (or 17,818 when removing a substantial outlier), versus 192 for non blocks. Yet, the average trade size figure does not necessarily equate to market share (percent of total shares or total trades), as shown in the following charts.



Source: FINRA, SIFMA estimates

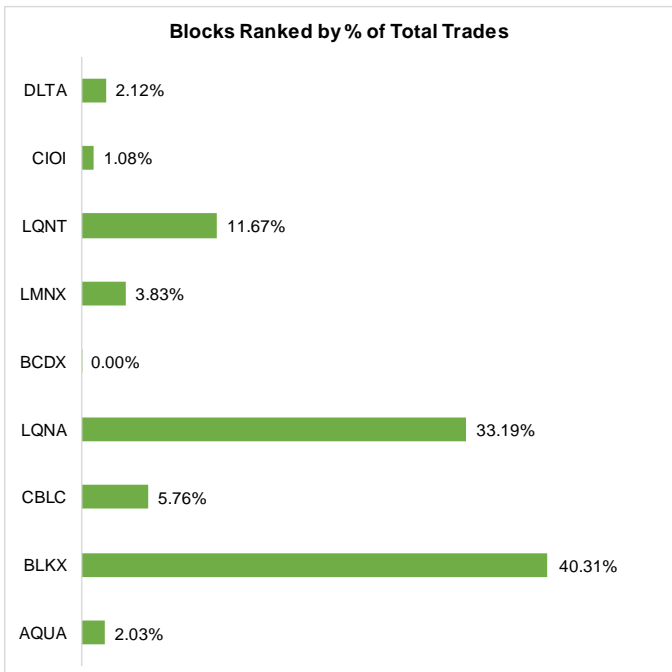
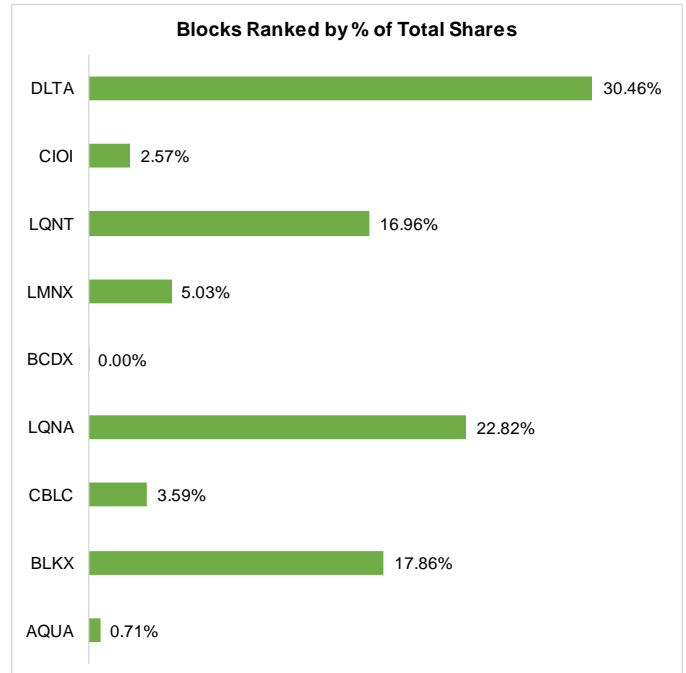
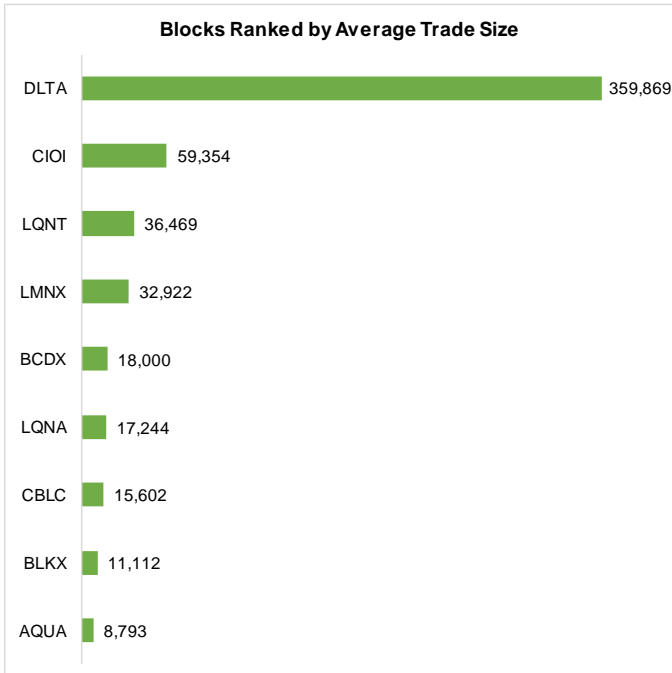
⁴ FINRA uses a less narrow definition than the market, with share-based and dollar-based thresholds.

Market Shares Across Exchanges and Off-Exchange Venues



Source: FINRA, SIFMA estimates (as of 1Q18)

Market Shares Across Exchanges and Off-Exchange Venues



Source: FINRA, SIFMA estimates (as of 1Q18)

Order Routing

How Does an Order Get from End User to Exchange?

Order routing is the process by which an order goes from the end user to execution. Once an investor places a trade, the order goes to a broker. If the order is marketable, it is eligible for immediate execution based on current market conditions. Non-marketable orders are not immediately executable for various reasons (the limit price is outside the current market, or it was an all or none trade and the quantity is not available in the market). Firms have built technologies to address market fragmentation and identify hidden liquidity, as market participants search for smart order routing paths to achieve best execution (best ex) of trades while minimizing market impact.

Once marketable, the broker will look at the size of the order and determine the path that will achieve best ex (taking into account, among other things, ADV of the security being traded). Of note, a client can direct the path the broker must follow to execute his trade, else the broker can choose the path itself. The path the broker can take varies, as shown on the following page.

By law, brokers are obligated to provide best ex for their clients⁵. However, the SEC does not specifically define what constitutes best ex, and market participants do not follow a uniform methodology themselves. Reg NMS, and earlier regulations, focused on stock price as measure of best ex. Yet, this does not tell the whole story.

