Member Poll Results

Evolving Investor Protections for 24-Hour Trading

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Summary

A strong investor protection regime is an important component of a robust U.S. equities market. However, certain investor protections currently only apply during regular trading hours, i.e., from 9:30 a.m. to 4:00 p.m., or apply differently to trading outside of this session. With the upcoming extension of exchange hours,[1] MEMX recently conducted a member poll asking market participants about whether and how investor protections should be updated to accommodate this move.[2]

This white paper discusses the poll results and shares some thoughts about what investor protections could look like in a 24-hour trading environment. MEMX looks forward to continued industry discussions as we work with both market participants and the other exchanges on updates to our investor protection framework.

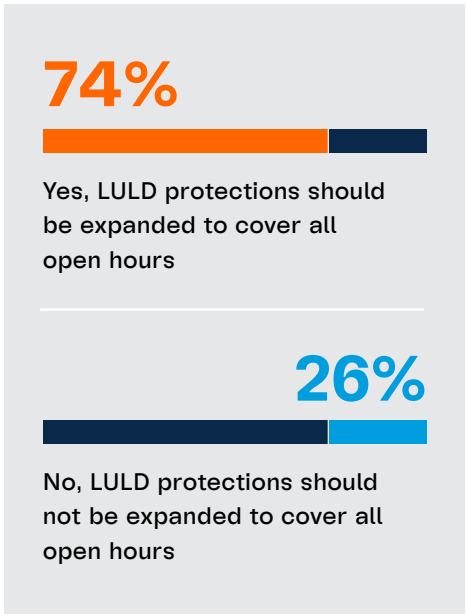
1 See SIPs to Propose Extended Operating Hours available at https://www.prnewswire.com/news-releases/sips-to-propose-extended-operating-hours-302447700.html.

2 MEMX conducted an online poll from May 28, 2025 to June 23, 2025 open to members of the exchange and qualified market participants. Employees from over 20 different institutions, market makers, and retail trading firms participated in the survey.

Q1. Should Limit Up-Limit Down (LULD) protections be expanded to cover all hours that exchanges are open for trading, including the overnight session?

Today, the Plan to Address Extraordinary Market Volatility, otherwise known as the LULD Plan,[3] operates only during regular trading hours from 9:30 a.m. to 4:00 p.m. The first question of our survey asks whether these protections should be expanded to cover all hours that exchanges are open for trading. On this question, three quarters of respondents favor an expansion of LULD, while the remaining quarter prefer to maintain the status quo.

Yet, expanding single stock volatility protections is not as simple as taking the existing LULD framework and applying it to the full trading day. Careful consideration should be given to calibrating these protections to less liquid sessions. This includes selecting an appropriate reference price and percentage parameters as discussed in the next section. However, there are also other considerations, including whether price bands should be coupled with trading halts, and how to account for post-market trading where earnings or material news announcements could result in wider price swings even for more liquid stocks.



MEMX Recommendation:

- Extend volatility protections, i.e., price bands, to cover additional exchange trading hours, including new pre-market trading starting at or around 9:00 p.m.
- Conduct additional data analysis and consider changes to account for more limited liquidity during the overnight hours and to account for post-market price swings. For example, it is unclear whether trading halts are necessary or helpful when coupled with price bands subject to a static reference price calculation.[4]

3 See LULD Plan, available at https://cdn.luldplan.com/plans/LULD-Plan-Amendment-20.pdf. This document contains a high-level description of various features of the Plan. Please consult the Plan for more in-depth requirements.

4 As discussed in the section below, a handful of more liquid stocks may benefit from a dynamic reference price. For those stocks it is possible that trading pauses may be helpful as a halt auction could be used to set a new reference price.

