November 2023

TSX

Alpha

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Introduction

The landscape of modern financial markets is characterized by technological advancements and sophisticated trading strategies. In this environment, exchanges play a role in shaping market structure in order to ensure and promote fairness, efficiency and integrity. TSX Alpha Exchange ("Alpha") has recently undergone a change in its market structure - a transition from a randomized one to three millisecond order processing delay (speed bump) to a deterministic static one millisecond speed bump.

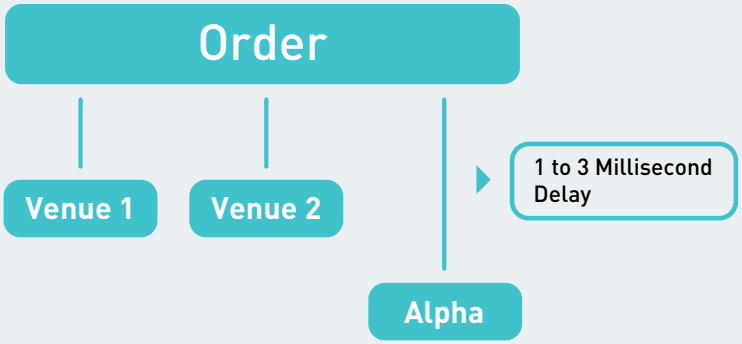
The purpose of this paper is to provide analysis on the implications of this change from a market structure perspective. Through examining post-trade markouts and key market quality metrics, this paper seeks to explain what motivated this change and assess the impact it has had on market participants, liquidity provision and overall market quality.

Original State: Randomized one to three Millisecond Speed Bump

The original state of Alpha's speed bump was tuned to be randomized between one to three milliseconds. The design choice was motivated by the exchange's commitment to mitigating the adverse effects of latency arbitrage strategies. Latency arbitrage is a prevalent concern in modern financial markets, particularly in high-frequency trading environments. It involves the exploitation of microsecond differentials in trade execution times across various venues to capitalize on stale quotes.

Alpha's speed bump, with its randomized design, was aimed at minimizing the ability of latency sensitive participants to "pick off" stale quotes by providing the passive liquidity providers a random time buffer (between one to three milliseconds) during which they could cancel or reprice their order in response to NBBO changes or relevant movement on the derivative markets. While the randomized speed bump was successful in its objective, its randomized nature limited the ability of participants to trade with all shares available on all Canadian marketplaces at a given price. Figure 1 illustrates this whereby a participant wishes to capture the liquidity available on multiple markets, including Alpha, at a particular price. Because the randomized speed bump on Alpha prevents the participant from timing its orders to arrive at all markets simultaneously, its order to Alpha generally arrives before or after its orders to the other markets. This provides signals to the passive participants, giving them the opportunity to move their liquidity out of the way, resulting in a missed opportunity for the active participant.

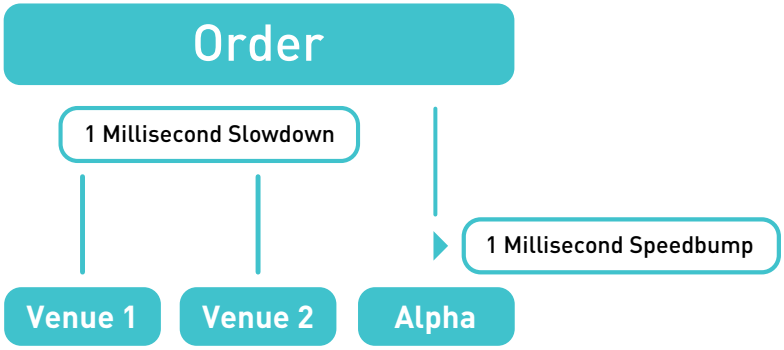
FIGURE 1



Current State: Static one Millisecond Speed Bump

In the current state, the Alpha speed bump is now fixed at a deterministic one millisecond. This allows for improved liquidity capture across the Canadian markets, as routers can now be tuned to incorporate the one millisecond delay to "venue 1" and "venue 2", in order to harmonize the arrival of all orders at their respective destinations, minimizing signaling and avoiding quote fading on Alpha (see Figure 2 below).

