

June 18, 2024

Vanessa Countryman, Secretary  
Securities and Exchange Commission  
100 F Street NE  
Washington DC

Re: File No. SR-NASDAQ-2022-079, Release 34-98321, Proposed Rule Change, as Modified by Amendment No. 2, to Amend Rules 4702(b)(14) and (b)(15) Concerning Dynamic M-ELO Holding Period

Dear Ms. Countryman:

The SEC approved Dynamic M-ELO on September 7, 2023, and as one of the two commenters on the rule filing I've been interested in its launch. After some delays, Nasdaq started rolling Dynamic M-ELO out in April, completed its rollout by mid-May, and then recently published its first monthly performance report on the order type. We now have some production results to go over.

Compared to March 2024, the last full month of the old version of M-ELO, Nasdaq's "Dynamic M-ELO Monthly Report" for May shows worse fill rate statistics in every category:

Order Size	March	May	+/-	Better/Worse(%)
1-100	86.00%	80.00%	-6.00%	-6.98%
101-250	70.60%	65.30%	-5.30%	-7.51%
251-500	62.60%	59.50%	-3.10%	-4.95%
501-1,000	51.20%	47.10%	-4.10%	-8.01%
1,001-2,000	41.30%	36.50%	-4.80%	-11.62%
2,001-5,000	26.30%	24.50%	-1.80%	-6.84%
5,000+	10.90%	10.30%	-0.60%	-5.50%

For what it's worth, Dynamic M-ELO also has worse fill rates than the old version in February 2024, in every category. I don't have a complete set of these performance reports - and so far as I can tell Nasdaq doesn't post an archive online - but for the monthly reports I do have, Dynamic M-ELO almost always delivered worse fill rates than the static 10ms version of M-ELO it replaced.

This is a mystery. Nasdaq's Dynamic M-ELO filings claimed better fill rates than the old version<sup>1</sup>, and yet so far in production it seems to do worse. It's even doing worse than a random timer Nasdaq tested as it developed Dynamic M-ELO, so I suppose Dynamic M-ELO would do worse than if a monkey threw darts to pick the holding period timers.<sup>2</sup>

Passive trade markout results are also a mystery. While the May report shows markouts improved in the smallest trade size category, markouts got worse compared to March in every other category but one, where they were the same.

Trade size	March*	May*	+/-	Better/Worse(%)**
1-100	-0.2	0	0.2	100%
101-200	-0.2	-0.4	-0.2	-50%
201-300	-0.2	-0.3	-0.1	-33%
301-400	-0.2	-0.3	-0.1	-33%

<sup>1</sup> Release 34-98321, page 10, where Nasdaq said "Dynamic M-ELO yielded an average combined volume-weighted (simulated) improvement of 31.7 percent, including a 20.3 percent increase in fill rates and a 11.4 percent reduction in mark-outs."

<sup>2</sup> Release 34-98321-ex3a, "Applying Artificial Intelligence & Reinforcement Learning Methods Towards Improving Execution Outcomes," October 10, 2022 ("White Paper"). At page 25 (Exhibit 3A page 82), note the "Fill Rate Improvement (%)" figures in the chart entitled "Benchmarking AI Model Against Static Timer and Random Timer." Using the "Random Timer" as a proxy for a monkey, the monkey could deliver roughly a 22% fill rate improvement over the legacy fixed 10ms holding period.

401-500	-0.2	-0.4	-0.2	-50%
501-600	-0.1	-0.2	-0.1	-50%
601-1,000	-0.2	-0.2	0	0%
1,000+	-0.1	-0.2	-0.1	-50%

\*Presumably measured in basis points, though the report doesn't say so.

\*\*Uses the same formula to measure this Nasdaq cited in its White Paper at page 23.

Nasdaq's report doesn't show enough to calculate exactly what these changes add up to for investors, but with a little arithmetic and some assumptions you can take a stab at it. My own back-of-the-envelope estimate is that, combining all trade size categories but the smallest, markouts in May got worse by about \$1.2 million. If Nasdaq doesn't like that estimate and disagrees with it, Nasdaq can tell us what the right dollar amount is. It can even put enough data on the report so investors can calculate it directly for themselves.

### *Wing it*

Another mystery we saw in production is about how Nasdaq decided to handle corporate actions. I wrote about corporate actions last September, when I asked how Nasdaq would handle them.<sup>3</sup> Corporate actions can dramatically affect order and trade behavior and any statistics calculated from that data, and I believed they could affect how Dynamic M-ELO might work. Nasdaq never responded. Despite being one of the largest listings markets in the world, it can appear as if no one thought of corporate actions until Nasdaq was already rolling out Dynamic M-ELO. That's when Nasdaq took its Equity Trader Alert #2024 - 25, first issued on April 15, 2024 to announce the roll out schedule, and later changed it to note "Certain symbols may default to the classic M-ELO timer of 10ms between May 15th and May 31st if they are subject to a corporate action or IPO during this period."