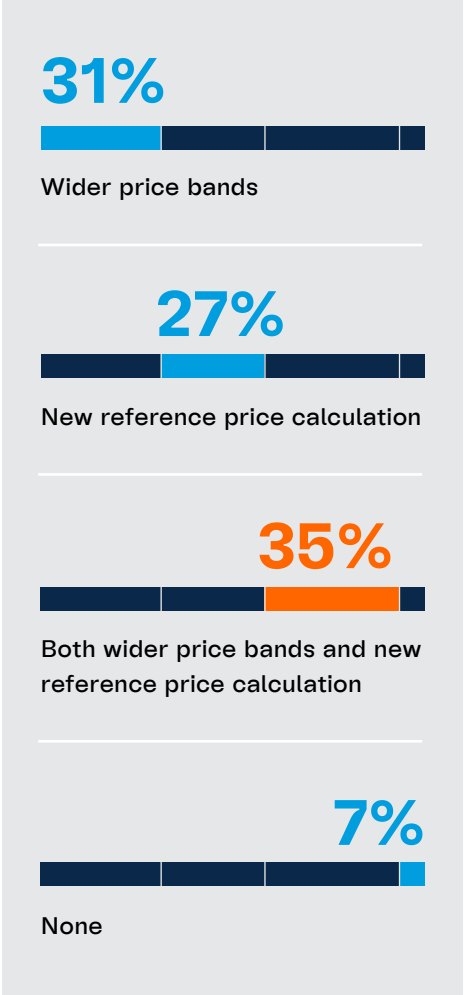
Q2. What changes would be needed to support an extension of the LULD mechanism?

While there seems to be some support for extending LULD, there also appears to be consensus that changes must be made to accommodate this expansion. To that end, the vast majority of respondents answered that either wider price bands, a new reference price calculation, or both would be needed to support an extension of the LULD mechanism. This is not surprising given differences in the liquidity profile of stocks across different sessions.

The LULD Plan determines reference prices dynamically during the course of regular trading hours from 9:30 a.m. to 4:00 p.m. The reference price is first set every morning based on the official opening price determined by the listing exchange auction. Following the auction, reference prices are updated as frequently as every 30 seconds using a reference price that is equal to the arithmetic mean of transactions executed during a rolling five-minute period, thereby incorporating trading activity as price discovery occurs throughout the trading day.

Price bands are then set by applying a 5% (Tier 1) or 10% (Tier 2) percentage parameter to the calculated reference price.[5] These price bands are disseminated by the Securities Information Processors (SIPs) and are coupled with trading pauses to facilitate fundamental price moves when national best bid (offer) rests on the upper (lower) price band. However, LULD price bands are not applied outside of regular trading hours, and any expansion of this mechanism must consider the different liquidity profile of stocks during those hours.

Notably, only a small fraction of NMS stocks trade any volume during the overnight session. During our sample period of April and May 2025, the average number of daily symbols traded overnight each day was 1,282. And even among stocks that do trade, most only do de minimis trading volume. During the same sample period, the median volume for NMS stocks traded overnight was 288 shares and the median notional was $8,465. For these stocks, a dynamic reference price calculation like that used during regular trading hours is not practical given limitations on the input for the reference price calculation, i.e., trades. In addition, wider price bands are presumably necessary to account for potential price swings.



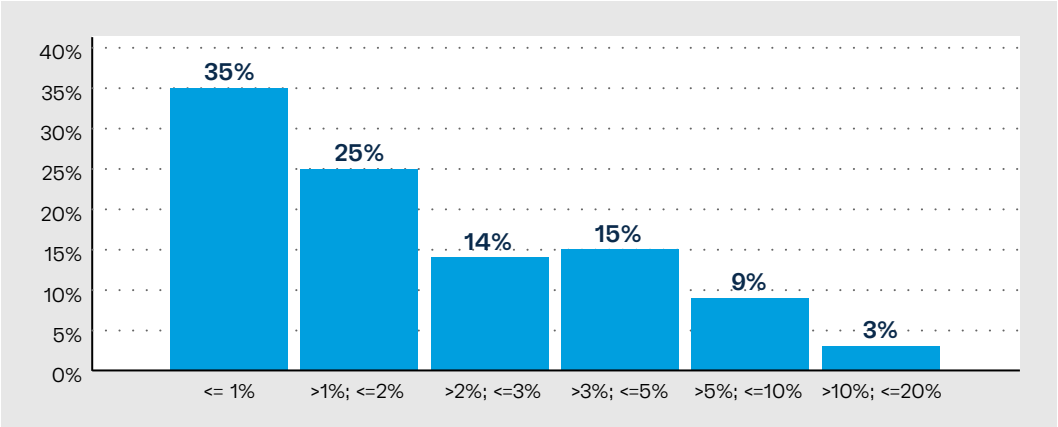
5 The percentage parameters discussed above apply to NMS stocks with a reference price greater than $3. The percentage parameter for Tier 1 and Tier 2 NMS stocks is 20% for stocks with a reference price equal to $0.75 up to and including $3, and the lesser of (a) $0.15 or (b) 75% for stocks with a reference price less than $0.75. Percentage parameters for leveraged ETPs are multiplied by the leverage ratio.

