Nasdaq

INTELLIGENT TICKS

A BLUEPRINT FOR A BETTER TOMORROW

U.S. equities markets are the most transparent and resilient in the world. The process of price discovery – bringing millions of buyers and sellers together in a massive electronic marketplace to determine a fair price – is a great technological and economic achievement of the modern age. And the accessibility of our well-regulated markets to Main Street investors means that prosperity and financial security can be widely shared.

Yet the regulatory framework that governs our markets has not kept pace with the astonishing advances in technology. To address this, Nasdaq launched **Revitalize**, our blueprint for market reform, in 2017. We followed that in 2019 with **TotalMarkets**, an expansion of our original blueprint that focused on market structure.

One of the highest-priority reforms recommended in both reports is replacing the current one-size-fits all tick regime with an intelligent tick regime that would improve markets and benefit investors, public companies, and exchange members alike.

The current approach to tick sizes needs to be modernized, as it fails to meet the market's needs which we believe ultimately costs investors money. A smarter approach – which has already been adopted in markets outside the U.S. – will lower costs for investors and reduce trading friction.

Following the release of TotalMarkets, we convened a coalition of market

participants to study the tick size issue closely, analyze data, and work collaboratively on a specific set of recommendations. The findings of this effort follow. I wish to personally thank the members of that group for their deep insight and dedication to enhancing U.S. markets, including Enrico Cacciatore from Voya Investment Management, John Comerford from Credit Suisse, Chris Iacovella from the American Securities Association (ASA), Mehmet Kinak from T Rowe Price, Justin Schack from Rosenblatt Securities and Eric Swanson from XTX Markets.

Nasdaq believes that free markets with clear, consistent and fair rules that catalyze innovation are extremely powerful. Reforming the outdated tick size regime is an important step toward ensuring that U.S. equities markets evolve and continue to drive widely-shared prosperity.

We look forward to the work ahead.

Sincerely,

Tal Cohen

Executive Vice President and Head of North American Markets
Nasdaq, Inc.

Lauren Dillard

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Executive Summary

In two major reports – Revitalize: Reigniting America's Economic Engine and TotalMarkets: Blueprint for a Better Tomorrow Nasdaq has laid out a comprehensive roadmap for reforming the U.S. public equities markets. Our markets are the most liquid, competitive and technologically advanced in the world, yet we believe change is essential.

Among our recommendations, we make a case for replacing the current one-size-fits all tick regime with an intelligent tick regime that would improve markets and benefit all key stakeholders – investors, public companies, and exchange members alike.

Tick sizes – the minimum increments by which a stock can be quoted – are currently identical for all traded entities, regardless of market capitalization, volume, or share price. That means a $2 stock is quoted at the same minimum tick size as a $2,000 stock.

Many of the issues afflicting the market today can be traced back to the current tick size regime, drawing the ire of both investors and issuers. The current tick size structure is sub-optimal for equities of all sizes, as well as for investors:

- Many low-priced stocks are tick-constrained, often trading one-tick wide when there is widespread desire and market forces to trade at a smaller tick increment. Such tick-constraints create long quotation queues, slowing fulfillment, creating inefficiencies and diminishing price discovery. This drives trading to inverted-fee or "taker-maker" markets, where larger, lower priced, more liquid stocks tend to trade heavily. In these cases, a narrower minimum tick would reduce bid-ask spreads, saving investors money, and make trading more efficient.
- Many high-priced stocks, conversely, trade at spreads that are multiples of the one-penny minimum tick increment. This increases investor costs, usage of odd-lots, flickering quotations, non-displayed trading that doesn't support price discovery, and price instability. Time priority for resting orders diminishes, and passive executions are outbid by economically insignificant amounts. Outbidding becomes so inexpensive that time priority becomes essentially non-existent, destroying the reward and incentive to post passive liquidity and diminishing price discovery.

In both instances there is less quote competition and price protection, resulting in wider spreads that further discourages these activities in a self-reinforcing cycle. Investors and issuers suffer.

Data show that these problems are getting worse. One contributing factor is the steady decline of stock splits in recent years. During the decades prior to the credit crisis, splits were common. Today, they are rare, causing many stocks – including some of the most actively-traded market titans – to trade at prices significantly higher than historical norms. In a market with a "one-size-fits-all," one-penny minimum increment, along with 100-share round lots and sophisticated trading algorithms, this share-price creep means more and more issues trade at the "wrong" tick size, and suffer the associated inefficiencies.

Technology today allows for an intelligent tick regime that we believe will lower costs for investors and decrease complexity without artificially widening spreads. Nasdaq strongly supports this, and to drive progress we convened a working group to share and analyze tick data and tick increment proposals. The working group studied the current tick size regime to determine whether a more intelligent tick size regime could benefit investors by improving tradability and lowering the cost of trading. Representatives from buy-side, sell-side, market maker, and retail firms joined to collaborate with us and think through what a potential proposal could look like. The working group, among others, included Enrico Cacciatore from Voya Investment Management, John Comerford from Credit Suisse, Mehmet Kinak from T Rowe Price, Justin Schack from Rosenblatt Securities, and Eric Swanson from XTX Markets. Together, this group analyzed and compared multiple potential tick regimes and provided valuable and varied input. There was rigorous analysis, spirited debate, and ultimately, support for a new tick regime.

As we describe in the pages that follow, we have developed a smarter tick proposal that would create an easy-to-implement table of of trading increments to account for a wide variety in size, volume, and, stock price. Importantly, stock spreads would not artificially widen under this proposal; rather, stocks would be assigned the next smallest increment by quoted spread e.g., a stock with average spread of $0.12, would be in the $0.10 increment category. In fact, based on prior research, the wider ticks we propose—which are always narrower than existing spreads—are expected to improve quote competition and narrow spreads, even in those stocks that would be assigned the wider tick size buckets. This new approach is data-driven and designed to do no harm while we believe doing considerable good.

In proposing this new structure, we recognize two important points. First, we expect that various market participants (including those who worked with Nasdaq on this proposal) will continue to consider and debate the specific details of an intelligent tick regime. We welcome that conversation and believe strongly that the overwhelming majority will support the concept.

Second, we recognize that this proposal addresses a non-exhaustive set of challenges to our markets as we view this as a foundational and critical starting point. Other related issues that market participants and policy makers should consider include round lot size, order protection, access fees and liquidity rebates, dollar-based versus basis-point trading, stock splits and optimal stock pricing, to name just a few.

We do not consider this an intellectual exercise. Our goal and hope in convening the working group and publishing this report is to advance the debate and spur the Commission to act. The sooner we start, the sooner we can rewrite the markets of tomorrow.

Intelligent Ticks Proposal

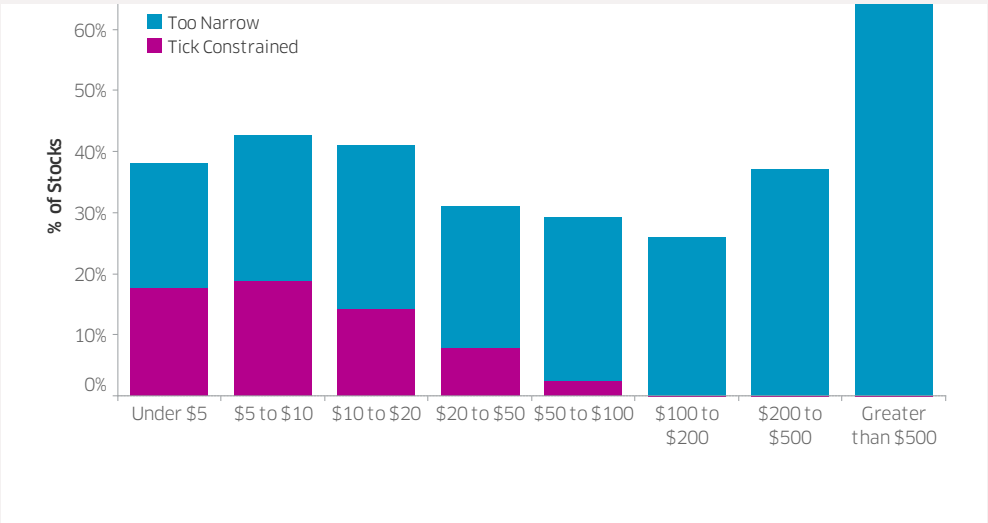
Nasdaq argued in Revitalize: Reigniting America's Economic Engine and TotalMarkets: Blueprint for a Better Tomorrow the one-size-fits-all tick regime governing U.S. equity markets is sub-optimal, and a more intelligent tick regime would improve the markets and benefit investors, public companies, and exchange members alike.