As of May 15, when according to Nasdaq's schedule it completed converting all symbols to Dynamic M-ELO, the mystery is that there was no such thing as "the classic M-ELO timer of 10ms." Nasdaq's rulebook detailed that the only permissible order timers ranged in .25ms steps from .25ms to 2.5ms (plus a fixed 12ms for its stability protection mechanism), and these timers were to be set only by the Dynamic M-ELO model itself. Try as I have, I can't find any authority in Nasdaq's rulebook for stocks to "default to the classic M-ELO timer of 10ms" when there was a corporate action in the name. I also can't find a proposed rule filing for this behavior. Did Nasdaq just wing it? It's obviously a material change in its operations or Nasdaq wouldn't have revised its Trader Alert to inform participants of it. And even more important, what happened such that *after* May 31 stocks with corporate actions no longer "default to the classic M-ELO"? Or are they still doing it and just haven't updated the Trader Alert?

This seems like a good place to remember that the Commission relied on Nasdaq's representations that the only permissible Dynamic M-ELO order timers ranged from .25ms to 2.5ms (plus 12ms):

Furthermore, the Commission finds that overall structure of Dynamic M-ELO - particularly, the static numerical constraints set forth in the proposed rule text - is designed in general, to protect investors and the public interest and promote just and equitable principles of trade pursuant to Section 6(b)(5) of the Act....For example, the initial Holding Periods for each trading day will be 1.25 milliseconds, the overall range for any Holding Period must be between 0.25 and 2.50 milliseconds during normal market conditions, and the Holding Period can only change by either 0.25 or 0.50 milliseconds at each Change Event during normal market conditions. Regardless of how the model analyzes the current market or changes the weighting of the data elements as a result of its retraining, *Dynamic M-ELO cannot operate outside of the static numerical ranges and limitations or minimums set forth in the rule text. As such, the Commission finds that Nasdaq has designed Dynamic M-ELO to operate in a manner that in general protects investors and the*

<sup>3</sup> Letter from R. T. Leuchtkafer to Vanessa Countryman, Secretary, SEC, dated September 28, 2023, at page 5. Available at <https://www.sec.gov/comments/sr-nasdaq-2022-079/srnasdaq2022079.htm>.

*public interest and promotes just and equitable principles of trade in accordance with Section 6(b)(5) of the Act.*<sup>4</sup>

It's also a good place to remember one of Nasdaq's commitments:

The Exchange will not modify the underlying structure of Dynamic M-ELO and M-ELO+CB without first obtaining the Commission's approval to do so, including modifications to the data elements the model considers in making decisions about Holding Period durations, *the conditions under which the model may adjust the duration of Holding Periods, the frequency with which the model may [sic] adjust the Holding Periods, the range of Holding Period durations available to M-ELOs and M-ELO+CBs...*<sup>5</sup>

The SEC included these statements and relied on them in its approval order:

Nasdaq represents that it will not modify the underlying structure of Dynamic M-ELO without first obtaining the Commission's approval to do so, including modifications to the data elements the model considers in making decisions about Holding Period durations, the conditions under which the model may adjust the duration of Holding Periods, the frequency with which the model may adjust the Holding Periods, the range of Holding Period durations available to M-ELOs and M-ELO+CBs...<sup>6</sup>

And while we're at it, let's also remember Nasdaq's commitment to "add statistics to the M-ELO Monthly Report about how frequently, on average, the System changes Holding Period durations for the top decile, median, and bottom decile of symbols, as measured by monthly M-ELO and M-ELO+CB trading volumes."<sup>7</sup> The SEC also included these statements and relied on them in its approval order, "Nasdaq also indicated it would add statistics to its existing M-ELO Monthly Report, which discloses quote stability by time horizon, about how frequently, on average, its system changes Holding Period durations for the top decile, median, and bottom decile of symbols, as measured by monthly M-ELO and M-ELO+CB trading volumes."<sup>8</sup> They're nowhere to be found on the May report.

### *Truth in advertising*

If Dynamic M-ELO's results keep on like this, Nasdaq should stop claiming a 31.7% improvement - or any improvement - over the old version of the order type. So far at least, fill rates got worse and most markouts got worse too. It's also a good time to remind Nasdaq of its obligation to follow its own rulebook, and to remind it of its many promises in the Dynamic M-ELO rule filing process to seek Commission approval for changes.