Given these constraints, the model currently employed by the Blue Ocean ATS (BOATS) may be instructive.[6] Today, BOATS applies price bands that are 20% above (below) a reference price equal to the exchange last sale as of 7:30 p.m. While we understand that there is ongoing industry discussion on whether this should be coupled with a different reference price, this is a good starting point for the many stocks that are illiquid overnight.

To get a better sense of how to establish sensible price bands for overnight trading, we reviewed trading data for all NMS stocks that traded overnight each day during April and May 2025. For each NMS stock traded each day, we calculated the high and low execution prices during the overnight session and expressed those high and low prices as a percentage away from the 7:30 p.m. reference price. We then selected the greater of the absolute value of the two. For example, during the overnight session on April 1, 2025, SPY traded just over 1 million shares at a low price of $554.15 (-0.5%) and a high price of $559.63 (0.4%), meaning the greatest distance from the 7:30 p.m. reference price is 0.5%. Put another way, a 0.5% price band would have been sufficient to allow all overnight trades in SPY on that trade date.

Figure 1 below shows the results for all stock and day combinations during our sample period. As illustrated, most NMS stocks trade less than 2% away from the reference price during each day's the overnight session. However, wider swings between 5-10% or 10-20% are not uncommon. This suggests that accommodating the full range of NMS stocks within a static price band framework requires correspondingly wider price bands. But such a one-size-fits-all approach may also permit abnormally large price swings in less volatile stocks.[7]

Figure 1: High/Low Overnight Execution Prices vs. 7:30 p.m. Reference Price (All NMS Stocks)[8]



6 MEMX Technologies, LLC provides the technologies used to operate BOATS and has also been selected as the technology provider for the 24X National Exchange LLC.

7 Today, executions significantly away from market prices would be subject to review under separate exchange clearly erroneous rules. However, those rules would presumably be modified concurrently with the introduction of price bands.

8 Unless otherwise noted, all Figures in this white paper include all trades executed between 8 p.m. and 4 a.m. during a sample period of April – May 2025.

At the same time, there are other ways to categorize securities for purposes of establishing appropriate price bands. Consider the current operation of the LULD Plan, which generally provides tighter price bands to more liquid (Tier 1) vs. less liquid (Tier 2) NMS stocks.[9] While a similar number of NMS stocks traded overnight fall into each of these tiers, Tier 1 stocks account for a significantly greater proportion of the notional value traded (79%), meaning that calibrating bands for those stocks will be relatively more impactful for investors.

Figures 2 and 3 below show this data for Tier 1 and Tier 2 stocks, respectively. When sorted in this manner, the data suggests that while Tier 2 stocks may move around more during the overnight session, a 20% price band is rarely necessary to accommodate normal price movement in Tier 1 stocks. Given the fact that our data set includes a period of heightened market volatility in April 2025, this may suggest the default price bands for those stocks could be narrower, e.g., 10%, without impacting a significant amount of trading activity.[10]

Figure 2: High/Low Overnight Execution Prices vs. 7:30 p.m. Reference Price (Tier 1 NMS Stocks)