To remain effective, our markets must continuously evolve, deploy innovative technology, and modernize rules to fit a changing world. For example, the Regulation NMS tick regime, adopted when markets were dominated by human traders buying and selling stocks on crowded trading floors, has become less effective as markets evolved. Its binary tick rule – one penny for all stocks priced above a dollar; sub-pennies for those priced below –now governs 6,200 widely-varying public companies' stocks. This ranges from trillion-dollar mega-caps to $50 million micro-caps, securities that trade billions of dollars of notional value daily to those trading little if at all, and stocks priced from $1 per share to $2,000 per share. The same blunt rule also covers 2,300 diverse exchange-traded products with assets of tens of millions to hundreds of billions of dollars; based on broad-based and narrow funds; holding domestic and global assets, and including equities, commodities, fixed income, and multiple asset classes. Today's "one-size-fits-all" tick regime may work optimally for a portion of these stocks and ETPs, but that segment is shrinking.

The data shows our current "one-size-fits-all" regime has costly consequences. Many low-priced stocks are tick-constrained, meaning they nearly always trade one tick wide. The market appears willing to trade with a narrower spread that has the potential to reduce costs for traders and investors. Tick constraints create long quotation queues, slowing fulfillment. The resulting inefficiency drives trader and investor focus on time priority and speed while diminishing price priority and, therefore, price discovery. This distortion pushes market participants to inverted taker-maker markets where participants achieve faster executions

CHART 1: Estimated Ticks Too Wide or Too Narrow

Note: Tick constrained stocks defined as stocks with an average NBBO spread under 1.1 cents. Stocks with ticks defined as too narrow are those with fill rates under the 25th percentile. Data averaged over October, 2019.



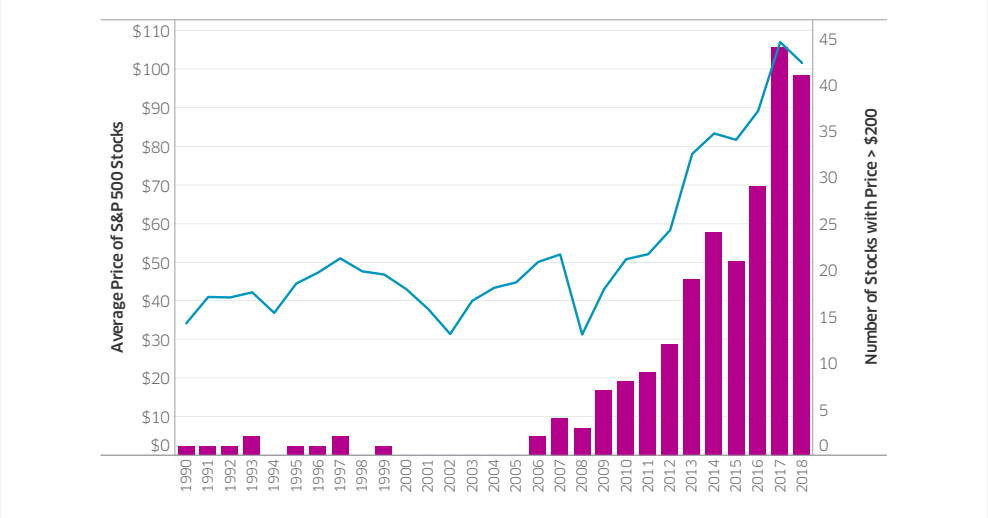
Source: Nasdaq Economic Research

by improving their place in the market-wide queue.[1] The data shows that larger, lower priced, more liquid stocks are most likely to be tick-constrained, and to trade heavily in inverted markets.

Other stocks trade at large multiples of the tick increment, leading to wider spreads, increased prevalence of odd-lots, flickering quotations, and non-displayed trading that doesn't support price discovery. When ticks are too narrow, time priority for resting orders diminishes in value: traders patiently awaiting passive executions are outbid by economically insignificant amounts. At the extreme, outbidding is so inexpensive that time priority becomes essentially non-existent, destroying the incentive to post passive liquidity and reducing quote competition. As quote competition declines, price discovery weakens and spreads widen; when spreads widen, quote competition and price discovery weakens further and so on. Investors and issuers suffer.

Data show the challenges are growing. A decline in stock splits, and the resulting rise in average stock prices, increases the frequency and inefficiencies of too-narrow ticks. In the decades prior to the credit crisis, stock splits were more common. Today, stock splits are rarer, causing many stocks, including several widely-held blue-chip stocks, to trade at prices significantly higher than historical norms. High stock prices combined with one-penny ticks, 100-share round lots, and sophisticated trading algorithms, makes trading outliers and inefficiencies more prevalent.

CHART 2: Average Price of S&P 500 Constituents



Source: Nasdaq Economic Research, Bloomberg

We think the industry supports change. There is widespread, growing agreement that we see as building blocks of progress. **First,** tick increments are critical to successful markets, especially to attracting displayed liquidity, narrowing effective spreads, and generating optimal reference prices. **Second,** the current tick regime is sub-optimal for large swaths of securities, especially low-priced stocks constrained by the tick size and regularly experience excessively wide spreads on a percentage basis. **Third,** technology and customer sophistication has evolved in a way that allows the market to support a more intelligent tick structure than was the case in decades past.

To hasten consensus building, Nasdaq convened a working group to share and analyze tick data and tick increment proposals. The working group studied the current tick size regime to

1 So-called "maker-taker" markets are trading venues that offer rebates to orders that provide liquidity and charge fees to those that take it. "Inverted" or "taker-maker" markets, pay rebates to orders taking liquidity and charges fees to those providing it.

determine whether a more intelligent tick size regime could benefit investors by improving tradability and lowering the cost of trading. The working group included representatives from the buy-side, sell-side, market maker, and retail sectors: Enrico Cacciatore from Voya Investment Management, John Comerford from Credit Suisse, Mehmet Kinak from T Rowe Price, Justin Schack from Rosenblatt Securities, and Eric Swanson from XTX Markets among others. The working group analyzed and compared multiple potential tick regimes, and provided valuable and varied input. There was not unanimity on all the aspects of the proposal; there was general collaboration, cooperation, spirited debate and ultimately, support for the intelligent tick concept.

Based on substantial effort with the working group, we believe we have developed a smarter tick proposal:

- Stocks would trade in one of six increments: $0.005, $0.01, $0.02, $0.05, $0.10, and $0.25.
- Stocks would be categorized based upon their duration weighted average quoted spread over the measurement period.
- Stocks spreads would not widen under this proposal; rather stocks would be assigned the next smallest increment by quoted spread (e.g., a stock with average spread of $0.12, would be in the $0.10 increment category).
- Listing exchanges would administer the tick regime, calculating and calibrating quoted spreads, determining applicable increments, and publishing stock lists.

As described below, data shows that this proposed regime produces better quoting and trading outcomes than other potential regimes.