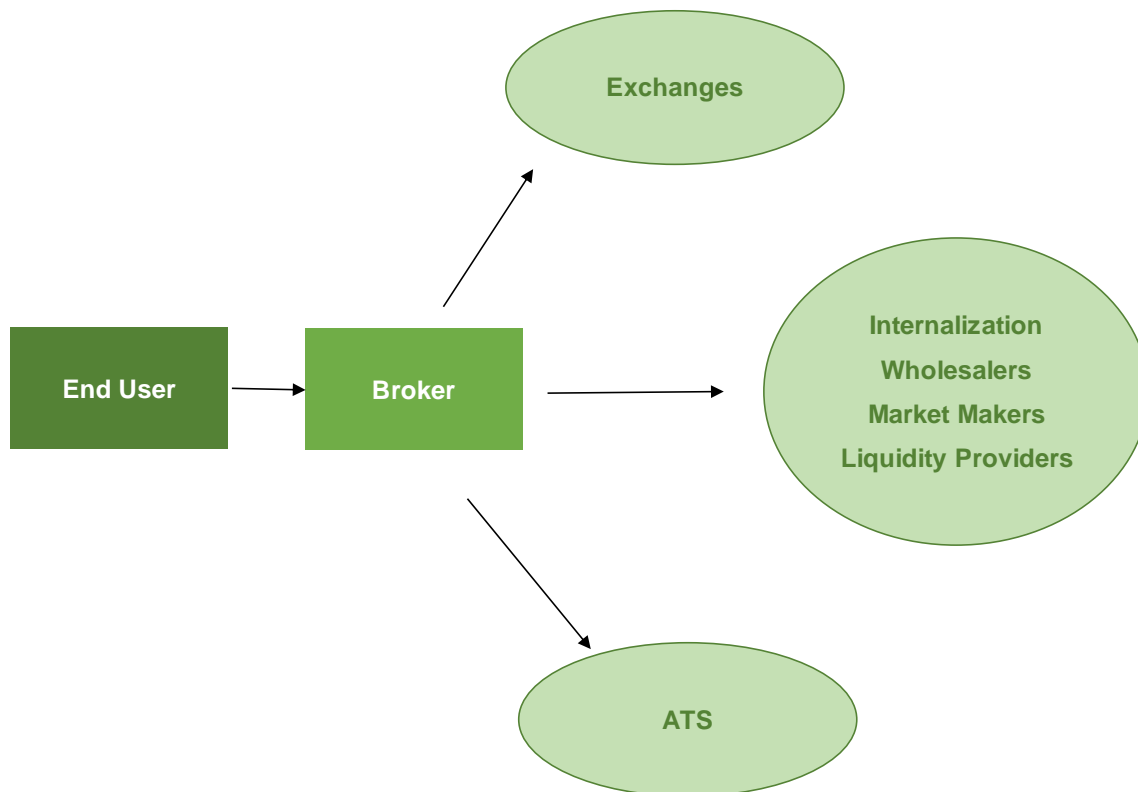
The total cost of a trade can be broken out into explicit and implicit costs. Explicit costs are the broker commissions. Implicit costs can include:

f {Stock Price; + Fees, - Rebates; Opportunity Cost (time to fill, percent of the order filled)}

During the time lapsed when searching for the price at the NBBO across all trading venues, the market could have moved, and the broker is forced to execute at a less profitable price. Or a client cannot get their entire order executed. These are all costs to trading, which can add up as brokers search across fragmented markets.

⁵ Brokers are legally required to seek the best execution reasonably available for their customers' orders. To comply with this requirement, brokers evaluate the orders they receive from all customers in the aggregate and periodically assess which competing markets, market makers, or ECNs offer the most favorable terms of execution. Some of the factors a broker must consider when seeking best execution of customers' orders include: the opportunity to get a better price than what is currently quoted, the speed of execution, and the likelihood that the trade will be executed.

Order Routing Visual

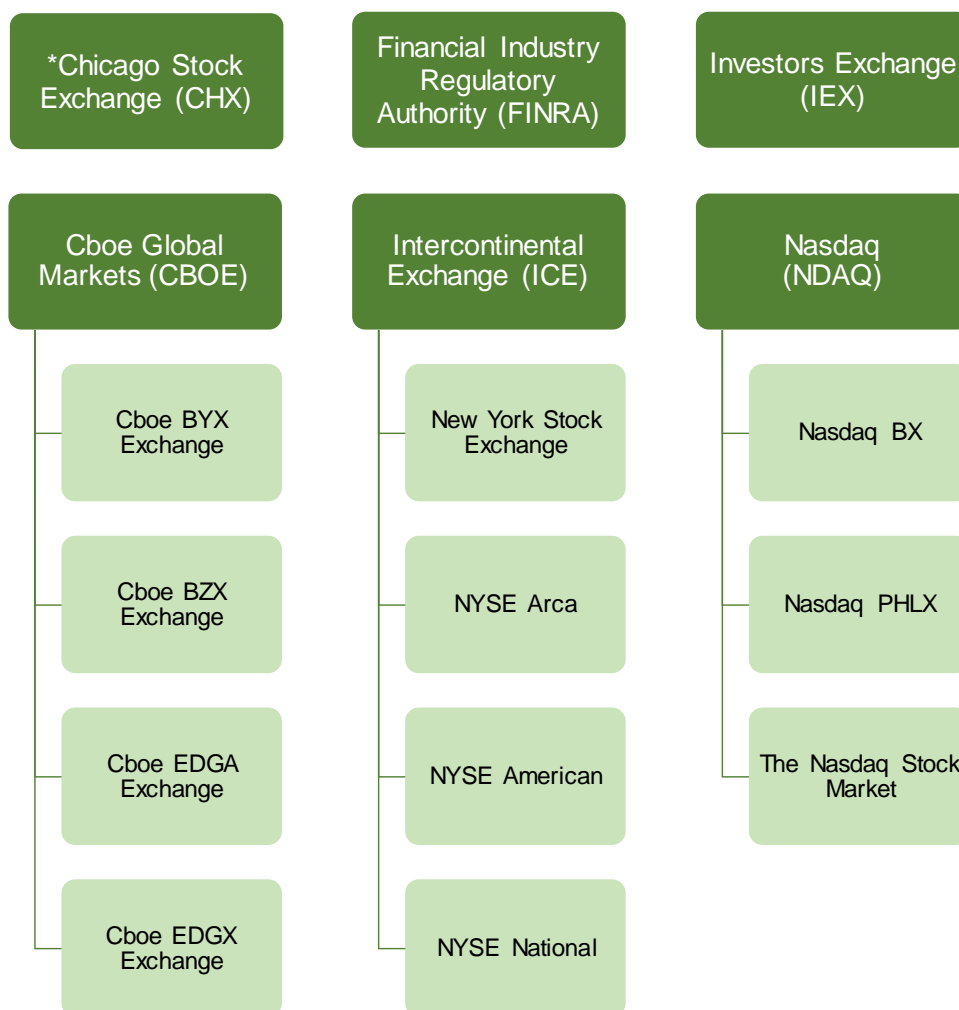


In order of the pro rata percentage of overall volumes seen in today's markets, order routing options include:

- **Exchanges** – A broker can send the client's order direct to the exchange
- Off-exchange – options
 - **Internalization/Wholesalers** – A broker can fill the client's order from its own inventory of stocks, making for quicker and cheaper execution, or it can send the order to another broker for execution
 - **Market Maker/Liquidity Providers** – For OTC trades, brokers can send orders to market makers, who stand ready to buy and sell stocks on a continuous basis, as they are obligated to make two-sided quotes in the market at all times
- **Off-exchange – ATS** – A broker can send the client's order to be executed by the ATS, a broker's own ATS or one operated by a third party

US Cash Equities SROs

By law, national stock exchanges also serve as Self-Regulatory Organizations (SROs). As such, they are responsible for regulating their member firms under their own rules and certain of the federal securities laws. In the SRO roles, the exchanges and FINRA (formerly NASD) enforce industry standards and requirements related to securities trading. These standards, among others, include: advance just and equitable principles of trade for the protection of investors; adopt and enforce rules of fair practice; and foster observance by its members of federal securities laws. The equities exchange SROs (and FINRA) include:



Source: <https://www.sec.gov/rules/sro.shtml>

Note: In April 2018, ICE announced it entered into an agreement to acquire CHX, pending regulatory approval.