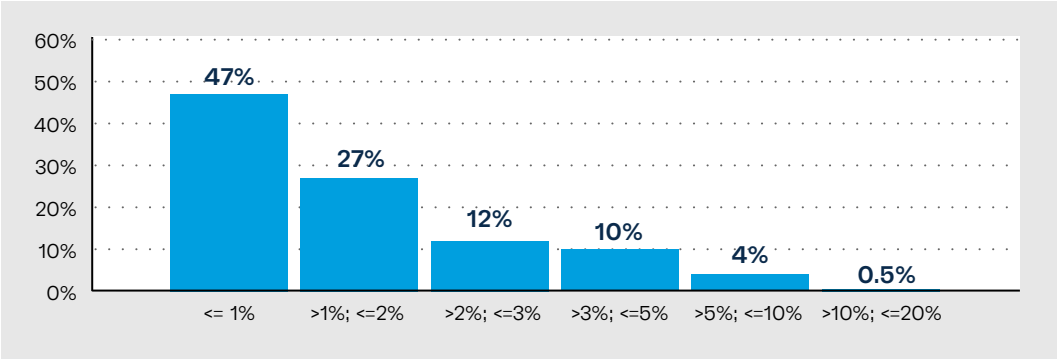
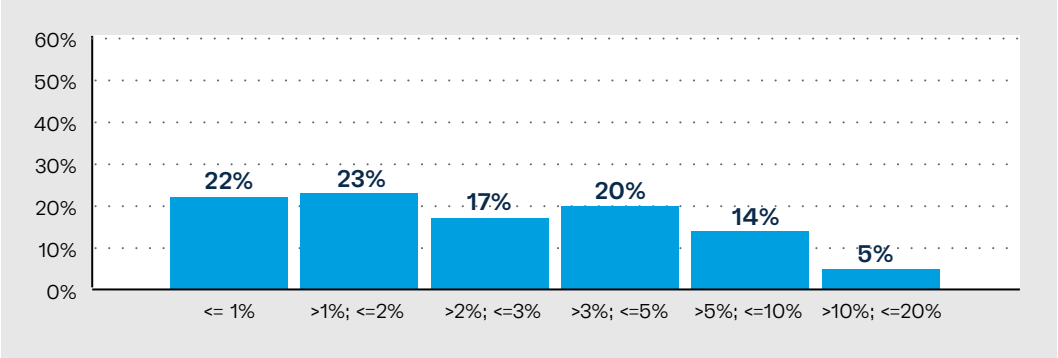


Figure 3: High/Low Overnight Execution Prices vs. 7:30 p.m. Reference Price (Tier 2 NMS Stocks)



9 Generally, Tier 1 NMS stocks are defined to include all NMS stocks included in the S&P 500 Index and the Russell 1000 Index, and ETPs (excluding leveraged ETPs) that trade over $2,000,000 CADV. Tier 2 NMS stocks include all NMS stocks not included in Tier 1, other than rights and warrants, which are excluded from LULD.

10 Today, all NMS stocks, i.e., Tier 1 and Tier 2, with a reference price that is less than or equal to $3 receive wider percentage parameters under the LULD Plan. See note 5 above. It may also be helpful to also keep this structure going forward.

To further assess the impact of introducing a narrower price band for Tier 1 NMS stocks, we also looked at notional value traded beyond a hypothetical 10% price band each day during our sample period.[11] The results are shown in Figure 4 below. As illustrated, on an average day no Tier 1 stocks trade through this hypothetical 10% price band. Trading beyond this hypothetical price band is instead concentrated on particularly volatile days, such as the week of April 7, 2025, where VIX closing prices reached a high of 52.33 on macroeconomic concerns related to tariffs and the S&P500 Index dropped more than 5% on two separate days. Indeed, that week alone accounted for 97% of the notional value traded that would be impacted by this change. This means that, in practice, a 10% price band for Tier 1 NMS stocks is not likely to impact trading except on the most volatile of days. However, on days where there is a significant spike in volatility, overnight price discovery may be constrained.