FIGURE 2



Empirical Analysis of Static Speed Bump

One of the metrics used to assess the impact of the change from randomized to static speed bump is **post-trade markouts**. For the purposes of this paper, a post-trade markout is evaluated from the passive order's perspective, and is based on the movement of the NBBO midpoint in the milliseconds following the trade (the NBBO here being the combined protected NBBO + the Alpha BBO). A negative markout is associated with adverse selection and is indicated by a post-trade decrease or increase in the NBBO midpoint for a passive buy or sell order respectively. For consistency, markouts are normalized to basis points (BPS).

Passive Buy Order

$$\frac{\text{(NBBO Midpoint (N msec post trade) - NBBO Midpoint (time of trade))}}{\text{Trade Price x 10,000}}$$

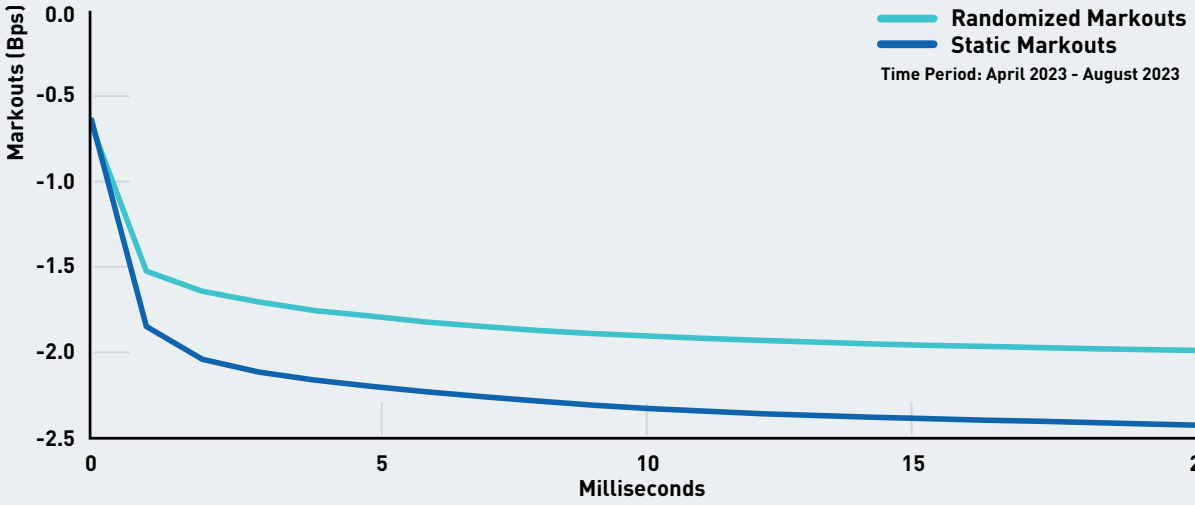
Passive Sell Order

$$\frac{\text{(NBBO Midpoint (time of trade) - NBBO Midpoint (N msec post-trade))}}{\text{Trade Price x 10,000}}$$

Figure 3 illustrates the average post-trade markouts for passive orders on Alpha in one millisecond time increments between 0 milliseconds (immediately post-trade) and 20 milliseconds. The markout analysis is based on greater than $5 non-interlisted equites.

FIGURE 3

Post Trade Markouts - Alpha



The static markout profile shows greater markouts than the pre-migration levels, a result which was expected. With participants now able to deterministically include Alpha in multi-venue market sweeps, it is expected that fewer signals will be available to passive participants in the form of away-market quote movements, and this has an impact on markouts. This is indicative of an increased proportion of trades followed by markouts, as opposed to the markouts themselves being larger. According to feedback received from several large clients, after the derandomization of the Alpha speed bump, Alpha's markouts are still superior to other Canadian venues.

