TRADING SERIES PART 1:

THE EVOLUTION OF TRADING — FROM QUARTERS TO PENNIES AND BEYOND

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Key Ideas

The structure of U.S. equity markets has recently been cast into the spotlight of national attention over renewed worries of nefarious activity and bad actors associated with high-frequency trading (HFT). While the current state of the markets certainly bears careful inspection, this evaluation must be done in a holistic fashion to more fully understand where we are today and how we arrived at this point. Stock markets have been continuously evolving since their earliest iterations and at no point in history has the pace of that change been faster than the last two decades. The current market is dominated by rapid, fragmented, and electronic execution, a framework within which high-frequency trading has come to play a significant role. But is this necessarily a bad thing, as some are quick to accuse? Are markets too fast or too complex to allow the institutional and retail investor a fair shake? Is the U.S. stock market truly "rigged?"

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To be clear, both retail and institutional investors have benefited from the following changes in the markets:

- Lower trading costs through significantly lower bid/ask spreads and commissions; and
- Faster execution facilitated by highly electronic and automated markets.

However, these changes also pose certain risks, namely:

- Increasing complexity, primarily due to greater speed and fragmentation of markets; and
- Potential systemic risk from unchecked or insufficiently tested trading algorithms.

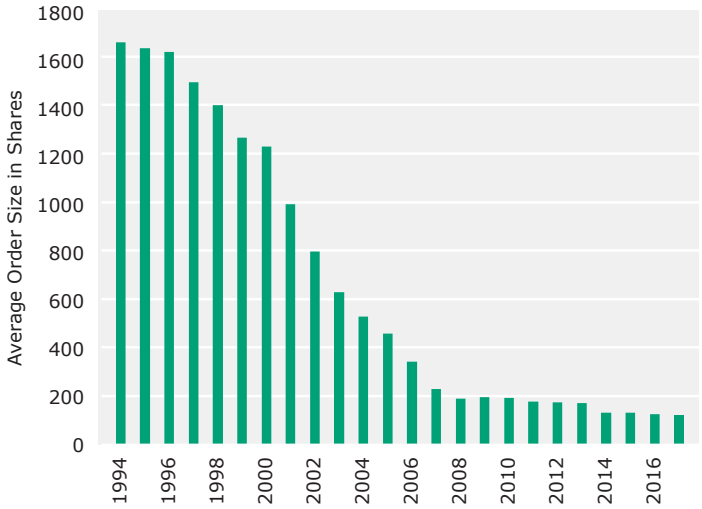
Brief history of markets and market making

To understand where we are today, it makes sense to take a step back and look at some of the changes that have occurred over the last two decades. Up until the mid-1990s, U.S. stock-market volumes were heavily concentrated at the New York Stock Exchange (NYSE) and subsequently the NASDAQ. Orders on these exchanges were facilitated by a middleman who was either tasked with matching orders to buy and sell (NYSE specialists), or by continuously providing offers to buy and sell stocks from their own inventory (NASDAQ dealers). In exchange for providing this service, the market maker was paid a "spread," or the difference between the price at which a stock is bought and sold. As stock prices, at the time, were quoted in increments of 1/8 of a dollar, this spread amounted to a minimum of $0.125 per share. Trading in NYSE-listed stocks was a relatively slow, human-controlled process, requiring the manual operation of a floor broker.

Major changes started in 1997, when the SEC amended the Order Handling Rules (OHR) to include the Limit Order Display Rule requiring market makers to display all outstanding limit orders. This, in combination with Regulation Alternative Trading System (or Reg ATS, for short) in 1998, legitimizing off-exchange, order-matching systems, introduced both competition and transparency to what was once a largely opaque system. Minimum bid/ask spreads rapidly narrowed following these two changes, beginning with a drop to $0.0625 (1/16s) in 1999 and culminating with the move to $0.01 (decimalization) in 2001. Bid/ask spreads became even smaller with the growth in off-exchange volume via electronic crossing networks (ECNs), which offered faster execution at tighter spreads. Average order sizes decreased rapidly to less than 500 shares from about 1500 shares in 1997, primarily because dealers and participants were now much less willing to put large orders on display. To make money in this competitive, automated, and transparent world, market makers had to execute many more smaller orders at much narrower spreads to be profitable. This model proved to be much better suited to computers than humans. Figures 1 and 2 demonstrate the rapid decline in order size and spreads since 1994.

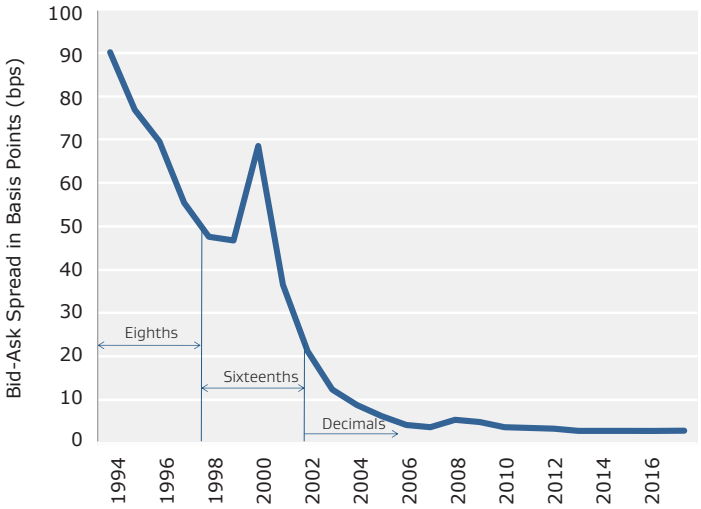
In 2005, Regulation National Market System (Reg NMS) was introduced, requiring routing between markets and forcing all market makers to honor the best displayed bid and ask across all venues. Until this point, trading in NYSE-listed companies was still dominated by the NYSE specialists. But protection of the

FIGURE 1
HISTORICAL U.S. ORDER SIZE



Source: Credit Suisse Trading Strategy.