Figure 4: Notional Beyond Hypothetical 10% Price Band[12]

Date	VIX	Overnight Notional	Notional Traded Through Hypothetical 10% Price Band	% of Overnight Notional
2025-04-04	45.31	$2,374,641,425	$4,331,490	0.2%
2025-04-07	46.98	$2,153,188,620	$155,076,198	7.2%
2025-04-08	52.33	$2,887,324,592	$87	0.0%
2025-04-09	33.62	$5,101,011,682	$783,938	0.0%
2025-04-10	40.72	$4,678,588,523	$24,668,964	0.5%
2025-04-23	28.45	$2,276,952,050	$2,562	0.0%
2025-04-25	24.84	$2,234,651,927	$1,220	0.0%
2025-04-28	25.15	$549,132,869	$35,899	0.0%
2025-05-01	24.60	$4,667,742,664	$21,792	0.0%
2025-05-02	22.68	$2,902,774,788	$17,696	0.0%
2025-05-08	22.48	$5,167,396,904	$1,347	0.0%
2025-05-12	18.39	$2,360,186,479	$1,095,207	0.0%
2025-05-22	20.28	$1,763,964,376	$5,602	0.0%
Total		$99,561,347,106	$186,042,002	0.2%

11 We exclude NMS stocks with a reference price <= $3 from our analysis as these stocks currently receive a wider percentage parameter under the LULD Plan.

12 Date column reflects the date as of the end of the overnight session. For example, the April 4, 2025 trade date began at 8 p.m. on April 3, 2025. Trade dates where no trades in included stocks take place outside of the hypothetical 10% price band are not shown in the table but are included in the total overnight notional calculation.

A related consideration is whether a static reference price is appropriate for all stocks. In practice, a static reference price requires wider bands as the midpoint of the bands may not always reflect market value. This means that as long as there is a static reference price there will be a tradeoff between investor protection and facilitating price discovery. One solution is to start the new extended hours session with a reference price based on post-market activity and transitioning to a dynamic reference price in sufficiently liquid names.

Further, while the LULD Plan currently utilizes the last five minutes of trades to set the reference price, other solutions could be examined for a less active trading session. For example, notional value thresholds could be put in place instead of a time threshold to ensure that price band updates are based on a reasonable amount of trading activity.

Institutional investors, who trade in size and demand more liquidity to support their trading, have expressed limited interest in overnight trading. The overnight session is consequently more retail focused. Consistent with that observation, a handful of top single stocks like TSLA and NVDA and exchange-traded products (ETPs) like SPY and QQQ account for an outsized proportion of overnight volume even relative to normal daytime concentration. In fact, looking at average notional value traded in top stocks across our sample period, the top 10 names account for just shy of half of the notional volume executed in the overnight session. And, on any given day, concentration among the top 10 likely exceeds this threshold as averaging across the sample period smooths out high-volume days for individual stocks.

Figure 5 below shows the average daily notional value traded in the top 10 overnight symbols during our sample period of April and May 2025. Figure 6 illustrates higher notional value traded for particular stock and day combinations across this same sample period.

Figure 5: Notional Traded in Top 10 Overnight Symbols

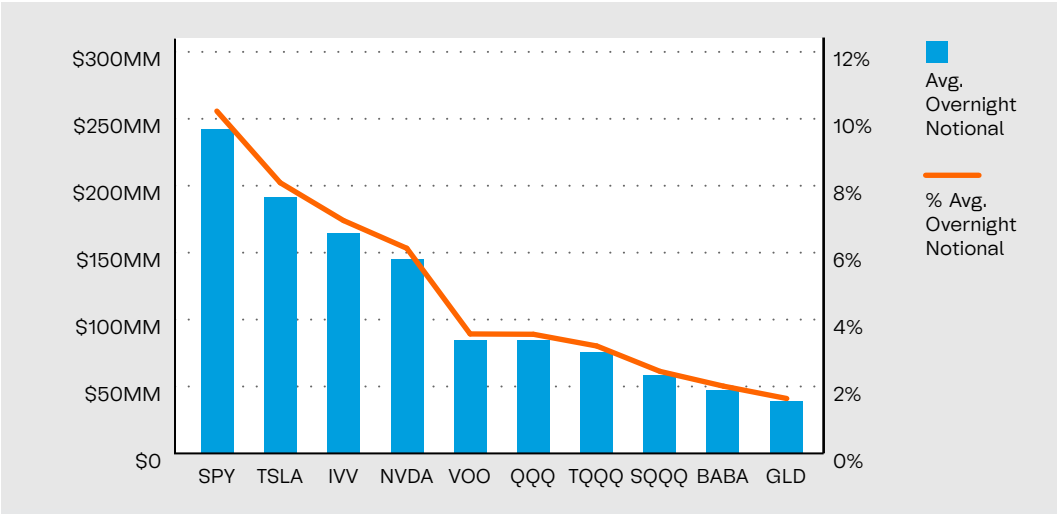
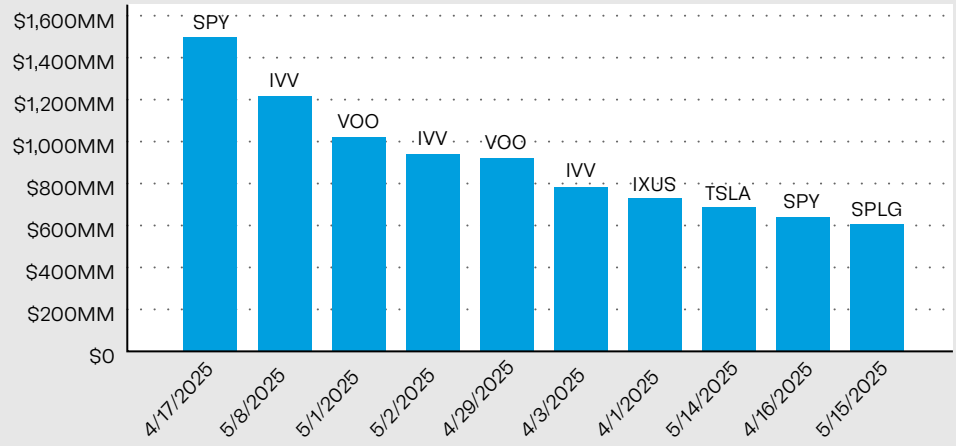