Market Analysis

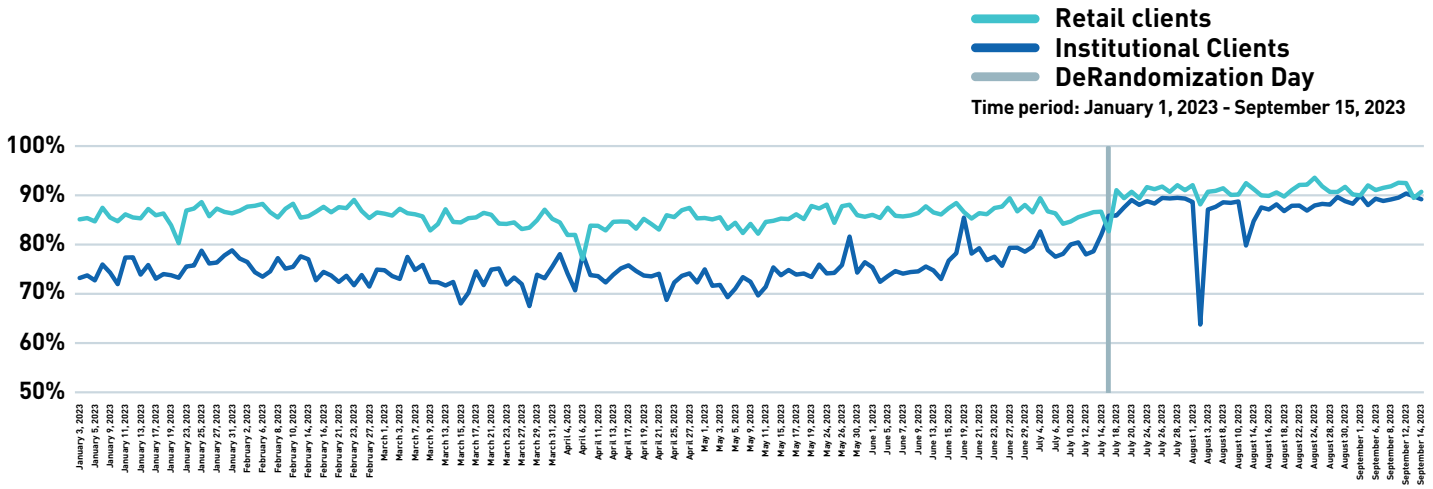
The section below highlights market quality changes since the transition from the randomized to static speed bump.

The first change highlighted is the "Alpha hit rate". The "Alpha hit rate" is a gauge of the active participant's success in obtaining a fill on Alpha. This metric is measured by comparing the amount of marketable volume when orders enter Alpha's speed bump with the volume that is ultimately traded upon exiting the speed bump, allowing for any missed opportunities resulting from the speed bump to be captured. The increase in the hit rates provide insight into how the change from random to static allows for an easier capture of liquidity on Alpha. Figure 4 provides insight on the "Alpha hit rate'' before and after the derandomization of Alpha's speed bump The figure below illustrates that the average institutional hit rate increased from 75% to 87% and the average retail hit rate increased from 86% to 91%[1].

1 Institutional and Retail volumes are collected based on an internal database.

FIGURE 4

Alpha Hit Rates



In order to evaluate the impact of the speed bump transition, it is useful to look at market quality metrics. This analysis focused on symbols with a trade price over and under $1.

FIGURE 5

Market Quality, over $1 symbols (TSX & TSXV listed)

ALPHA MARKET QUALITY STATISTICS - OVER $1

	% of Time at NBBO	Median Spread (Bps)	% of Top of Book Volume	Avg. Trade Size
Randomized	59.0%	153	11.7%	337
Static	59.1%	147	10.5%	337

Market Quality, under $1 symbols (TSX & TSXV listed)

ALPHA MARKET QUALITY STATISTICS - UNDER $1

	% of Time at NBBO	Median Spread (Bps)	% of Top of Book Volume	Avg. Trade Size
Randomized	52.5%	1,452	7.9%	6,150
Static	48.4%	1,460	5.5%	4,961