Nasdaq's proposal attempts to address a discrete set of challenges in the national market system. There are other, related challenges that that market participants and policy makers should consider including round lot size, order protection, access fees and liquidity rebates, dollar-based versus basis-point trading, stock splits and optimal stock pricing, to name just a few. Rather than risk doing too much and over-complicating the debate, we focused on improving the tick regime. Doing so will help with those other challenges and will benefit investors and issuers alike. Furthermore, we believe this proposal to be less disruptive and easier to implement than potential reforms that would address the above all at once.

Nasdaq hopes this proposal will advance the debate and spur the Commission to act; change takes time. There are many constituencies and subject matter experts. There is room for disagreement, and valid concerns about investor education. The Commission needs time to thoughtfully develop, propose, refine, adopt, and implement any new, intelligent tick regime. The sooner we start, the sooner we progress.

Background: Regulation and Technology Continuously Evolve

The challenge of establishing optimal tick increments has existed for many years and has been greatly impacted by tectonic shifts in technology. From the 1970s development of the national market system through 1999, tick increments were measured in fractions and applied in markets that were highly concentrated. Tick increments set by the New York Stock Exchange, the American Stock Exchange and Nasdaq effectively harmonized all trading in those shares.

This changed in 1999 and 2000, when market fragmentation, decimalization and automation began radically shifting how market participants traded. Regulation ATS triggered a proliferation of execution venues, some of which experimented with variable tick regimes under ambiguous regulatory requirements. This coincided with improved and automated execution technologies that new, disruptive entrants employed to great benefit, leap-frogging established players by skipping old technologies and fractions completely. Progress was messy, characterized by increasing fragmentation and a challenging lack of uniformity as market participants transitioned to new technology at varied speeds.

In 2005[2], Regulation NMS established a baseline and a path to a unified tick increment, consistent with the prevailing technology. The Commission adopted a simple, uniform quotation and trading increment of one penny for stocks priced above a dollar and sub-pennies for those priced below. This left the vast majority of stocks trading in a one-size-fits-all environment despite large differences in trading characteristics. Shortly after, the European Union chose a different path, establishing a multi-tier multi-dimensional tick regime. Putting aside the relative merits and outcomes of the two regulators' choices, it is clear that technology was not a hindrance to more complex tick regimes. The concept of customized minimum ticks for different categories of securities has been successfully deployed in the EU as well as major Asian markets including Japan and Hong Kong.

In 2016, the Commission launched a Tick Size Pilot to test the impact of two distinct changes related to tick size: (1) forcibly widening tick increments to $0.05 in an attempt to consolidate greater liquidity at the inside quote; and (2) testing a trade-at rule to understand its impact on displayed liquidity and execution quality.[3] While the Tick Size Pilot is widely considered a failure,[4] it demonstrated that U.S. markets could function effectively with multiple minimum tick increments and surrounding rules, absorbing the advanced technological requirements with little disruption.

Market technology continues to evolve; regulation must evolve with it. Today's fully automated markets and dispersal of technology empower us to differentiate more tick increments in smarter ways.

2 Reg NMS as referenced here was adopted in 2005 with multiple implementation phases through 2007.

3 Assessment of the Plan to Implement a Tick Size Pilot Program. Originally Submitted to the NMS Plan Participants July 3, 2018, Revised August 2, 2018. Available at https://www.sec.gov/files/TICK%20PILOT%20ASSESSMENT%20FINAL%20Aug%202.pdf

4 See, e.g., Pragma, SEC's Tick-Size Pilot Will Cost Investors More Than $300 Million (Sept. 7, 2018), available at: https://www.pragmatrading.com/2018/secs-tick-size-pilot-will-cost-investors-300-million/.

Data Demand Change

Data show the one-size-fits-all tick no longer meets the demands of the market negatively affecting a wide swath of stocks. As shown in **Chart 3**, on a percentage basis, the penny tick affects stocks quite differently. As prices fall, one-cent spreads become too large as a percentage of value. For stocks priced $1, the one-penny tick represents 100 basis points; at $10, 10 basis points; at $100 only 1 basis point; and for a growing number of stocks like Amazon and Google, priced above $1,000 a share, less than one-tenth of a basis point. Yet, in all cases the tick is the same. This is most harmful for smaller, less-liquid stocks because the tick represents a higher percentage (basis points) of value, which ends up costing investors money.

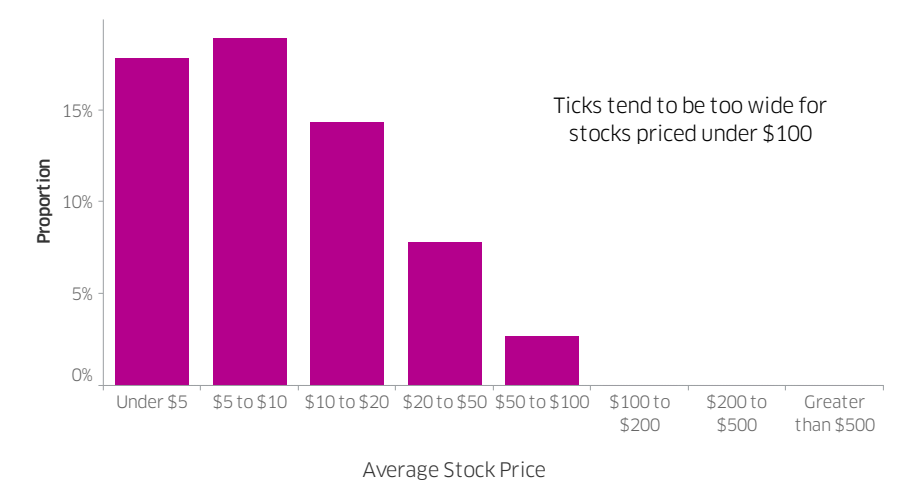
Chart 3: Average Spread (bps) vs. Stock Price

Note: Data averaged over the month of October, 2019. Average spread is the average duration weighted NBBO spread in basis points. Chart Limited to corporate equities with a price greater than $2.

Source: Nasdaq Economic Research, SIP, FactSet

Chart 4: Proportion of Tick Constrained Stocks

Note: Data averaged over the month of October, 2019. Tick constrained stocks defined as stocks with an average NBBO spread under 1.1 cents. Chart limited to corporate equities with a price greater than $2.

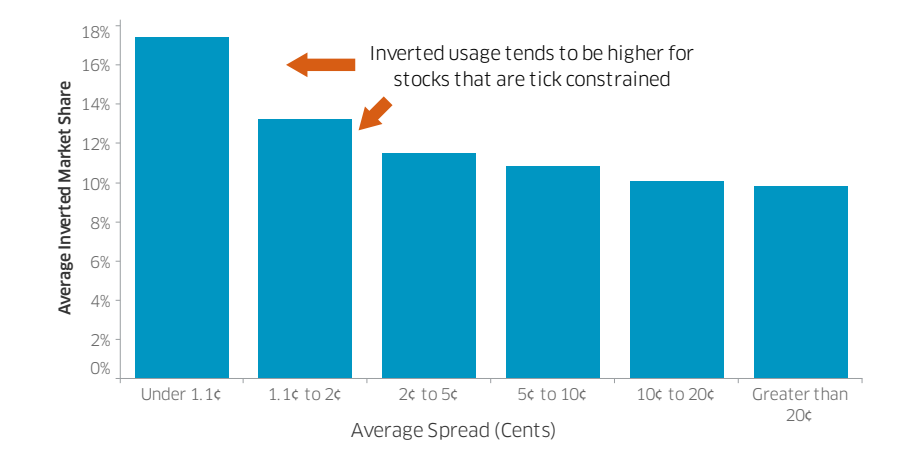


Source: Nasdaq Economic Research, SIP, FactSet

When faced with a spread constraint, observed in **Chart 4**, market participants will have an incentive to find ways to narrow the spread. Due to the various pricing structures across different venues (maker-taker vs. inverted), spread capture, or the economic spread, can be different than the one-cent displayed spread. In essence, all-in economic spreads in maker-taker markets are 1.6 cents.[5] Thus, as seen in **Chart 5,** tick-constrained stocks trade more on inverted venues which compresses the spread more than the tick regime allows.