Figure 6: Notional Traded in Top 10 Overnight Symbol/Day Combinations



A good long-term solution should therefore consider not only the thousands of stocks that don't trade, or that trade miniscule volume, but also the stocks that account for the bulk of trading activity. While the average stock may not trade enough to set dynamic price bands, most of the volume is traded in symbols that could benefit from this kind of mechanism. And overnight liquidity may very well increase in response to the extension of exchange hours and as this market continues to mature over time. Ensuring that these price bands are flexible enough to account for changing market dynamics is therefore an important exercise.

Let's put this in perspective. As discussed, volatility spiked on April 7, 2025 with the VIX closing at 46.98. This trade date also had the largest notional traded outside of a hypothetical 10% price band for Tier 1 NMS stocks. During this session, 41 million shares traded with a total notional value of $2.2 billion. Of that $2.2 billion notional value traded, $300 million was traded in NVDA (14%) and $260 million was traded in TSLA (12%).

Both of these stocks traded down significantly in the overnight session on concerns related to tariffs, with NVDA trading between a low of $83.66 (-10%) and a high of 87.98 (-5.3%), and TSLA trading between a low of $208.56 (-11.5%) and a high of 218.24 (-7.4%).[13] At first glance, the price action in these two stocks seems to suggest a need for wider price bands at least to the extent those price bands are intended to account for particularly volatile days.

However, on closer inspection the high and low prices were not too far apart in either symbol. The real issue is the reference price, which for both symbols significantly exceeded even the highest prices executed overnight. A dynamic reference price calculation would enable narrower price bands that permit fundamental price moves in response to news or other market moving events. Indeed, if there is sufficient liquidity in the stock, dynamic price bands would seem to both protect investors and allow price discovery to occur normally as applicable price bands would be updated continuously in response to market activity.

13 Bracketed numbers reflect the percentage away from the 7:30 p.m. reference price.

Of course, it's important to consider exactly how much liquidity is needed to set dynamic price bands. Nevertheless, our experience with LULD suggests that many top overnight names do have sufficient liquidity to set dynamic price bands. Over the course of May 2025, the median Tier 1 NMS stock, i.e., the stocks that receive the narrowest price bands under the LULD Plan, traded $54 million of notional value. By comparison, the top nine overnight stocks traded on April 7, 2025 exceeded this threshold based solely on overnight activity.