The Evolution of the US Equity Market Regulations⁶

Securities Act of 1933

<http://legcounsel.house.gov/Comps/Securities%20Act%20Of%201933.pdf>

Catalyst: The stock market crash of 1929

Objective: (1) Ensure transparency in financial statements to assist investors in making informed decisions; (2) prohibit deceit, misrepresentation and other fraud in the sale of securities

Details:

Also known as the Securities Act or Truth in Securities Act, this was the first federal law used to regulate the stock market and the first major law on the sale of securities, which had historically been governed by state laws. Importantly, the act created a uniform set of rules to protect investors against fraud.

The Securities Act required companies to register with the SEC prior to going public, providing relevant financial and other information in a prospectus and registration statement. Information required included: corporate description of properties and businesses; management information; financial statements certified by an independent account; and a description of the security being offered. Some exemptions from the registration requirement existed (private offerings to a limited number of persons or institutions; offerings of limited size; intrastate offerings; and securities of municipal, state and federal governments).

Securities Exchange Act of 1934

<http://legcounsel.house.gov/Comps/Securities%20Exchange%20Act%20Of%201934.pdf>

Catalyst: The stock market crash of 1929

Objective: (1) Create the SEC to regulate the securities industry; (2) establish self regulation; (3) regulate trading of securities

⁶ Additional NMS Plan descriptions can be viewed on the SEC's website here: <https://www.sec.gov/rules/sro/nms.htm>

Details:

Also known as the Exchange Act, this law empowered the SEC with broad authority over all aspects of the securities industry. It tasked the agency to register, regulate and oversee brokerage firms, transfer agents, and clearing agencies as well as the nation's securities self-regulatory organizations (SROs). This act identified and prohibited certain types of conduct and provided the SEC with disciplinary powers over regulated entities and persons associated with them. The Exchange Act also enabled the SEC to require periodic reporting of information by publicly traded companies. Further, the act established supervised exchange self regulation⁷, with direct and flexible requirements for exchanges. On the direct side, exchanges must: register with the SEC; restrict broker-dealer borrowing; and prohibit manipulative practices. Additionally, exchanges have discretion in monitoring their markets, relying on self-regulation (the flexible aspect).

Maloney Act Amendments of 1938

<https://www.sec.gov/news/speech/1938/102338mathews.pdf>

Catalyst: General update to regulations as the trading landscape evolves, i.e. off-exchange trading

Objective: Establish the NASD to regulate OTC markets

Details:

This act authorized the SEC to register national associations of broker-dealers for the purpose of regulating themselves under SEC oversight. The Maloney Act established the National Association of Securities Dealers (NASD), with a mandate to: standardize the securities industry's principles and practices; promote high standards of commercial honor; advance just and equitable principles of trade for the protection of investors; adopt and enforce rules of fair practice; and foster observance by its members of federal and state securities laws (the promotion of capital formation was added in 1963).

⁷ While self-regulation dates back to the Buttonwoods Agreement, and early stock exchanges formed constitutions and by laws on their own, this was the first version of supervised self-regulation.

Securities Act Amendments of 1975

<https://www.sec.gov/news/speech/1975/111875loomis.pdf>

Catalyst: Lack of market efficiency and the Paper Crisis

Objective: Integrate markets and promote competition by establishing a national market system

Details:

In the 1960s/1970s, Congress and the SEC were concerned about efficiencies and lack of competition in markets, wondering whether investors were getting the best price to transact (not just stock price). The U.S. equities markets had become quite fragmented, with the same stock sometimes trading at different prices across various trading venues. The NYSE ticker tape did not report transactions of NYSE-listed stocks that took place on regional exchanges or OTC markets. The fragmentation made it difficult for traders to assess the whole market and determine the best price. At the same time, NYSE and a few others dominated the markets, and many felt regulation was needed to remove barriers to entry. The chaos from the paper crisis furthered the case for a central system. This act – while also imposing an obligation on the SEC to consider the impacts of new regulation on competition – empowered the SEC to establish a national market system and a system for nationwide clearing and settlement of securities transactions. This act enabled the Securities Industry Processors (SIPs), a structured method of transmitting securities transactions in real-time and showing the price and volume data for the transactions. This was a further shift from industry driven rules to regulatory mandates prescribing rules for all equity transactions.

Interestingly, Congress noted competitive forces were to drive market development. The goal was to link trading venues across the country – there were still many regional exchanges at this time – to promote competition and allow orders to be executed at the best price. Congress provided the SEC with five factors to establish a functioning national market system: (1) efficiency; (2) competition; (3) price transparency; (4) best execution; and (5) order interaction. Additionally, they indicated new technologies would increase efficiency, with improved communications and data processing tools linking markets. The objective was to increase information flow and enable the ability to offset orders, all contributing to best execution.

Order Handling Rules (1997)

<https://www.sec.gov/rules/sro/nd9821o.htm>

Catalyst: General update to regulations as the trading landscape evolves, i.e. technological advances

Objective: Enhance the quality of published quotations for securities and promote competition and pricing efficiency

Details:

The SEC requires a market maker to display customer limit orders that (1) are priced better than a market maker's quote or (2) add to the size associated with a market maker's quote when the market maker is at the best price in the market. This gives investors the ability to directly advertise their trading interest to the marketplace, enabling them to trade inside the current bid-ask spread and thereby compete with market maker quotations and narrow the size of the bid-ask spread. This rule amended prior regulations to require a market maker to display in its quote any better priced orders that it places into an ECN. Alternatively, it may comply with the display requirements through the ECN itself, provided the ECN (1) ensures that the best priced orders entered by market makers into the ECN are included in the public quotation, and (2) provides equivalent access to the ECN for brokers that do not subscribe to the ECN.

Regulation Alternative Trading Systems (Reg ATS, 1998)

<https://www.sec.gov/rules/final/34-40760.txt>

Catalyst: General update to regulations as the trading landscape evolves, i.e. technological advances

Objective: Strengthen the securities markets, while encouraging innovative new markets

Details:

At the time there was a growing acceptance of technology to provide investors with an increasing array of services, often more efficiently and at a lower cost. However, the regulatory environment at the time was not designed to incorporate these types of systems, despite the fact ATS were already handling around 20% of the orders in securities listed on Nasdaq and almost 4% of other exchange listed securities. Yet, ATS were private, available only to chosen subscribers and regulated as broker-dealers, not like registered exchanges. The SEC was concerned this could affect investor protections and the operation of the markets as a whole, as ATS remained outside the national market system. For example, market makers could quote prices better than those made available to public investors, since they were not fully disclosed. Reg ATS allowed ATS to choose to register as national securities exchanges or as broker-dealers, then complying with additional requirements depending on their activities and trading volume.

In 2015, the SEC proposed rules to enhance transparency and oversight of ATS, including: providing information about and activities of the broker-dealer operating the NMS Stock ATS and detailing how the ATS is operated; making these details public; establishing a process for the SEC to review material changes to the operation of an ATS; and requiring ATS to protect subscribers' confidential trading information. The SEC is voting on this proposal on July 18.

Decimalization (2000)

<https://www.sec.gov/rules/other/34-42360.htm>

Catalyst: General update to regulations as the trading landscape evolves

Objective: Match the rest of the world already using decimalization

Details:

The original convention of quoting stock prices in fractions dated back over two hundred years, leaving the U.S. the only major market at the time not to price securities in decimals. The SEC, after discussions with market participants, recognized the potential benefits of decimal pricing over the fraction-based pricing scheme. Decimalization moved the smallest price improvement from 1/16th (or \$0.0625) to \$0.01.