Chart 5: Inverted Usage vs. Average Spread (¢)

Note: Data averaged over the month of October, 2019. Average spread is the average duration weighted NBBO spread in cents. Chart Limited to corporate equities with a price greater than $2.

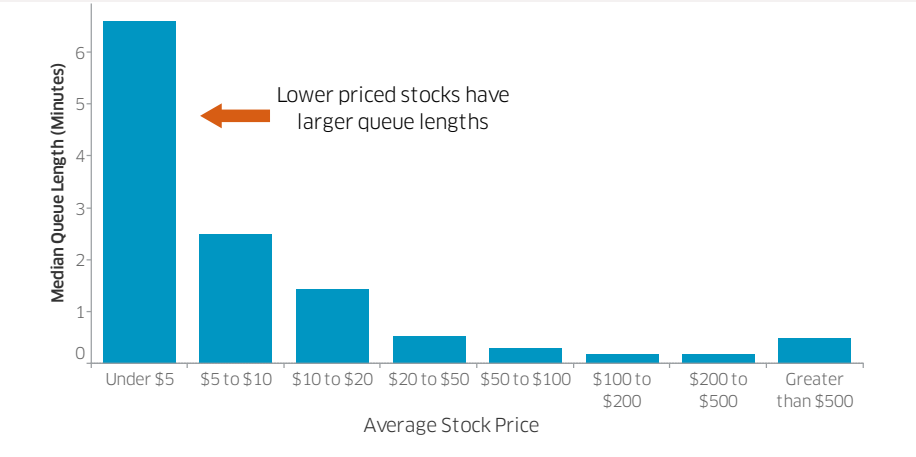


Source: Nasdaq Economic Research, SIP, FactSet

Inverted usage is a result of low-priced stocks trading with long queues. **Chart 6** displays the fact that queue length is substantially higher amongst stocks priced lower than $5. The longer queues associated with low-priced stocks further highlights the issues that the tick constraint adds. As alluded to above, once a stock becomes constrained at one cent, price priority becomes limited.

Chart 6: Queue Length vs. Stock Price

Note: Data averaged over the month of October, 2019. Queue Length measured as average NBBO size/ADV multiplied by the number of minutes in a trading day. Chart Limited to corporate equities with a price greater than $2.



Source: Nasdaq Economic Research, SIP, FactSet

5 If the best bid and offer on a maker/taker exchanges is $0.01 a market participant accessing that quotation would pay $0.003 more if buying on the offer or receive $0.003 less when selling on the bid. Therefore the full economic spread is $0.016 - 1.6 cents.

On the other hand, the one-cent tick also affects those stocks that trade on the opposite side of the stock price spectrum. Our research shows that too small of a tick size can result in increased quotation volatility and less price competition that impairs price discovery, creating an imbalance between providers and takers of liquidity.[6]

It is instructive to review the recently concluded Tick Pilot in which a sample of smaller stocks traded on a nickel tick. The NMS Plan participants submitted a study of the impact of the pilot, in which a variety of market quality metrics were analyzed, including bid/ask spreads.[7] The study found, not surprisingly, that many pilot stocks experienced substantial spread increases—a preordained outcome for stocks whose spreads prior to the pilot were less than a nickel.[8] What was interesting to observe, however, is that for stocks whose pre-pilot spreads were ten cents or more, spreads actually decreased under the nickel tick.[9] In terms of why this might be the case, the study reports:

> "…the cost of setting a new price level rises with nickel ticks compared with penny increments. Market makers, therefore, may be less subject to other market participants "penny jumping" their bids and offers in less-liquid securities and, therefore, feel more confident quoting narrower spreads."[10]

The Plan participants' assessment analyzed the full spectrum of market cap, price, and ADV strata for Pilot securities.[11] This shows that for some types of stocks, the nickel tick created a constraint where none had existed before. On the other hand, other types of stocks seem to have benefited from the wider tick, specifically those that tended to have higher prices or lower levels of trading volume. **The clear takeaway is that the preferred tick size for a given stock certainly varies according to the characteristics of the stock.**

Tick size changes have been implemented in Europe. The ESMA Tick Regime, through MiFID II, addressed the adverse effects associated with a minimum increment being too narrow. The Autorité des marchés financiers (AMF) conducted a study on the outcome of the tick regime.[12] The AMF's study not only analyzed the impact that ESMA's tick regime had on market quality, but it also stated the context in which the tick regime was introduced. For example, the study discusses a "race-to-the-bottom" environment where trading venues continuously lowered ticks in order to offer improved prices and to increase market share. However, moving toward an "ever-finer degree of tick granularity," diminished price improvement for those whose ticks were too narrow. As the AMF describes:

> "If the tick size is too small, the outbidding cost is no longer significant (it costs next to nothing to outbid) and liquidity does not aggregate effectively as there are too many increments of possible prices. Insertions, modifications and cancellations of orders are therefore more frequent, affecting book legibility and price formation."[13]

The "race-to-the-bottom" led regulators to conclude that ticks had generally become too narrow. The impact of the ESMA tick regime was, therefore, mostly widening the minimum tick. Since, as the AMF writes, "Tick size strongly influences both liquidity and the price formation process, and must always be analyzed in relation to the spread," the regulators determined that "an appropriate tick such that the corresponding spread is between 1.5 ticks and 2 ticks for liquid securities and between 1.5 ticks and 5 ticks for less liquid

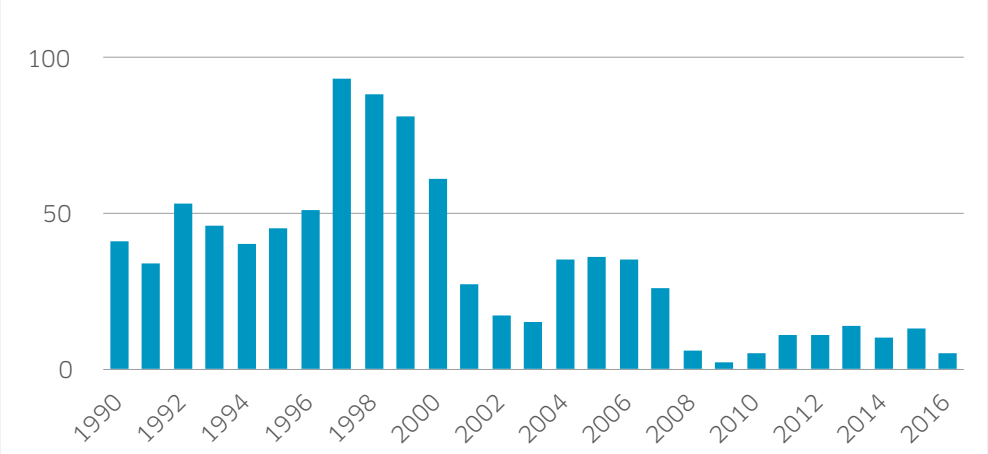
6 See Phil Mackintosh, Two Charts Show How Smart Traders Use Odd Lots to Compress Spreads in High-Priced Stocks, available at https://www.nasdaq.com/articles/two-charts-show-how-smart-traders-use-odd-lots-compress-spreads-high-priced-stocks-2019-06
7 See Tick Study at fn. 1.
8 Nasdaq notes that this is a situation the proposal herein seeks to avoid. As described throughout, a stock would never be forced to a wider spread than what it currently experiences.
9 See Tick Study at p. 19.
10 Id. at p. 22
11 Id. at appendix, Figures 52, 53, and 54.
12 MiFID II: Impact of the New Tick Size Regime, March 27, 2018, available at https://www.amf-france.org/en_US/Publications/Lettres-et-cahiers/Risques-et-tendances/Archives?docId=workspace%3A%2F%2FSpacesStore%2F4ee6cbf6-c425-4537-ab74-ef249b9d316d
13 Id. at p.3.

securities."[14] The relationship between tick size and spread serves as the basis of our proposal. Overall, the AMF concluded that the European tick regime had the desired effect in improving overall market quality – although spreads slightly increased, market depth also increased and quote volatility diminished.