And if results keep on like this, it might also be a good time to consider rescinding Dynamic M-ELO approval. Nasdaq has repeatedly claimed Dynamic M-ELO is an improvement over the prior version of the order type, and as of May 2024 its own data suggests it's worse, in particular for larger orders and trades. That does not "protect investors and the public interest." It also suggests the SEC's conclusion in the approval order that "Nasdaq has demonstrated that it has analyzed the anticipated or simulated effects of the proposed change on all current M-ELO users, and that this work did not indicate that particular firms or classes of firms are anticipated to unfairly benefit from or be harmed by the proposed Dynamic M-ELO functionality"<sup>9</sup> isn't so. For now at least, a firm or class of firm that submits larger orders can end up worse off than it was before.

Speculating, I suppose there are at least a few possibilities for why, to this point, Dynamic M-ELO's performance is worse in production than what Nasdaq claimed during the approval process: (a) Nasdaq

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<sup>4</sup> Release 34-98321, pages 41-42, emphasis added.

<sup>5</sup> Release 34-98321, page 16, emphasis added.

<sup>6</sup> Release 34-98321, page 44.

<sup>7</sup> Release 34-98321, page 17.

<sup>8</sup> Release 34-98321, page 43.

<sup>9</sup> Release 34-98321, page 39.

developed and tested Dynamic M-ELO on 380 active symbols<sup>10</sup> but deployed it on thousands of highly varied instrument types and activity levels; or (b) Nasdaq's methods of testing Dynamic M-ELO in development were otherwise flawed; or (c) Nasdaq's performance reports are wrong. I suppose it's also possible that right now Nasdaq is trying to figure out why Dynamic M-ELO is doing so much worse in production than it did in development, and is looking at different training data samples or weight parameters to see what it can do.<sup>11</sup> Sample or parameter changes can invalidate bias test results Nasdaq presented last year, and since the Commission relied on those results to approve Dynamic M-ELO, Trading and Markets might want to follow up.

### *Wild Turkey*

What on earth is going on at Nasdaq? It's pretty funny that after all the sound and fury of the Dynamic M-ELO approval process, so far at least Nasdaq's delivered a product that, as I see it, looks quite a bit worse than what it had before, but Nasdaq's efforts over its Contra Midpoint Only order type ("CMO") are even funnier.

Those efforts went public early last year when Nasdaq proposed the CMO, right around the time it first filed for Dynamic M-ELO.<sup>12</sup> Commenters jumped in to criticize the CMO for information leakage, and Nasdaq eventually withdrew. But bad ideas can die hard, and Nasdaq tweaked the order type and proposed a new version through Nasdaq PHLX last September.<sup>13</sup> Commenters jumped in again to criticize it for information leakage. Nasdaq disputed that. After the SEC announced an OIP in December,<sup>14</sup> I read the filing for the first time and saw what I thought was a huge reserve order information leakage problem. It didn't take long to see it, even distracted by a "Vanderpump Rules" special and a tumbler of Wild Turkey. Nasdaq/Nasdaq PHLX didn't respond to the reserve order question or anything else, and withdrew the filing just as the 180 day clock ticked down.

Looking at the timeline, and working backward from the initial filing date of January 5, 2023, I figure Nasdaq's been thinking about the CMO at least since mid-2022. A new order type takes time. Product managers and client managers and even developers get together to talk about it. Maybe an exchange talks to some firms about it. Sooner or later the lawyers get involved and kick it around, and pick up the phone and call Trading and Markets to talk about it. Anyway, I believe all this easily adds up to six months or more. So from inception to the December 5, 2023 OIP, it's fair to believe the CMO bounced around at Nasdaq for at least 18 months, and people in product and client management, technology, legal, and maybe even regulation and surveillance pawed it over in that time.

In those 18 months, then, through two versions of the idea, and despite commenters pounding the table about it, I can only believe no one at Nasdaq understood the extent of the information leakage problem and how much of a disservice the order type could be to many of its customers. Or if they knew it, they discounted it. Hard to know which is the bigger pickle. An institution invested with an exchange's commercial and regulatory privileges and responsibilities, given or delegated to it by Congress, federal agencies, and the courts, should do better than this. An exchange that should do better needs attention, especially if it's dealing with an underperforming high-profile product like Dynamic M-ELO.

Trading and Markets should think hard about all that and talk to the Division of Examinations about it. And then Trading and Markets should think about why it chose this exchange and that product to do so much damage to 3b-16 and its decades of service in the public interest.

Sincerely,

R. T. Leuchtkafer

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<sup>10</sup> See White Paper, pages 14-15 (Exhibit 3A pages 71-72).

<sup>11</sup> Could market volatility account for May's poor performance compared to March? It seems unlikely. The VIX ranged from 12.4 to 16.04 during March and from 11.91 to 16.22 during May.

<sup>12</sup> See File No. SR-NASDAQ-2022-077.

<sup>13</sup> See File No. SR-PHLX-2023-40.

<sup>14</sup> Release 34-99083.