The primary case for decimalization was it would result in: tighter spreads; increased competition among market makers; and make quotes easier to understand. These factors would all benefit investors and the markets themselves.

Regulation National Market System (Reg NMS, 2005)

<https://www.sec.gov/rules/final/34-51808.pdf>

Catalyst: A need to modernize regulations to match changes in the markets

Objective: (1) Consolidate the rules promoting the national market system; and (2) modernize and strengthen the NMS system

Details:

In the 1970s, the equities markets consisted of mutualized exchanges and human interaction to execute orders. By 2005, computers dominated execution, and exchanges had demutualized and became global for-profit publicly traded entities in many cases. Speed became king, with trades executing in fractions of a second and algorithms implementing trading strategies.

Reg NMS is responsible for the current equity market structure, including the unintended consequences it brought about. This rule was intended to assure investors receive the best prices for order execution by encouraging competition in the marketplace, fostering competition among individual markets and orders to promote efficient and fair price formation across securities markets.

Key rules included:

- **Market Data Rules** (Rules 600, 601 and 603) – These rules amended existing SEC rules and NMS plans governing the dissemination of market data, controlling how exchanges charge for access to data on quotations and orders. It also enabled exchanges to distribute their proprietary market data separately.
 - Allocation Amendment – This section instituted a new market data revenue allocation formula, splitting the revenue generated by charging for SIP market data across trading centers. Originally, the formula was based solely on the trading activity of an SRO. The new formula included a number of elements, such as: quoting share (dollar size and length of time equal to the price of the NBBO); NBBO improvement share (displayed quotations improve the price of the NBBO); trading share (average of the percentage of total dollar volume and percentage of qualified trades, i.e. dollar volume \$5,000+); and security income allocation (square root of dollar volume; adjusts for the disproportionate level of trading in the top tier of stocks).

- Governance Amendment – This section created non-voting advisory committees for the NMS Plans governing the SIPs, inclusive of non-SRO members, who would have the right to submit their views to the NMS Plan operating committees on matters, including any new or modified product, fee, contract or pilot program.
- Distribution and Display Rules – This section authorized the independent distribution of market data outside of what was required by the NMS Plan, believing it would allow investors and vendors greater freedom to make their own decisions regarding the data they need.
- **Access Rule** (Rule 610) – This established a uniform standard to ensure fair and non-discriminatory access to quotes by all trading centers, including nonmembers of exchanges.⁸ It also imposed a limit on what trading centers could charge to access protected quotations, as well as mandating SROs to enforce rules to prohibit members from interfering with protected quotes of other trading centers or creating locked or crossed markets.
- **Order Protection Rule** (Trade Through; Rule 611) – The objective was to mandate trades be executed at the best displayed price. This rule required trading centers to establish, maintain and enforce policies and procedures to prevent trade executions at prices inferior to other trading centers. A trading center cannot “trade through” (essentially ignore) a better displayed quote, rather it must route the trade to the venue displaying the better quote or execute the trade at the better price or with price improvement. Reserve or hidden orders can be ignored – as can manual quotes, those not published on an electronic trading system, even if at a better price – and are not protected. This rule put price and speed ahead of all other best execution factors (fill rates, etc.), which can actually increase total trading costs.
- **Sub-Penny Rule** (Rule 612) – This established minimum pricing increments, preventing market participants from displaying quotes in increments less than a penny (for all NMS securities except those priced at less than \$1.00). The objective is to prevent traders from outbidding customers’ orders by a fraction of a penny, preventing customers’ orders from getting executed.

Rule 613: Consolidated Audit Trail (CAT, 2012)

<https://www.sec.gov/divisions/marketreg/rule613-info.htm>

Catalyst: May 2010 Flash Crash

Objective: Provide FINRA, the SEC and the exchanges data to enable a view of the whole market, including granularity at the customer account level

⁸ Trading centers: exchanges, associations operating a trading facility, ATS, market makers, and broker-dealers executing orders internally as a principal or agent.

Details:

The SEC adopted Rule 613 to create a comprehensive consolidated audit trail that would allow regulators to efficiently and accurately track all market activity. The rule requires SROs to jointly submit a plan to create, implement and maintain a consolidated audit trail (CAT), and mandates include:

- Provide certain detailed information (origination, modification, cancellation, routing, and execution) to the CAT for each quote and order, and each reportable event with respect to each quote and order, in an NMS security.
- Require all reportable events to be reported to the CAT so it can link them to an order through its entire life cycle from generation through routing, modification, cancellation or execution.
- Establish unique and consistent identifiers for each broker-dealer and national securities exchange.
- Establish unique and consistent identifiers for each account holder, as well as any person who has trading discretion over an account.
- Require synchronization of business clocks used to record date and time of any reportable event and require timestamps for each reportable event to the CAT to be in millisecond or finer increments.

Measures to Address Market Volatility (2012)

<https://www.sec.gov/oiea/investor-alerts-bulletins/investor-alerts-circuitbreakersbulletinhtm.html>

Catalyst: May 2010 Flash Crash

Objective: To address extraordinary market volatility in NMS Stocks.

Details:

The NMS Plan to Address Extraordinary Market Volatility was designed to address the type of sudden price movements the market experienced during the Flash Crash. This includes:

- **Limit Up-Limit Down Mechanism (LULD)** – This addresses market volatility by preventing trades in listed equity securities when triggered by large, sudden price moves in an individual stock, i.e. preventing trades from occurring outside of a specified price band. This price band is set at a percentage level above and below the average price of the stock over the immediately preceding five-minute trading period, including: 5%, 10%, 20%, or the lesser of \$.15 or 75%, depending on the price of the stock (the price bands double during the opening and closing periods of the trading day). If the stock price does not naturally move back within the price bands within 15 seconds, there will be a five-minute trading pause.
- **Revised Market-Wide Circuit Breakers** – Market-wide circuit breakers provide for cross-market trading halts during a severe market decline as measured by a single-day decrease in the S&P 500 Index, at these thresholds: 7% (Level 1), 13% (Level 2), and 20% (Level 3). These triggers are set by the markets at point levels that are calculated daily based on the prior day's closing price of the S&P 500 Index. A market decline that triggers a Level 1 or Level 2 circuit breaker before 3:25 p.m. will halt market-wide trading for 15 minutes, while a similar market decline at or after 3:25 p.m. will not halt market-wide trading. A market decline that

triggers a Level 3 circuit breaker, at any time during the trading day, will halt market-wide trading for the remainder of the trading day.

- **Large Trader Reporting Regime** – This rule established large trader reporting requirements to identify large market participants, collect information on their trading and analyze their trading activity. The new rule required large traders to register with the SEC, assigning each trader a unique identification number. Large traders will provide this number to broker-dealers, who will be required to maintain transaction records for each large trader and report this information to the SEC upon request.

Regulation Systems Compliance and Integrity (Reg SCI, 2014)

<https://www.sec.gov/rules/final/2014/34-73639.pdf>

Catalyst: May 2010 Flash Crash & August 2012 Knight Trading errors, which lead to the firm's demise (acquired by Getco)

Objective: Ensure the resiliency of trading systems

Details:

The rules were designed to: reduce the occurrence of systems issues (glitches, crashes, etc.); improve resiliency when systems problems do occur; and enhance regulatory oversight and enforcement of market technology infrastructure. The regulation applies to SROs, registered clearing agencies, ATS trading NMS and non-NMS stocks exceeding specified volume thresholds, disseminators of consolidated market data (plan processors) and certain exempt clearing agencies. The regulation required exchanges to design, develop, test, maintain and surveil systems for key securities market functions: trading, clearance and settlement, order routing, market data, market regulation and market surveillance. Reg SCI did not necessarily introduce new procedures to the exchanges – systems resiliency is important to combat reputational risk and their entire business model and exchanges continuously invest in systems and technology – but rather put formal rules down on paper.