In the U.S., the problem of sub-optimal minimum ticks is becoming more pronounced as stock splits have declined and as average stock prices have risen.[15] Data show that since 2007, stock splits have become far less popular as shown in **Chart 7**.

CHART 7: Number of Stock Splits Per Year

Note: Limited to S&P 500 Companies



Source: Wall Street Journal, Birinyi Associates

Since then, the average stock price has almost doubled, and the average price of an S&P 500 stock is over $100. As we show in **Chart 9**, higher stock prices eventually lead to wider spreads and more odd-lot trading. This, in turn, decreases the tradability of stocks which has been shown to increase companies' cost of capital.[16] As of October, 2019, over one third of S&P 500 companies had prices over $100 per share.

This worsening tradability and transparency into the market has driven the SIP committee [17] to consider adding odd lots to the tape. Comment letters on that issue mostly agree that high priced stocks cause tradability issues, however, many disagree that odd lots should be used for best execution or be covered by the Reg NMS Order Protection Rule. That's consistent with ESMA's reasoning discussed above: a $2,000 stock trading one-cent wide for one or two shares is not representative of actionable or meaningful liquidity. Moreover, the tick, at 0.0005%, would be uneconomic to capture for a market maker.

Insight into decreased tradability from a minimum tick that is too narrow can be seen when analyzing fill rates across stock prices. We examined the fill rate of passive orders submitted by large investment banks. **Chart 8** highlights the average fill rate across stock price buckets. The diagram illustrates that fill rates are generally higher for low-priced stocks and begin to decline once a stock is priced greater than $100. As mentioned above, when the tick becomes too narrow, time priority becomes insignificant. A trader may

14 MiFID II: Impact of the New Tick Size Regime, March 27, 2018, available at https://www.amf-france.org/en_US/Publications/Lettres-et-cahiers/Risques-et-tendances/Archives?docId=workspace%3A%2F%2FSpacesStore%2F4ee6cbf6-c425-4537-ab74-ef249b9d316d

15 See Phil Mackintosh, Three charts that show how dramatic the drop in stock splits has been at: https://www.nasdaq.com/articles/three-charts-that-show-how-dramatic-the-drop-in-stock-splits-has-been-2019-06-27

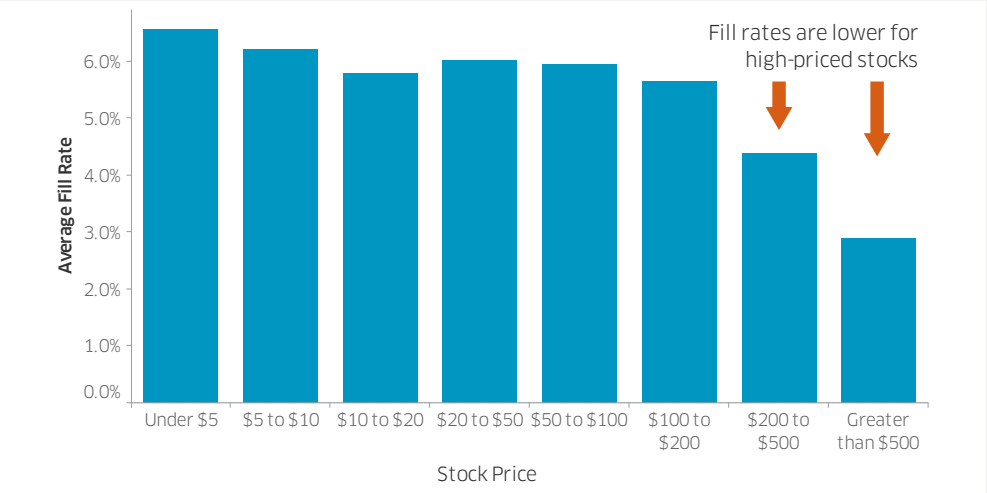
16 See Phil Mackintosh, 3 Compelling Reasons for Companies to Split Stocks at: https://www.nasdaq.com/articles/3-compelling-reasons-for-companies-to-split-stocks-2019-09-12

17 See Securities Information Processor Operating Committees, Odd Lots Proposal, available at: https://www.ctaplan.com/publicdocs/CTA_Odd_Lots_Proposal.pdf

improve the bid for a stock, patiently awaiting a passive fill. Sometime later, another trader may outbid the first trader, but by an economically insignificant amount, obtaining price priority and perhaps capturing the fill. This discourages the first participant from improving the bid in the first place. At the extreme, time priority becomes non-existent, reducing the reward and therefore the incentive to post displayed liquidity since outbidding is so cheap.

CHART 8: Average Fill Rate Across Stock Price

Note: Data based on U.S. corporate equities over the month of October, 2019. Stocks limited to those priced greater than $2. Fill rates based on executions completed by large investment banks



Source: Nasdaq Economic Research

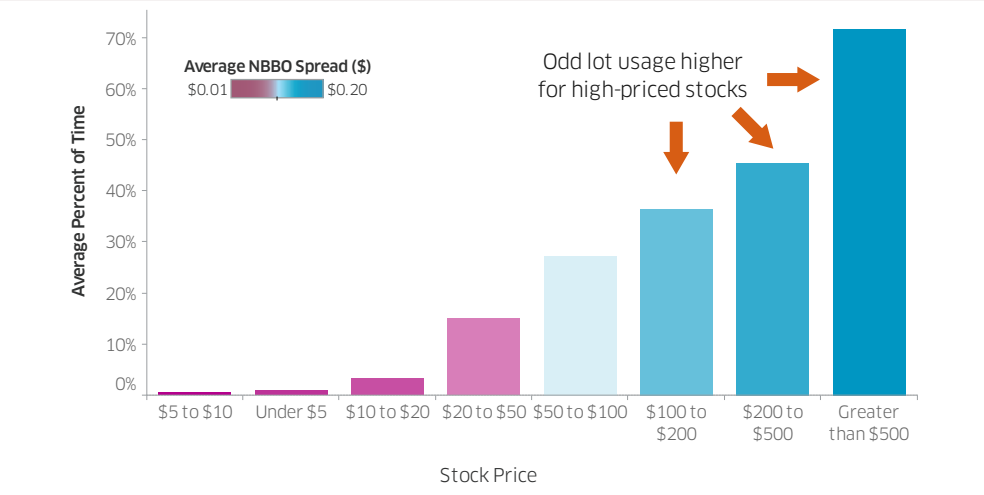
Additionally, as **Chart 9** shows, high-priced stocks tend to have wide spreads (blue bars) and experience more odd lots inside the National Best Bid or Offer (NBBO). In fact, using Nasdaq order data, we see that stocks like GOOG and AMZN, with spreads closer to $1, have odd lots inside the quote almost 70% of the time. In contrast, stocks like AAPL and MSFT, with spreads below two cents, have relatively small percentage of odd lots inside the NBBO.

In fact there has been a consistent increase in the use of odd lots to trade, and a recent Wall Street Journal investigation determined that algorithms are becoming agnostic to round lots. [18]

18 See Wall Street Journal, Tiny "Odd Lot" Trades Reach Record Share of U.S. Stock Market, Oct. 23, 2019, available at: https://www.wsj.com/articles/tiny-odd-lot-trades-reach-record-share-of-u-s-stock-market-11571745600

CHART 9: Percent of Time True Nasdaq Top of Book <100 Shares

Note: Based on Nasdaq order data over first week of October, 2019. Chart limited to corporate equities with a market cap greater than $2 billion.