FIGURE 2
CONSOLIDATED U.S. AVERAGE BID/ASK SPREAD



Source: Credit Suisse Trading Strategy.

so-called National Best Bid and Offer (NBBO) led to the trading of NYSE-listed stocks at outside venues and interconnection of the fragmented exchange markets. When an order was hit at any exchange, the remaining orders across other venues had to be canceled to prevent duplication of buys and sells. This process required speed only a computer could provide in posting and canceling thousands of orders per second as stocks traded throughout the day.

The net result of all of these changes is a market that today is incredibly fast-paced and also highly fragmented among many execution venues. Regional exchanges run by BATS/Edge, and others specializing in rapid electronic trading, have grown to as much as 19% of market volume in 2017, with NASDAQ and NYSE holding 18 and 23%, respectively. The remaining 40% is comprised of off-exchange crossing at ECNs, internal crossing at broker/dealers, and in dark pools (broker-run crossing networks where orders to buy and sell are not publicly displayed so they can be matched without releasing information to the market at large).

A process that was once relatively slow and human-controlled has evolved to the point where computers and their algorithms have become imperative.

High-frequency trading

So what is high-frequency trading and where does it fit amidst all this change in today's market? HFT is a style of trading performed by firms that make use of sophisticated, computer-driven algorithms capable of processing thousands of orders per second. These firms typically have very short holding periods, trading into and out of names with little-to-no leverage and holding minimal positions overnight. For all of the strategies these traders employ, speed is paramount as their profits depend on being able to execute very-low-margin trades at very high volumes.

HFT firms typically fall into one of the following categories:

Market Making: HFT firms naturally emerged as market makers in a world of razor-thin spreads and shrinking order sizes, largely displacing their historically manual and human-controlled predecessors. The majority of HFT revenue is generated simply by facilitating trades in the market and capturing sub-penny bid/ask spreads in addition to rebates offered by many exchanges for providers of liquidity. This type of HFT-generated volume is almost certainly a benefit to the market-at-large, as it is adding liquidity to the system to allow faster, cheaper execution on even the smallest of orders.

Arbitrage: In addition to market making, HFT shops take advantage of their speed of execution by finding and correcting short-term pricing dislocations across markets. These mispricing situations may arise from differences in price quotes for the same stock on multiple venues (latency arbitrage), where pairs or small groups of stocks that typically trade in tandem temporarily dislocate (statistical arbitrage), or any number of other scenarios. In all instances, the HFT firm will buy the relatively cheap stock or listing and sell short the overpriced one, closing out the position when the dislocation is corrected.

News Flow: Along similar lines, the rapid trading of stocks and indexes immediately upon release of information is another area where the speed of HFT dominates as speed is paramount in being first to react. In combination with arbitrage trading, the rapid trading on news flow works to continuously bring the market back to equilibrium and to ensure that quoted prices always contain all available information. The net result here is a much more efficient market that is continuously offering more reliable pricing, to the benefit of all participants.

Pattern/Trend Trading: Another HFT strategy involves identifying market patterns and trade flow to move ahead of other market participants. A simplified example is an algorithm designed to identify a significant buyer in an individual name, with the intent to buy ahead of that trader, driving the price of that stock up and then turning around and selling it back for a profit. This is a much more concerning area, especially for larger institutional investors who typically trade large blocks of stock. The state of current markets dictates that these large orders must be executed much more diligently than in years past. Continuing evolution of the implementation process and skilled, disguised execution on a day-to-day basis are required to minimize the impact high-frequency trading can have on these large orders.

In aggregate, HFT firms have grown from basically zero before 1997 to represent more than half of all current volume. HFT market share reached its highest point in 2009, when it was reported by TABB Group to account for more than 60% of all trades in the U.S. market before relaxing closer to 50% in 2017. With such a large share of all volume traded, HFT firms undoubtedly present a systemic risk in today's market. This was most evident in the so-called "Flash Crash" on May 6, 2010, when the Dow Jones Industrial Average dropped as much as 9% in only five minutes. During the crash, it was believed that computer-driven algorithms operated in an uncontrolled manner and that simultaneously the liquidity that HFT typically provides withdrew, making it much more difficult for the market to find a bottom amidst a highly electronic and complicated market structure. A massive trade error experienced by Knight Capital after installation of new trading code in August of 2012 also highlighted the general risks associated with a highly automated, extremely rapid market structure.

Looking forward

While there are no major changes to market structure slated for the immediate future, there will undoubtedly be continuing evolution and change. One thing is for certain, margins for all market makers, both on- and off-exchange, are likely to continue shrinking. Goldman Sachs recently announced that they would be closing down their dark pool in light of shrinking margins and increasing regulatory scrutiny. The SEC recently adopted Rule 613, which requires the creation of a consolidated audit trail to track and store all orders, quotes, and executions from inception to execution. This will help bring some light to the complex and sometimes opaque structure we face today.

Today's equity markets are faster, more efficient, and more automated than ever before. Given careful, diligent portfolio implementation and the adoption of appropriate measures to control the risks that this new structure presents, all market participants stand to benefit from the changes we've seen over the last 25 years.

Faced with ever-evolving market structure, how can investment managers effectively seek best execution for their clients? How should managers think about and measure trading costs? How can a manager tailor the implementation process to best fit their investment process while protecting clients' best interests? These questions and more will be addressed in Part 2 of our trading thought leadership series.

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