Where We Stand Today

Many market participants believe today's market structure – although U.S. markets are among the deepest, most liquid and most efficient in the world – has some “issues” due to unintended consequences rather than market failures themselves. Regulatory “micromanagement” has led to complexity and fragmentation.

For example, the order protection (or trade through) rule has been blamed for intensifying market fragmentation. Under this rule, only the quotes at the top of the book are protected. The rule requires traders to transact at the best displayed price, forcing brokers to comb through all the exchanges and other trading venues in the market, rather than searching for the quickest or most reliable execution. This can result in increased total trading costs, as well as rising technology and exchange costs for market makers and brokers.

Some market participants feel the current regulatory structure forced the development of incentive programs and order types to attract order flow, increasing complexity in markets. In addition, the equity markets place emphasis on speed of execution, and markets process billions of trades per day, which take place in microseconds, or millionths of a second (it takes a human 150,000 microseconds to click a computer mouse).

Some of these concerns around today's markets were actually expressed when SEC Commissioners Cynthia Glassman and Paul Atkins dissented to the Adoption of Regulation NMS. Some of their concerns included Reg NMS being:

- In conflict with Congress' goal to allow competition, not regulation, to drive the development of the national market system
- Flawed in its underlying assumptions of how investors and markets should interact
- The potential cause of major distortions in the market, hurting competition and innovation
- Unnecessarily complex and not market-based
- Having too exclusive a focus on price as the measure of best ex, with the Commissioners preferring clarification of a broker's duty of best ex, since investors have different preferences

The SEC listened to market concerns and is undergoing a multi-year holistic review of market structure. Commissioner Peirce noted, “NMS is not a goal to be achieved...it should be a continuously developing system that is agile to respond quickly to new technologies and changing issuer and investor needs”.

Pilots to Assess Potential Changes

Historically, the SEC utilized pilot programs to test changes to market structure, and the agency currently has 17 active pilots, five of which apply market-wide, as opposed to a single exchange. The SEC has been reviewing all active pilots, noting pilots come with real costs to market participants and therefore need a solid structure, a clearly defined program, a set end date and an assessment system to measure success. The SEC needs to collect high-quality data to determine if the proposed change helps markets or if it could lead to a suboptimal solution.

Tick Size Pilot

The two-year tick size pilot was designed by the SEC to assess the impact of wider minimum quoting and trading increments (tick sizes) on the liquidity and trading of small cap stocks. Beginning in October 2016, the pilot included stocks with a market cap less than \$3 billion and share prices of at least \$2.00, splitting them into one control and three test groups (around 400 stocks in each test group and the rest in the control group). The groups are broken out as follows:

- **Test Group #1** – Quoting in \$0.05 per share increments but continue to trade at the current price increments, subject to limited exceptions.
- **Test Group #2** – Quoting in \$0.05 per share increments but trading in \$0.05 per share increments. Exceptions permit executions that are the (1) midpoint between the NBBO, (2) retail investor orders with price improvement of at least \$0.005 per share, or (3) negotiated trades.
- **Test Group #3** – Quoting in \$0.05 per share increments and trading in \$0.05 per share. These securities are also subject to a trade-at prohibition, preventing price matching by a trading center that is not displaying the best price, subject to limited exceptions.
- **Control Group** – Continue to quote and trade at the current tick size increment of \$0.01 per share.

Many believed a wider tick increment might improve liquidity for smaller cap stocks, potentially increasing the number of market makers trading the stocks, research analysts covering the stocks and overall trading in these names. The pilot is set to expire October 2, 2018. Not only does the SEC not expect to extend it, the SROs voted to end the pilot on this date. The SEC's Director of the Division of Trading and Markets Brett Redfearn indicated increasing tick sizes "may not make sense for the long haul," but we might learn the relative changes in trading costs associated with wider spreads and the costs/benefits associated with a trade-at provision, via the collected data.

Transaction Fee Pilot

The transaction fee pilot – often called the access fee pilot, currently in the proposal stage – aims to assess the impact of transaction-based fees and rebates, and changes to those fees and rebates, on order routing behavior, execution quality and general market quality. This would be a two-year pilot, with a one-year automatic sunset. The pilot would apply to all NMS stocks of any market cap, with a share price of at least \$2.00 (and not closing below \$1.00 per share during the proposed pilot), and would include all equities exchanges (including taker-maker exchanges). The groups are broken out as follows:

- **Test Group #1** – \$0.0015 fee cap for removing and providing displayed liquidity (no cap on rebates)
- **Test Group #2** – \$0.0005 fee cap for removing and providing displayed liquidity (no cap on rebates)
- **Test Group #3** – Rebates and linked pricing prohibited for removing and providing displayed and undisplayed liquidity; Rule 610(c) cap continues to apply to fees for removing displayed liquidity (30 cents per 100 shares cap to access protected quotations)

- **Control Group** – Rule 610(c) cap continues to apply to fees for removing displayed liquidity (30 cents per 100 shares cap to access protected quotations)

While the SEC's proposal arose out of a recommendation by the Equity Market Structure Advisory Committee (EMSAC, now dissolved), the inclusion of a test group ending rebates diverged from the EMSAC. Yet, the SEC believes it would be missing an opportunity to fully evaluate exchange pricing models without this feature. At the end of the pilot, the SEC intends to also assess the appropriate role of regulators in setting market pricing – could competitive market forces cap fees without the government setting caps? Some market participants have expressed concerns about the size of the test buckets: 1,000 stocks in each of three groups, totaling over one-third of all NMS stocks.

Roundtables to Discuss Potential Changes

The SEC is also holding a series of roundtables to discuss market structure issues and potential fixes with market participants. These exercises include:

- **Market structure for low volume securities** (<100,000 ADV) – 50% of NMS stocks are low volume, as are ~30% of U.S. corporate stocks. The low volume corporate stocks represent 15% of total NMS stocks, but <1% of total NMS volume (low volume ETPs equal 18% and <0.5% respectively). Low volume stocks are illiquid “for a whole bunch of reasons”, but SEC's Redfearn indicated it is worthwhile looking into market structure changes that could make it easier to trade these stocks, allowing exchanges to innovate to serve issuers and investors and repatriate liquidity back onto exchanges.
- **Access to markets and market data** – Market participants have access to products and services providing a range of entrances to markets and market data. This roundtable will explore costs, speed and transparency around data, including the amount of SIP money collected and how much is reinvested in improving the SIP.
- The third roundtable will address **regulatory approaches to combat retail fraud**.