Source: Nasdaq Economic Research

Another finding supported by the tick pilot data is that if higher priced stocks traded at a wider tick there would be more depth displayed at each tick increment.

Most importantly, what all this shows is that if the tick is too wide (tick constrained) or too small (stocks trading in multiple tick increments), the mismatch creates inefficiency that increases the companies' cost of capital.[19] That in turn hurts listed companies and investor returns, potentially harming economic growth and retirement stability.

19 Lin, J.C., & Singh, A., & Yu, W., 2009. Stock splits, trading continuity, and the cost of equity capital. Journal of Financial Economics 93, 474 – 489.

The Proposal: Trust the Market and Do no Harm

Nasdaq, with the help of the working group, evaluated multiple proposals and concluded that other global tick regimes such as the MiFID regime are more complex than necessary (Note: more detail surrounding MiFID and other alternatives can be found in the appendix). For example, applying a MiFID-like but simpler approach to the U.S. market could potentially yield adverse outcomes for highly liquid names. Therefore, we decided an approach that would "do no harm" to quoted spreads would be the goal for implementing an intelligent tick regime in the U.S.

After studying the data and comparing these and other potential models, we reviewed data depicting how stocks trade today based on their quoted spread. Trusting the market and assuming stocks should trade at or near their quoted spread, we considered a variety of stratification based on tick increments from sub-pennies to dollars. Ultimately, we decided upon a market based approach where no tick would be wider than a stock's average quoted spread. **Using this method, no security would be forced into a spread wider than that at which it currently trades,** resulting in unchanged or potentially tighter spreads. Further, as stock trading characteristics change over time, the proposed model would allow market forces to determine the proper tick size: a stock's quoted spread would determine in which of the six buckets it would trade: .5cps, 1cps, 2cps, 5cps, 10cps, 25cps.

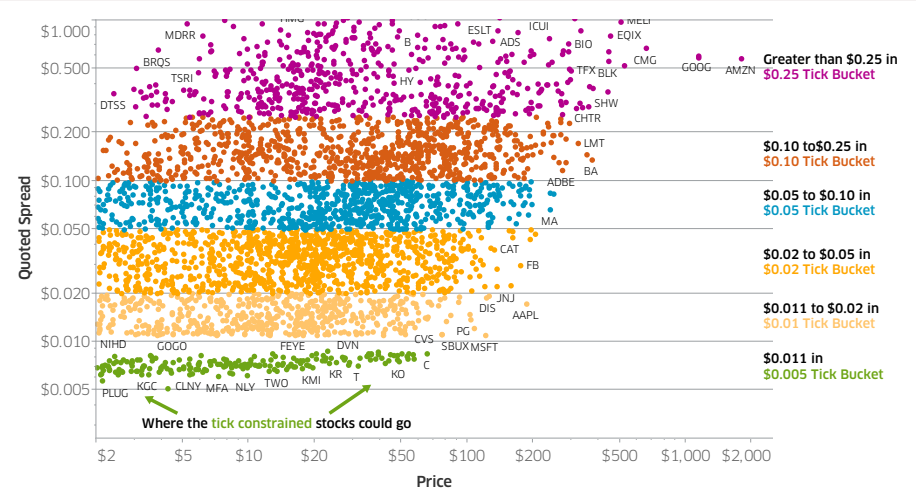
For example, a stock that currently trades at an average quoted spread:

- up to $.011 would be placed in the $.005 bucket
- between $.011 and $.02 would be placed in the $.01 bucket
- greater than $.02 and less than or equal to $.05 would be placed in the $.02 bucket
- greater than $.05 and less than or equal to $.10 would be placed in the $.05 bucket
- greater than $.10 and less than or equal to $.25 would be placed in the $.10 bucket
- greater than $.25 would be placed in the $.25 bucket

Chart 10 illustrates how stocks would be grouped into tick buckets by their current quoted spreads. The benefit of a tick regime where the market determines the tick size is that stocks may move in and out of various tick buckets depending on market events.[20]

Chart 10: Illustration of a Market-Based Approach

Note: Tick buckets determined by average duration-weighted quoted spread. Illustration based on current quoted spread in the market (2019). Chart is limited to corporate equities priced greater than $2. Data represents an illustration of where we believe stocks might trade after implementing such a proposal.



Source: Nasdaq Economic Research

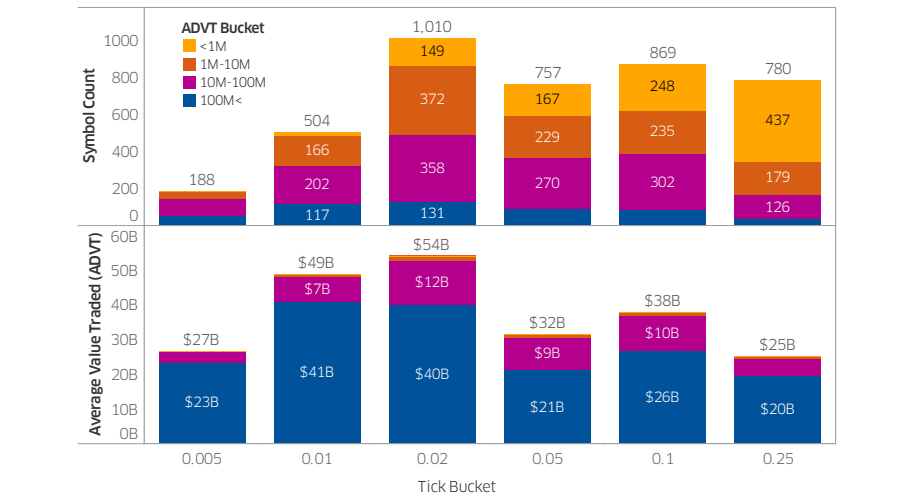
20 Stocks would not move in and out of tick increments dynamically based on their quoted spread. Instead they would be evaluated periodically, and remain static until the next review

Generally speaking, this approach yields clear results with stocks falling within buckets according to their current status.

Based upon the above data and stratification, **Chart 11** represents an illustration of the count of corporate equities that would be grouped into each tick size bucket using present day quoted spreads.

Chart 11: Distribution of Symbols

Note: Tick buckets determined by average duration-weighted quoted spread. Illustration based on current quoted spread in the market (2019). Chart is limited to corporate equities priced greater than $2.

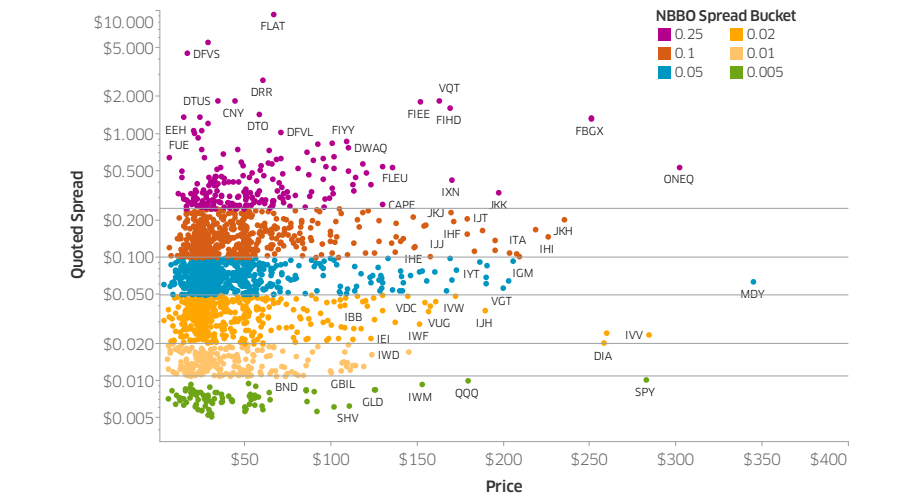


Source: Nasdaq Economic Research

Importantly, this market based approach could be applied to all securities. For example, Exchange Traded Products (ETPs) would be stratified using the same value-weighted average spread as shown in **Chart 12**:

Chart 12: Illustration of a Market-Based Approach for ETPs

Note: Tick buckets determined by average duration-weighted quoted spread. Illustration based on current quoted spread in the market (2019). Chart is limited to exchange traded products. Data represents an illustration of where we believe ETPs might trade after implementing such a proposal.