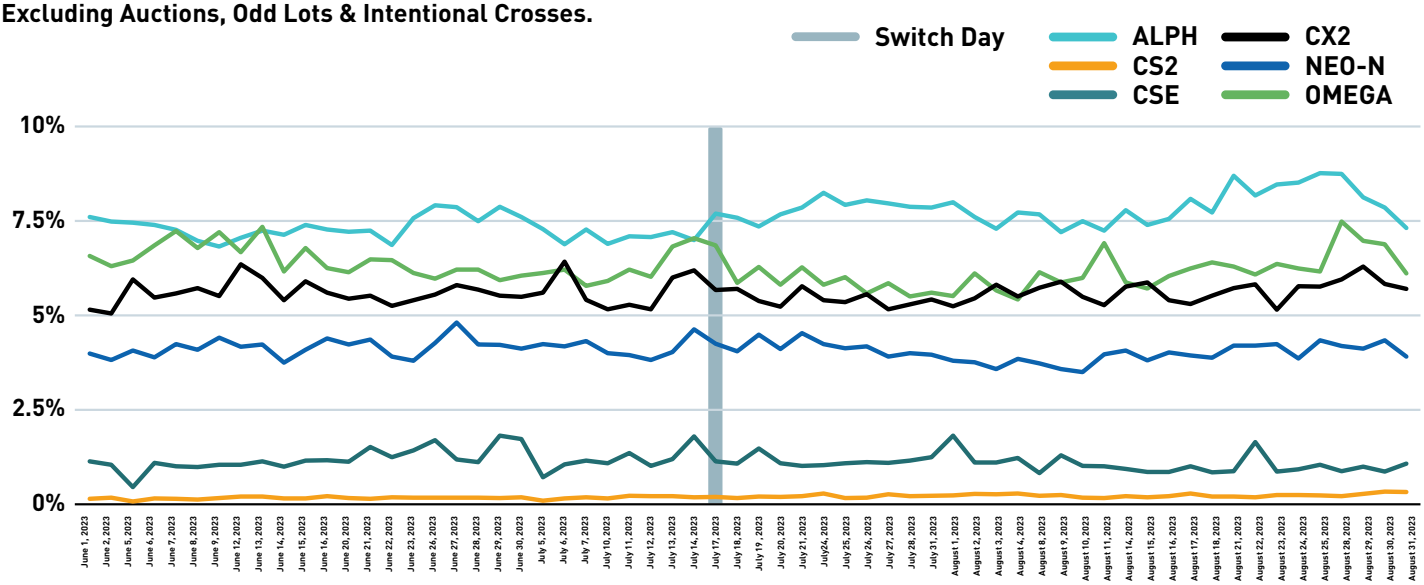
Symbols from an over and under $1 perspective saw little to no disruption in the market quality of Alpha. When looking at the "% of time at NBBO", which is the percentage of time Alpha is at the the best bid or offer in Canada, in the over $1 category, Alpha remains essentially at the same level on average pre and post static speed bump, in contrast to the under $1 category which fell by 4.1%. The median spread on Alpha decreased by 6 basis points on over $1 symbols and increased by 8 bps on under $1 symbols. The "% of Top of Book volume"[2] provides insight to the depth of volume Alpha has at the NBBO. Top of Book volumes on Alpha have changed by -1.2% and -2.4% for both over and under $1 respectively since the derandomization. Lastly, Alpha has observed a 0.6% change in market share since the derandomization of the speed bump, going from 7.2% from June 1st to July 16th to 7.8% from July 17th to August 30th. Since the derandomization of the speed bump, participants are now finding it easier to access liquidity on the venue, while fill and market quality have remained at acceptable levels.

2 Volume at the highest bid and lowest ask.

FIGURE 6

Inverted Venue Market Share as a % of Total Canadian Volume

Excluding American holidays (June 19th & July 4th).
Excluding Auctions, Odd Lots & Intentional Crosses.



Conclusion

The transition from a randomized to a static 1 millisecond speed bump on Alpha represents a significant milestone in the evolution of Alpha's market structure. This transformation was motivated by a desire to balance the imperatives of latency arbitrage mitigation with the need to provide market participants with efficient access to available liquidity. The empirical analysis and market-quality metrics presented in this paper offer valuable insights into the impact of this transition.

The observed increase in post-trade markouts following the transition highlights the shifting dynamics of market behavior. While this increase was modest, it is important to recognize that the result was expected as participants are now able to deterministically include Alpha in multi-venue market sweeps.

The introduction of the "Alpha hit rate" as a metric for assessing the trading experience on Alpha Exchange yielded compelling results. The substantial improvement in hit rates for both institutional and retail orders underscores the positive impact of the transition on market participants. This metric serves as a powerful tool for quantifying the effectiveness of the speed bump mechanism in facilitating successful trade executions and access to liquidity.

The comprehensive analysis of market quality metrics further reinforces the positive outcomes of the transition. Symbols with a trade price over $1 experienced improvements in key metrics such as median spread and % time at NBBO. Similarly, symbols with a trade price under $1 exhibited resilience to the transition, with minimal changes in market quality metrics.

Overall, the transition from a randomized to a static speed bump on Alpha has proven to be a positive move towards enhancing market quality and participant experience.

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