

AUGUST 2018

Market Lens

In conjunction with the end of the SEC's 2-Year Tick Size Pilot Program this October, the exchanges have published their required formal Assessment of the pilot program*. Finally, we have an opportunity to objectively determine whether changing the minimum tick size from one cent to five cents for 1,200 small- and mid-cap corporate stocks improved the trading of those stocks for investors. **Spoiler alert: No, it did not.** More so, the pilot made it meaningfully more expensive for investors to trade small- and mid-cap stocks, irrespective of the Test Group bucket (see box).

The exchanges' analyses are primarily based on so-called difference-in-difference methods, which simply means they computed various statistics for stocks both before the start of the pilot (April 2016 – Sep 2016) and during the pilot (Oct 2016 – Dec 2017), and recorded how these statistics may have changed (i.e., their differences). Changes in statistics for stocks in the Control Group are used as the baseline. Changes in statistics for stocks in any of the three Test Groups that are larger or smaller than the changes observed for stocks in the Control Group (i.e., the difference between these differences) are attributed to the effects of the pilot.

QUOTED SPREADS (NBBO) INCREASED

The most important finding is of course the one that is also most self-evident: increasing the minimum tick size from one cent to five cents forcibly widens quoted spreads. For stocks in Test Groups 1 and 2, average quoted spreads (measured in basis points) increased by about 14%, compared to less than 1% for stocks in the Control Group; for stocks in Test Group 3, the increase was an even wider at nearly 24% (see Fig 19 on [page 19](#)).

However, these averages belie the magnitude of the impact for stocks that were trading tightly before the pilot. For this subset of stocks, the exchanges recorded a nearly three-fold increase in quoted spreads (see Fig 20 on [page 19](#)).

- Test Group 1 increases the minimum quoting increment at which an order can be accepted, displayed, or ranked from one to five cents. Trades in Test Group 1 stocks can continue to be executed at any finer increment currently permitted for NMS stocks.
- Test Group 2 adds an additional restriction prohibiting trades at increments finer than five cents, with some specific exceptions.
- Test Group 3 contains one additional restriction that prohibits a non-quoting trading center from executing a trade at a price that matches that of a protected quote (the so called trade-at provision), with some specific exceptions**.

* Assessment of the Plan to Implement a Tick Size Pilot Program, July 3, 2018 (<http://www.finra.org/sites/default/files/tick-size-pilot-assesment.pdf>)

** See page 6 of the Assessment for a complete description of the Test Groups rules and enumerated exceptions.

The SROs observed that the net effective spread (i.e., the spread actually paid by investors) increased by 50-60% for stocks in all Test Groups even as effective spreads decreased by 5% for stocks in the Control Group (see Fig 23 on page 22). This translates into over \$8.00 in increased costs to an investor executing a 1,000-share order.

ACTUAL COSTS INCREASED

Simply based on this data, we might conclude that the pilot increased costs to investors, unless we found that investor trades received price-improvement resulting in executions occurring at prices inside the wider quotes. **Unfortunately for investors, any changes in price-improvement fell far short of countering the increases in quoted spreads****

So where did the money go? It appears to have gone to market makers. According to the exchanges, realized per-share profits increased from between 17% (Test Group 2) to 45% (Test Group 1), whereas the baseline increase in Control Group stocks was only 8% over the same time period.

None of these numbers should be surprising. That costs to investors would significantly increase, and that market makers would be the beneficiaries, was well understood before the Pilot was approved. The Assessment only serves to quantify these costs more precisely.

The real question the pilot was designed to address is whether these expected costs would yield any commensurate benefits to the market by improving the trading of small and mid-cap stocks by investors.

EXPECTED SHIFT OF MARKET SHARE...

We begin by noting that off-exchange trading for stocks in Test Groups 1 and 2 increased by about 7 points compared to a baseline of less than 2 points for stocks in the Control Group (see Fig 33 on page 29). Considering that one of the goals of the pilot was to test whether increasing displayed size would yield more liquidity, this movement to off-exchange trading seems contrary to an important aspect of the pilot.

However, this effect was anticipated by those crafting the pilot, and the inclusion of Test Group 3 with its trade-at bucket was designed to counter the expected increase in off-exchange trading that would result from forcibly increasing spreads. The inclusion of a trade-at provision more than offset the increase in off-exchange trading observed in the other Test Groups – off-exchange trading in Test Group 3 stocks actually decreased by nearly 5 points.

This is likely because of where market share moved. For stocks in Test Groups 1 and 2, taker-maker (inverted) exchanges increased their market share 5 points, whereas the increase for stocks in Test Group 3 is 11 points. This redirection of market share is an important potential finding

of the Pilot: when opportunities to compete for order flow based on improving prices is reduced because of tick-size constraints, market participants turn to competing for queue priority. This effect appears more pronounced when additional constraints on competition are layered in such as the trade-at restriction in Test Group 3. And as we shall see below, forcing more trading to occur on-exchange does not improve market quality, but does lead to an increase in realized spreads.