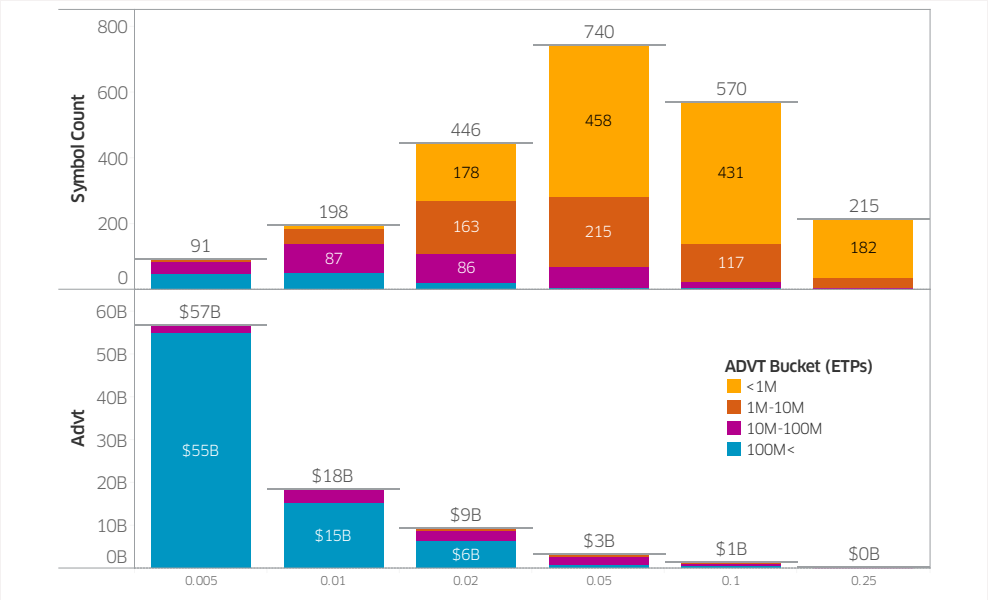


Source: Nasdaq Economic Research

Based on that stratification, ETPs would fall into the same six buckets as shown in **Chart 13**. Highly liquid ETPs would skew heavily toward the two smallest increments due to their current high liquidity and narrow quoted spreads.

CHART 13: Illustration of Market-Based Approach for ETPs

Note: Based on average duration weighted quoted spreads. Limited to exchange traded products.



Source: Nasdaq Economic Research

The proposed model would benefit the market in several measurable ways. First the proposal would create a narrower $0.005 increment that can be expected to reduce the current spread for a significant number of tick constrained stocks. Additionally, larger increments for stocks that currently trade in significant multiples of today's $0.01 minimum tick, would reduce quote flickering and promote price stability. Many securities across the spectrum would benefit from smarter tick increments in the form of lower trading costs.

We do not believe that the implementation of this proposal would incur significant costs to the industry. Any adoption of intelligent ticks could re-use the industry work done to manage the different minimum-tick groupings created for the Tick Pilot, minimizing costs. As described above, based on the Pilot's results, we believe spreads should only narrow, reducing spread costs to investors. We estimate the potential spread saving from this proposal in a range of $100 million to $1 billion annually. Evidence also suggests fragmentation, routing complexity and, opportunity costs may also be reduced.

Minimal costs, coupled with no stock being worse off, suggest that this proposal would greatly benefit investors.

Mechanics of the Proposal

Nasdaq is proposing to change as few elements of Rule 612 of Regulation NMS as are necessary to promote progress. The Rule would continue to place the same requirements and limitations on sending, receiving, price-sliding, and after executing orders that currently apply to both on- and off-exchange trading. Given the importance to investors, issuers, and traders of stability and predictability, stocks should change buckets infrequently, preferably only once every six months. Additionally, our working group recommends a slower, phased-in approach to change rather than an abrupt, complete rollout of the new tick regime. Further, the working group recommends there be a clear path to reverse course if there is any unexpected negative impact from implementation of a new tick regime.

Primary listing markets would be required to calculate duration-weighted quoted spreads over a defined measurement period – i.e. the six month review period mentioned above to identify the appropriate tick increment, and communicate that information to member and the public. Specifically, the listing exchange will:

- produce a Securities Tick Size Daily List each night, identifying the securities included in each tick bucket;
- produce a Securities Tick Size Change List, identifying any securities that moved from one bucket to the another;
- collect data and provide metrics using the same quantitative methods used to establish the tick buckets;
- post the list on an exchange website each day, barring any delays in the source data; and
- the Securities Tick Size files will be pipe-delimited .txt files.

Conclusion

Nasdaq is profoundly grateful to the market participants that spent significant time collaborating on the development of this proposal. We welcome the opportunity to expand the discussion, and to continue working with the industry, issuers, investors, and regulators to refine this proposal and build a consensus for change.

Tick size is a crucial component of trading costs and investor experience. The current one-size-fits-all approach undermines the tradability of hundreds if not thousands of securities, particularly low-and high-priced publicly traded securities. Too wide a tick size (i.e., tick constrained) results in increased trading costs and can lead to long order queues and, as a result, excessive fragmentation. Too small of a tick size can increase volatility and a reduction in price competition that impairs price discovery, thus once again creating an imbalance between providers and takers of liquidity. Today's one-size-fits-all approach is particularly suboptimal for small-and-medium-growth companies.

The proposed tick regime has the potential to increase liquidity, promote quote competition, and reduce trading costs, all of which will serve to protect investors by improving market quality. It will also enable a better path forward for assessing the right level for fees and rebates and for addressing round lots and odd-lots as average stock prices increase. Technology-driven market changes warrant a review of the trading increment and empower us to adopt a smarter and more efficient tick structure.

Appendix

Other Models Are Too Complex

As mentioned previously we evaluated multiple proposals and concluded that other global tick regimes such as the MiFID regime are overly complex and could potentially yield adverse outcomes for highly liquid names. We will demonstrate some of the complexities below.

The MiFID tick approach is designed by categorizing stocks not only by price, but also by liquidity, as measured by average daily trades (ADT). Table 1 illustrates the categorization of tick sizes based on price and ADT.