The History of US Stock Exchange and Market Events⁹

- **1790**, Board of Brokers of Philadelphia (will become the Philadelphia Stock Exchange) – This was the formation of the oldest stock exchange in the U.S.
- **1792**, The Buttonwood Agreement – This was an effort to organize securities trading in New York City, akin to their Philadelphia peers. The agreement was signed by 24 stockbrokers outside of 68 Wall Street in New York, under a buttonwood tree, and contained two provisions: (1) brokers were to deal only with each other, eliminating the auctioneers, and (2) commissions were set at 0.25%. It was the first example of self regulation.
- **1817**, New York Stock and Exchange Board (will become NYSE) – The stock brokers in the Buttonwood Agreement instituted new reforms and reorganized, adopting restrictions on manipulative trading and formal structures of governance. The brokers began renting out exclusive space to trade securities, which previously took place at the Tontine Coffee House. Prior to settling at its current 11 Wall Street location in New York (the exchange used to have a second building at 18 Broad Street), several locations were used between 1817 and 1865.
- **1834**, Boston Stock Exchange (BX, formerly BSX or BSE) – The third oldest exchange in the U.S. opened
- **1864**, Open Board of Stock Brokers – This exchange, with a similar membership model, opened to directly compete with the NYSE
- **1864**, Oil Exchange (Pittsburgh Coal Exchange, Pittsburgh Oil Exchange; will become Pittsburgh Stock Exchange) founded
- **1865**, NYSE acquired New York Gold Exchange
- **1867**, stock tickers were introduced
- **1869**, Open Board of Stock Brokers merged with NYSE
- **1875**, Board of Brokers of Philadelphia renamed itself the Philadelphia Stock Exchange (PHLX)
- **~1880**, New Orleans stock Exchange began operating

⁹ Other U.S. regional stock exchanges include: Buffalo Stock Exchange, Colorado Springs Stock Exchange, Denver Stock Exchange, Detroit Stock Exchange, Hartford Stock Exchange, Honolulu Stock Exchange, Louisville Stock Exchange, Milwaukee Stock Exchange, Richmond Stock Exchange and Wheeling Stock Exchange. This section is not meant to be exhaustive of all U.S. exchanges or highlights in the history of stock markets.

- **1884**, Washington Stock Exchange began operating
- **1881**, Baltimore Stock Exchange opened
- **1882**, Chicago Stock Exchange (CHX) founded
- **1882**, San Francisco Stock and Bond Exchange founded
- **1885**, Cincinnati Stock Exchange founded
- **1888**, Salt Lake Stock and Mining Exchange founded (will become Intermountain Stock Exchange)
- **1894**, Pittsburgh Oil Exchange rebranded as Pittsburgh Stock Exchange
- **1896**, Dow Jones Industrial Average (DJIA) was first published in The Wall Street Journal
- **1897**, Spokane Stock Exchange began operating
- **1899**, Cleveland stock Exchange founded
- **1899**, Los Angeles Oil Exchange founded
- **1899**, St. Louis Stock Exchange opened
- **1906**, the DJIA exceeded 100
- **1907**, Panic of 1907 (1907 Bankers' Panic, Knickerbocker Crisis) – This was a financial crisis lasting three weeks starting in mid-October, when the NYSE fell ~50% from last year's peak. With the country in an economic recession, panic spread and caused runs on banks and trusts. The panic was triggered by the failed attempt to corner the market on United Copper Company stock. This led to the collapse of the Knickerbocker Trust Company, New York's third largest trust, creating a domino effect of regional banks withdrawing reserves from New York City banks. Financier J.P. Morgan stepped in with other bankers to provide money to stabilize the banks. The event emphasized the inability of the country's Independent Treasury system to inject liquidity back into the market and eventually led to the creation of the Federal Reserve System.
- **1907**, the curb brokers gained rights of seniority but intentionally averted organizing to avoid authorities forcing them to sell exchange memberships
- **1908**, the New York Curb Market Agency was established, with formal trading rules for curbstone brokers
- **1910**, the informal Curb Association formed to weed out "undesirables"
- **1911**, the New York Curb Market Association was formed with a formal constitution
- **1914**, World War I stock exchange closures
- **1915**, quoting and trading in stocks changed from percent of par value to dollars
- **1920**, Wall Street bombing (outside the NYSE building)
- **1923**, Poor's Publishing introduced the Composite Index (now the S&P 500)
- **1927**, Seattle Stock Exchange began operating

- **1928**, San Francisco Stock and Bond Exchange took the name San Francisco Stock Exchange
- **1929**, central quote system established
- **1929**, Minneapolis-St. Paul Stock Exchange opened
- **1929**, New York Curb Market Agency changed its name to New York Curb Exchange
- **1929**, Wall Street Crash of 1929 (the Great Crash) – As the Roaring Twenties rolled on, the stock market soared despite the Fed's warning of excessive speculation (leading to a mini crash in March, stopped by a credit backstop by National City Bank). During the decade, the stock market had increased tenfold. Yet, the U.S. economy showed signs of trouble, with declines in steel production and auto sales, coupled with an increase in consumer debt based on easy credit. After gaining ~20% between June and September, the market corrected in September, after financial expert Roger Babson predicted a crash. Then, on September 20, the London Stock Exchange crashed, when top British investor Clarence Hatry and many of his associates were jailed for fraud and forgery, weakening optimism and creating instability in the U.S. stock market. On October 24, the market declined but was stemmed by strategic blue chip stock buying by a group of banks. Media coverage over the weekend increased the hysteria, and the DJIA declined ~13% on October 28, Black Monday (it fell another ~12% the next day). By mid-November, the DJIA had lost almost half of its value, with the slide continuing through the summer of 1932 when the DJIA troughed 89% below its peak. The DJIA did not return to its pre-crash heights until November 1954.
- **1933**, Securities Act of 1933
- **1934**, Securities Exchange Act of 1934 and the establishment of the SEC
- **1935**, Seattle Stock Exchange merged with Seattle Curb and Mining Exchange
- **1938**, San Francisco Stock Exchange absorbed the San Francisco Curb Exchange
- **1938**, Maloney Act Amendments to the Securities Exchange Act of 1934, authorizing the formation of national securities associations to supervise the conduct of their members subject to the oversight of the SEC, i.e. self-regulatory organizations (SRO)
- **1939**, National Association of Securities Dealers established as a SRO to play a leading role in the management of stock trading in the markets
- **1942**, Seattle Stock Exchange closed
- **1949**, Philadelphia Stock Exchange and Baltimore Stock Exchange merged
- **1949**, CHX merged the St. Louis, Cleveland and Minneapolis/St. Paul exchanges to form the Midwest Stock Exchange
- **1953**, New York Curb Exchange changed its name to the American Stock Exchange (AMEX)
- **1954**, Philadelphia-Baltimore Stock Exchange merged with the Washington Stock Exchange
- **1954**, DJIA surpassed its 1929 peak in inflation-adjusted dollars
- **1956**, DJIA closed above 500 for the first time