...AND EXPECTED INCREASE IN SIZE AT PRICIER NBBO...

To understand why market quality did not improve, we first explore changes in displayed quote depth. As expected, increasing the minimum tick size from one cent to five cents led to a 4x-6x increase in average share depth at the NBBO across all Test Groups (see Fig 7 on page 10). However, for stocks in Test Groups 1 and 2, the average running total of displayed size across all price points out to 20 cents beyond the NBBO seems to be the same as for stocks in the Control Group (see Fig 12 on page 14). In other words, increasing the minimum tick size from one cent to five cents did not seem to result in an increased number of posted shares or of any additional market activity; rather, just a rearranging of those same shares into a smaller number of permitted, but much more expensive, price points***.

Only for stocks in Test Group 3, which includes the trade-at provision, do we see a net increase in the total number of shares posted deeper in the book, but still at much more expensive price points. As discussed above, this is likely the result of competition for queue priority at the more limited number of venues on which market participants can trade Test Group 3 stocks at the NBBO.

...BUT NO IMPROVEMENT IN MARKET QUALITY.

The purpose of the pilot is of course not simply to see if one can increase the number of shares posted at the NBBO by making the NBBO more expensive. **Neither the size at the NBBO nor the total size of the depth of book is, in isolation, a measure of market quality or, ultimately, of liquidity.** Rather, one should consider either:

** See Fig 26 on page 24 showing that the Effective Spread to Quote Spread (E/Q) ratios for Test Group stocks actually increased 10-20% during the Pilot period, compared to a 3% decrease in E/Q ratio for stocks in the Control Group.

*** Note that in Fig 12 the exchanges plot displayed size as a function of price distance from the NBBO, not price distance from the midpoint. Since the NBBO widened for Test Group stocks, the additional shares shown in the graph for those stocks are at more expensive price levels

- Measuring these sizes relative to actual trading to determine if posted sizes are constraining the market and inhibiting trading, or
- Creating the conditions to increase posted sizes and observe whether trading improves.

The pilot is designed to test the latter, and the results appear quite conclusive:

Increasing minimum tick sizes may have increased posted sizes at the NBBO by artificially making trading at the NBBO more expensive, and the trade-at provision of Test Group 3 may have also artificially transferred market share from off-exchange venues to inverted exchanges, but this did not translate into any increase in actual trading volume.

In fact, relative to stocks in the Control Group, average trading volume was statistically flat to down for stocks in all three Test Groups (see Fig 13 on [page 15](#)).

WHAT WE LEARNED

This strongly suggests that the trading of small- and mid-cap stocks has not been hindered or constrained by the size of displayed quotes associated with a one cent minimum tick size and the ability to trade off-exchange. Neither increasing

tick sizes to increase posted shares at the NBBO (with or without a trade-at restriction), nor widening spreads to increase profits for markets makers, seems to yield any benefits to investors trading small- and mid-cap stocks.

To the contrary, increasing tick sizes appears to increase cost to investors, at least for small orders executed at the NBBO. To measure the impact of the pilot on larger orders that may be filled via an execution algorithm, the exchanges would need additional data from institutional asset managers at the level of parent orders, which was not collected as part of the pilot.

However, a reasonable proxy for this type of analysis is to compute realized spreads at different time horizons – something the exchanges did measure. In general, the exchanges find that realized spreads for stocks across all Test Groups were typically greater than or equal to those in the Control Group (see Fig 25 on page 23). Most notably, “in virtually all look-ahead buckets, Group 3 performed worse than the other Test Groups” ([page 23](#)).

The exchanges also included in their analyses a number of other metrics related to the speed of executions, the number of cancellations, the number of quote updates, and the number of market makers. Though interesting, these are not as relevant as the more direct measurements of market quality discussed above.

In conclusion, as a platform for testing a specific hypothesis, the pilot arguably has been effective*. Each of the three successively restrictive 400-stock test-buckets affected quoting in the expected manner and produced reasonably clear results:

- 1 Increasing the minimum tick size for 1,200 small- and mid-cap stocks significantly increased the costs to investors trading those stocks.
- 2 Trading in these stocks did not increase, though the microstructure for these stocks changed.
- 3 The addition of a trade-at restriction shifted market share, but did not result in increased trading, and did not mitigate cost increases. Rather it served only to rearrange existing market share in a way that appears to have increased depth slightly, but also increased realized spreads.
- 4 Without any benefits to market quality, and some observable harms, the cost to investors as a result of increasing minimum tick sizes, with or without a trade-at provision, is not justified.

As noted, our observations and conclusions are based on findings published by the exchanges, not the SEC itself. We look forward to seeing how the SEC incorporates the exchanges’ Assessment, as well as any other additional analysis, into its final evaluation of the pilot program and any determination of next steps on the basis of the pilot results.

* Whether the ability to test the hypothesis justified the cost of the pilot is a completely separate question.