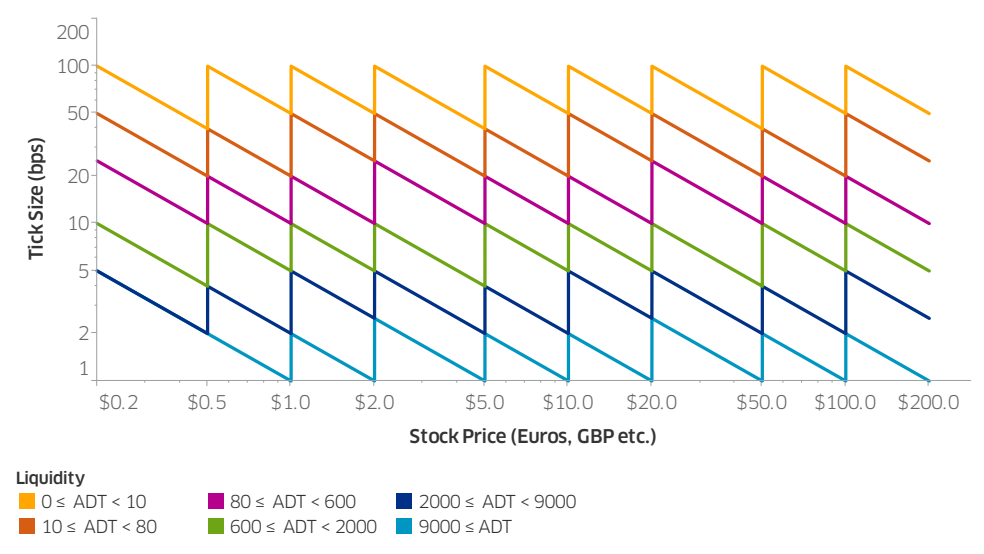
Table 1

	Liquidity Bands					
Price Ranges	**0< Average daily number of transactions <10**	**10< Average daily number of transactions <80**	**80< Average daily number of transactions <600**	**600< Average daily number of transactions <2000**	**2000< Average daily number of transactions <9000**	**9000< Average daily number of transactions**
0< price <0.1	0.0005	0.0002	0.0001	0.0001	0.0001	0.0001
0.1< price <0.2	0.001	0.0005	0.0002	0.0001	0.0001	0.0001
0.2< price <0.5	0.002	0.001	0.0005	0.0002	0.0001	0.0001
0.5< price <1	0.005	0.002	0.001	0.0005	0.0002	0.0001
1< price <2	0.01	0.005	0.002	0.001	0.0005	0.0002
2< price <5	0.02	0.01	0.005	0.002	0.001	0.0005
5< price <10	0.05	0.02	0.01	0.005	0.002	0.001
10< price <20	0.1	0.05	0.02	0.01	0.005	0.002
20< price <50	0.2	0.1	0.05	0.02	0.01	0.005
50< price <100	0.5	0.2	0.1	0.05	0.02	0.01
100< price <200	1	0.5	0.2	0.1	0.05	0.02
200< price <500	2	1	0.5	0.2	0.1	0.05
500< price <1000	5	2	1	0.5	0.2	0.1
1000< price <2000	10	5	2	1	0.5	0.2
2000< price <5000	20	10	5	2	1	0.5
5000< price <10000	50	20	10	5	2	1
10000< price <20000	100	50	20	10	5	2
20000< price <50000	200	100	50	20	10	5
50000< price	500	200	100	50	20	10

Chart 14 is an illustration of what the MiFID tick table looks like in basis points. One of the benefits of the MiFID regime is the symmetry across levels of prices and liquidity. For example, note that spreads in basis points remain within a specific range for each given level of liquidity, stocks trading between 2,000 and 9,000 ADT will always trade between 2 and 5 basis points, whereas stocks that trade between 10 and 80 ADT will always trade between 20 and 50 basis points, respectively, regardless of price. However, a major drawback with the MiFID model contains complexity from the multi-dimensions used to determine a tick. Table 1 highlights this complexity with six classes of liquidity buckets and nearly 20 price bands.

CHART 14: MiFID Tick Regime

Note: Illustration based on ESMA tick size regime introduced with MiFID II



Source: Nasdaq Economic Research

We reviewed a proposal that was constructed similarly to MiFID in terms of constructing tick increments based on price and a liquidity metric – in this case, average daily value traded (ADVT). **Table 2** illustrates the tick size assignment based on price and ADVT.

Table 2

Price		Value Traded Buckets - Ticks			
Min	Max	Under $1M	$1M-$10M	$10M-$100M	$100m<
$1	$24.99	0.020	0.010	0.005	0.005
$25	$49.99	0.050	0.020	0.010	0.005
$50	$99.99	0.100	0.050	0.020	0.010
$100	$199.99	0.100	0.100	0.050	0.020
$200	$499.99	0.100	0.100	0.100	0.050
$500	$10,000	0.100	0.100	0.100	0.100

Additionally, **Charts 15 and 16**, illustrate what this proposal would look like in both cents and basis points. As observed in the MiFID schedule, spreads in basis points remain in a fixed range for any given level of liquidity.

Chart 15: Proposed Ticks

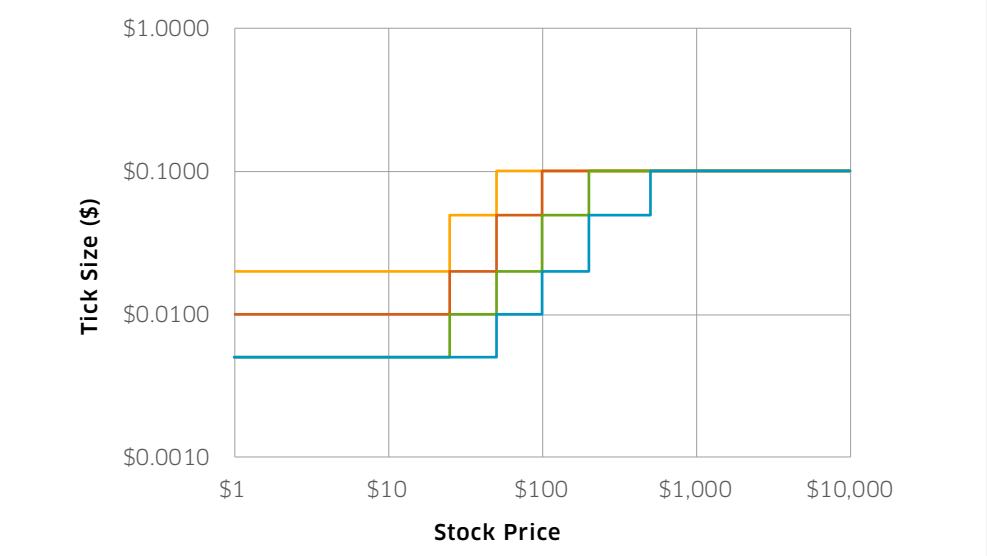
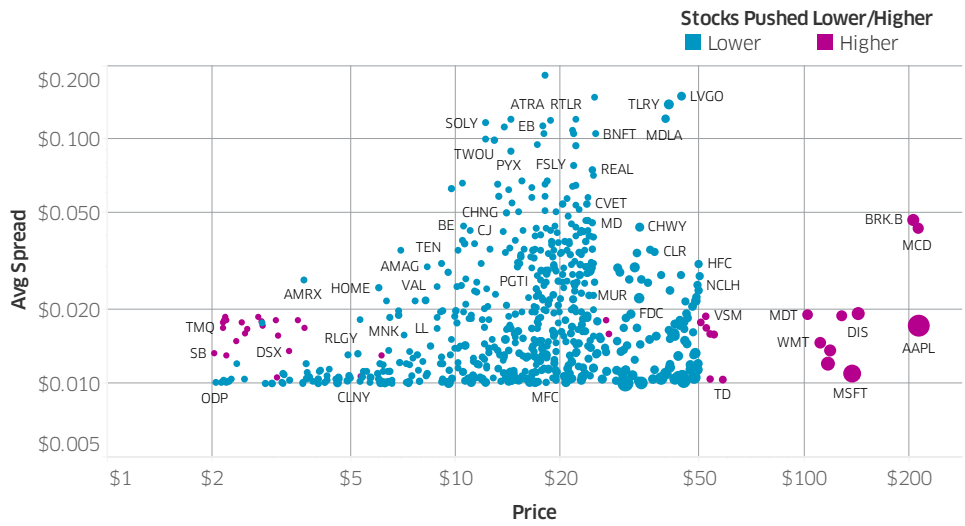


Chart 16: Proposed Basis Points

The model proposed above was next applied to the current trading environment. **Chart 17** highlights that although there are tick constrained stocks that could benefit from a smaller tick (blue circles), there are also observable stocks whose spreads would be pushed forcibly higher (purple circles) – an undesirable result.

Chart 17: Proposed Ticks vs. Current Spread

Undesirable Results of MiFID-Like Proposal



	Advt	Count of Symbols
Higher	16,867,769,579	46
Lower	49,635,653,580	578

Nasdaq