- **1956**, Pacific Coast Stock Exchange was formed with the merger of the San Francisco Stock and Bond Exchange and the Los Angeles Oil Exchange
- **1957**, Poor's Publishing merged with Standard Statistics Bureau and the Standard & Poors composite index grew to track 500 companies on the NYSE (now known as the S&P 500)
- **1959**, New Orleans Stock Exchange merged with the Midwest Stock Exchange
- **1968+**, The Paper Crisis – Equities ADV hit 12M shares per day, with piles of stock certificates and other paperwork overwhelming many Wall Street back offices, those responsible for settling and clearing trades. NYSE was forced to restrict trading to four days a week, but it was not enough to stop a flood of fails (failures by firms to receive or deliver securities within five days of a trade). Many firms lost control of their records and costs, leading to around a sixth of all NYSE member firms disappearing either through merger or closure. Capitalizing on the confusion, organized crime syndicates made off with >\$400M in stolen securities in 1971, according to the U.S. Attorney General's office.
- **1969**, Philadelphia-Baltimore-Washington Stock Exchange acquired the Pittsburgh Stock Exchange
- **1969**, Institutional Networks Corp (Instinet) founded
- **1970**, Securities Investor Protection Corporation (SIP) established
- **1971**, National Association of Securities Dealers Automated Quotations (NASDAQ, now Nasdaq) founded as the world's first electronic stock market
- **1972**, DJIA closed above 1,000 for the first time
- **1972**, Salt Lake Stock and Mining Exchange changed its name to Intermountain Stock Exchange
- **1973**, the Pacific Coast Stock Exchange was renamed the Pacific Stock Exchange
- **1973**, The Depository Trust Company (DTC) was created to alleviate the paper crisis
- **1976**, as another solution to the paper crisis, the National Securities Clearing Corporation (NSCC) was formed to clear U.S. equities, using multilateral netting
- **1980s**, Savings and Loan Crisis – Lasting through the 1980s and into the early 1990s, more than 700 U.S. savings and loan associations failed. The S&Ls were lending long term at fixed rates using short-term money and became insolvent when interest rates rose.
- **1982**, LatAm Sovereign Debt Crisis – Mexico, Brazil and Argentina (and others) borrowed money for development and infrastructure programs, and LatAm debt roughly quadrupled in seven years. With the U.S. recession in the late 1970s, interest rates rose while LatAm currencies devalued significantly. Mexico was the first country to acknowledge it could not repay its debt, and many LatAm nations eventually received bailouts from the IMF.
- **1985**, NASDAQ-100 Index introduced
- **1986**, COMEX acquires Intermountain Stock Exchange

- **1987**, Black Monday – On October 19, 1987, the DJIA dropped 23% in the day. The Wednesday before Black Monday, the U.S. House of Representatives filed legislation to eliminate tax benefits for financing mergers. Stock values re-adjusted, as many companies were no longer viewed as takeover targets. That same day, the trade deficit for August came in notably above expectations, causing the dollar to decline as expectations increased for the Fed to tighten rates, pressuring stocks. By Thursday, markets continued to decline, with flight to safety moves as funds flowed to bonds from stocks. That Friday, many stock index options expired, and previous price movements eliminated at-the-money options preventing investors from rolling into new contracts/hedges easily. People sold futures contracts to hedge, creating a significant price discrepancy between the values of the stock index and its underlying stocks. There was substantial selling pressure on the Monday open at the NYSE. Specialists were not able to settle the imbalances, delaying the open by an hour. With the delay in trading in stocks, the futures markets opened using stale prices on the indexes. Once the NYSE opened, stock prices dropped massively.
- **1989**, Junk Bond Crisis – During this decade, junk bonds became popular for use in leveraged buyouts and as a business financing mechanism, and the market grew exponentially. While the start of the junk bond collapse is debated, it culminated with the failure of Drexel Burnham Lambert, due to its substantial participation in junk bonds. The crisis led to a recession in the U.S.
- **1991**, DJIA exceeded 3,000
- **1991**, Spokane Stock Exchange closed
- **1993**, Midwest Stock Exchange changed its name back to CHX
- **1994**, TerraNova Trading was founded; it started excepting orders on Archipelago in 1997
- **1994**, Tequila Crisis – A nearly 50% devaluation in the Mexican peso (driven by a reversal in economic policy removing tight currency controls) caused interest rates to increase significantly and led Mexico to need a bailout for its bonds.
- **1995**, DJIA exceeded 5,000
- **1996**, real-time tickers introduced
- **1999**, DJIA exceeded 10,000
- **1999**, The Depository Trust & Clearing Corporation (DTCC) formed as a holding company for DTC and NSCC
- **1997-1998**, Asia Crisis – The Thai Baht collapsed, leading to Thailand not being able to repay its debt. The crisis spread across the region, particularly South Korea, Indonesia, Laos, Hong Kong and Malaysia. (This also contributed to the failure of Long-Term Capital Management, which was bailed out by the Fed and a group of banks to prevent a wider collapse of the financial markets.)
- **1998**, Attain (will become Direct Edge) founded
- **1999-2000**, Dotcom Bubble – Following a rush into technology and Internet stocks, despite the fact that many of them made essentially no money, a slowing economy and rising interest rates forced the dotcoms to go bankrupt.

- **2000**, National Association of Securities Dealers spun off the Nasdaq Stock Market into a publicly traded company
- **2001**, trading in fractions ($\frac{n}{16}$) replaced by decimals (increments of \$0.01), or decimalization
- **2001**, September 11 terrorist attack stock exchange closures
- **2003**, Cincinnati Stock Exchange rebranded as the National Stock Exchange (NSX)
- **2004**, NYSE merged with Euronext, forming the first transatlantic stock exchange
- **2005**, Archipelago acquired the Pacific Exchange
- **2005**, NASDAQ acquired Insitnet (from Reuters, which acquired it in 1987)
- **2005**, Bats Global Markets (BATS) founded
- **2006**, NYSE merged with Archipelago Exchange (ArcaEx, now NYSE Arca), an exchange on which both stocks and options are traded
- **2006**, DJIA topped 12,000
- **2007**, DJIA exceeded 14,000
- **2007**, Nasdaq merged with OMX, a leading exchange operator in the Nordic countries and renamed itself the NASDAQ OMX Group
- **2007**, Knight Capital Group spun off Attain (which it bought two years earlier) and rebranded it as Direct Edge, as an electronic communication network
- **2007**, CBOE Stock Exchange (CBSX) launched in partnership with four liquidity providers
- **2007**, BX was purchased by NASDAQ
- **2007**, PHLX was purchased by NASDAQ
- **2007**, FINRA was formed, merging NASD and the regulation, enforcement and arbitration functions of NYSE
- **2007-2008**, Global Financial Crisis – The housing (price) bubble burst when mortgage delinquency rates began rising in August 2006. This led to a rapid devaluation of financial instruments (MBS, CDS, etc.). As values continued to quickly decline, buyers disappeared and the financial institutions holding these securities faced a liquidity crisis. It became difficult to borrow money, resulting in a decrease in home buyers and a corresponding plunging of home prices. What began with a crisis in the U.S. subprime mortgage market developed into a full-blown international financial services crisis.
- **2008**, Bats Global Markets became an operator of a licensed U.S. stock exchange
- **2008**, NYSE Euronext acquired AMEX; AMEX was integrated with the Alternext European small-cap exchange and was renamed NYSE Alternext US
- **2009**, after the DJIA reached a 12-year low at 6,547.05, it rebounded to >10,000 in October

- **2009**, NYSE Alternext US rebranded as NYSE Amex Equities
- **2010**, Direct Edge received approval to operate licensed national securities exchanges
- **2010 Flash Crash**, In May 2010, the U.S. equity markets experienced “a severe disruption”, as a large number of stock prices suddenly dropped by significant amounts in a very short time period and then equally suddenly reversed to pre-decline levels. This led to a large number of trades being executed at temporarily depressed prices, including many that were more than 60% away from pre-decline prices.
- **2011**, Bats Global Markets acquired Chi-X Europe
- **2011**, CBSX acquired NSX
- **2012**, NYSE Amex Equities changed its name to NYSE MKT
- **2012**, Hurricane Sandy stock exchange closures
- **2013**, IEX (Investors Exchange) opened for trading, operating as an ATS
- **2013**, ICE acquired NYSE Euronext
- **2013**, DJIA ended the year above 16,500
- **2014**, DJIA closed above 17,000 in July and above 18,000 in December
- **2014**, CBSX closed
- **2014**, NSX ceased trading operations
- **2014**, Direct Edge merged with BATS
- **2015**, NSX resumed trading operations under new ownership
- **2016**, IEX received SEC approval as an official exchange
- **2017**, NYSE MKT renamed NYSE American
- **2017**, ICE acquired NSX, rebranded as NYSE National
- **2017**, IEX received SEC approval to list companies
- **2017**, CBOE acquired BATS
- **2017**, DJIA crossed 20,000 for the first time
- **2018**, DJIA crossed 25,000 for the first time
- **2018**, ICE entered an agreement to acquire CHX (pending regulatory approval at publication of this report)

Appendix

Terms to Know

FINRA	Financial Industry Regulatory Authority
SEC	Securities and Exchange Commission
SRO	Self-Regulatory Organization
ADV	Average Daily Trading Volume
ATS	Alternative Trading System
Best Ex	Best Execution
Dark Pool	Private trading venues, not accessible by the public
ECN	Electronic Communication Network
EMS	Equity Market Structure
ETF	Exchange-Traded Fund
ETP	Exchange-Traded Product
HFT	High-Frequency Trading
IOI	Indication of Interest
IPO	Initial Public Offering
MM	Market Maker
OTC	Over-the-Counter
PFOF	Payment For Order Flow
SI	Systematic Internaliser
Tick Size	Minimum price movement of a trading instrument
EMSAC	Equity Market Structure Advisory Committee
NMS	National Market System
Reg NMS	Regulation National Market System
SIP	Security Information Processor; aggregates all exchange's best quotes, sent back out to the market in one data stream
Bid	An offer made to buy a security
Ask, Offer	The price a seller is willing to accept for a security
Spread	The difference between the bid and ask price prices for a security, an indicator of supply (ask) and demand (bid)
NBBO	National Best Bid and Offer
Locked Market	A market is locked if the bid price equals the ask price
Crossed Market	A bid is entered higher than the offer or an offer is entered lower than the bid
Opening Cross	To determine the opening price of a stock, accumulating all buy and sell interest a few minutes before the market open
Closing Cross	To determine the closing price of a stock, accumulating all buy and sell interest a few minutes before the market close
Order Types	
AON	All or none; an order to buy or sell a stock that must be executed in its entirety, or not executed at all
Block	Trades with at least 10,000 shares in the order
Day	Order is good only for that trading day, else cancelled
FOK	Fill or kill; must be filled immediately and in its entirety or not at all
Limit	An order to buy or sell a security at a specific price or better
Market	An order to buy or sell a security immediately; guarantees execution but not the execution price
Stop	(or stop-loss) An order to buy or sell a stock once the price of the stock reaches the specified price, known as the stop price
Investors	
Institutional	Organization, fewer protective regulations as assumed to be more knowledgeable and better able to protect themselves*
Retail	Individual, a non-professional investor
Accredited	Individual, income > \$200K (\$300K with spouse) in each of the prior 2 years OR net worth >\$1M, excluding primary residence

*Types of institutional investors: endowment funds, commercial banks, mutual funds, hedge funds, pension funds and insurance companies

ATS Data

Equity ATS Name	MPID	Total Shares	% of Total Shares	Total Trades	% of Total Trades	Avg. Trade Size	# Times the Avg.
UBS ATS	UBSA	11,558,612,209	20.17%	74,684,445	26.58%	155	0.8x
CROSSFINDER	CROS	6,131,230,224	10.70%	37,641,434	13.40%	163	0.8x
LEVEL ATS	EBXL	4,036,471,200	7.04%	20,531,738	7.31%	197	1.0x
SUPERX	DBAX	4,030,627,076	7.03%	21,670,068	7.71%	186	0.9x
MS POOL (ATS-4)	MSPL	3,895,161,690	6.80%	16,362,217	5.82%	238	1.2x
BARCLAYS ATS ("LX")	LATS	3,453,137,482	6.03%	18,958,277	6.75%	182	0.9x
JPM-X	JPMX	3,240,235,070	5.65%	16,794,978	5.98%	193	0.9x
BIDS TRADING	BIDS	2,719,614,540	4.75%	2,278,461	0.81%	1,194	5.9x
SIGMA X2	SGMT	2,462,502,574	4.30%	15,631,833	5.56%	158	0.8x
INSTINCT X	MLIX	2,214,264,890	3.86%	10,332,918	3.68%	214	1.0x
INSTINET CONTINUOUS BLOCK CROSSING SYSTEM (CBX)	ICBX	1,674,461,755	2.92%	7,999,595	2.85%	209	1.0x
POSIT	ITGP	1,607,349,782	2.81%	5,530,164	1.97%	291	1.4x
MS TRAJECTORY CROSS (ATS-1)	MSTX	1,211,480,500	2.11%	7,255,670	2.58%	167	0.8x
VIRTU MATCHIT	KCGM	1,146,037,324	2.00%	6,339,584	2.26%	181	0.9x
DEALERWEB	DLTA	1,054,776,222	1.84%	2,931	0.001%	359,869	1764.1x
IBKR ATS	IATS	1,003,202,015	1.75%	3,666,525	1.30%	274	1.3x
CROSSSTREAM	XSTM	804,362,651	1.40%	2,392,943	0.85%	336	1.6x
LIQUIDNET H2O	LQNA	790,199,400	1.38%	45,824	0.02%	17,244	84.5x
CITI CROSS	CXCX	622,238,237	1.09%	3,072,427	1.09%	203	1.0x
JPB-X	JPBX	618,955,773	1.08%	5,795,286	2.06%	107	0.5x
BLOCKCROSS	BLKX	618,438,688	1.08%	55,655	0.02%	11,112	54.5x
LIQUIDNET ATS	LQNT	587,409,900	1.03%	16,107	0.01%	36,469	178.8x
USTOCKTRADE SECURITIES, INC.	USTK	442,665,109	0.77%	742,620	0.26%	596	2.9x
CODA MARKETS, INC.	PDQX	323,599,205	0.56%	1,510,480	0.54%	214	1.0x
MS RPOOL (ATS-6)	MSRP	318,863,430	0.56%	1,542,721	0.55%	207	1.0x
INSTINET CROSSING	XIST	306,502,028	0.53%	86,037	0.03%	3,562	17.5x
LUMINEX TRADING & ANALYTICS LLC	LMNX	174,025,591	0.30%	5,286	0.002%	32,922	161.4x
CITIBLOC	CBLC	124,141,506	0.22%	7,957	0.003%	15,602	76.5x
CIOI	CIOI	88,912,991	0.16%	1,498	0.001%	59,354	291.0x
AQUA SECURITIES L.P.	AQUA	24,689,596	0.04%	2,808	0.001%	8,793	43.1x
XE	WDNX	16,415,697	0.03%	15,435	0.01%	1,064	5.2x
PRO SECURITIES ATS	PROS	2,196,731	0.004%	4,799	0.002%	458	2.2x
BARCLAYS DIRECTEX	BCDX	18,000	0.00003%	1	N/A	18,000	88.2x
Grand Total		57,302,799,086		280,978,722		204	

Source: FINRA (as of 1Q18)

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