Collectively, those nine stocks accounted for 56% of notional value traded that session. If similar and even less liquid stocks qualify for the narrowest price bands during regular trading hours, a similar structure may very well work for the top names traded in extended hours, provided care is taken to consider volatility and other differences in market activity when setting an appropriate reference price and percentage parameters. And a program that allows stocks to grow into this framework over time based on notional value traded would also ensure that investors are protected if and when overnight volumes increase.

Using the top ten symbols traded in the overnight session during our sample period as a conservative proxy for stocks that could benefit from a dynamic reference price, we recalculate the notional traded through a hypothetical 10% price band excluding trading activity in those stocks. As shown, the notional value impacted by this hypothetical band on particularly volatile days would fall—for example, a shift from 7.2% to 3.8% on April 7, 2025. These numbers would be further reduced to the extent that dynamic price bands are implemented in additional names.[14]

14 Of the $83 million in notional value that would have traded through our hypothetical 10% price band on April 7, 2025 after removing the top ten overnight symbols, more than half ($42 million) is associated with trading in Bitcoin treasury company MSTR. While MSTR is not in our top ten, which includes trading data for all of April and May, it was in the top 10 symbols that session. Other cryptocurrency companies and ETPs, including COIN ($14 million) and IBIT ($3 million) were also significant contributors.

Figure 7: Notional Beyond Hypothetical 10% Price Band

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2025-05-22	20.28	$1,763,964,376	$5,602	0.0%
Total		$99,561,347,106	$113,459,009	0.1%

MEMX Recommendation:

1. Apply 10% (Tier 1) or 20% (Tier 2) price band with static reference price to stocks that do not trade or that trade de minimis volume during extended trading hours.[15]

2. Apply dynamic reference price calculation for more liquid securities that account for majority of overnight volume.[16] Consider use of notional volume threshold instead of time window in reference price calculation.

3. Conduct timely study on the impact of any choices made in relation to extended hours price bands given the possibility that market dynamics continue to evolve.

15 Percentage parameters above do not apply to Tier 1 or Tier 2 NMS stocks with a reference price <= $3, which already receive a percentage parameter >= 20%. As with current LULD rules, the applicable percentage parameter for leveraged ETPs should continue to be multiplied by the applicable leverage ratio of the product.

16 An interim solution that does not include dynamic reference prices for more active stocks could be considered in the short term as exchanges and market participants delve into the data needed to make more lasting decisions, including decisions about how to categorize different groups of stocks, the reference price calculation and percentage parameters, and how to incorporate pre- and post-market trading.

Q3. Should clearly erroneous rules be amended to account for overnight trading?

In addition to questions on LULD, our poll also asked whether changes to clearly erroneous rules should be made to account for overnight trading and three quarters of respondents answered yes to this question. Clearly erroneous rules currently backstop LULD during regular trading hours, providing another avenue for addressing bad trades when systems or other issues impact the availability or accuracy of LULD price bands. However, clearly erroneous currently stands on its own during pre- and post-market trading.

As a starting point, MEMX believes that preventing bad trades from occurring is generally better than busting those trades after the fact. For this reason, harmonized price bands, either under the LULD Plan or pursuant to individual exchange rules, should be considered.

If harmonized price bands are adopted, clearly erroneous rules should also be amended to ensure that all trades executed within those price bands are allowed to stand. Similar to trades executed during regular trading hours, clearly erroneous review should be limited to instances where technology or other issues result in executions outside of price bands, or where the price bands themselves are not available or are otherwise invalid. Investors should not have to rely on after-the-fact clearly erroneous protections when appropriately calibrated price bands can prevent those trades from being executed in the first place.

MEMX Recommendation:

- Amend clearly erroneous rules such that review is limited to executions outside applicable price bands, or where there are systems or other issues that impact the dissemination or accuracy of established price bands.
- Work with market participants to determine whether other changes should be made to reflect different staffing levels or operational changes during overnight hours.

Q4. Should market-wide circuit breaker (MWCB) rules be amended to allow halts to be triggered based on a drop in the S&P 500 Index outside of regular trading hours?

Two thirds of respondents also supported allowing MWCB to be triggered outside of regular trading hours. In addition to single stock volatility protections, the MWCB mechanism provides a cooling-off period where the entire market is halted on a 7% (Level 1), 13% (Level 2), or 20% (Level 3) decline in the S&P 500 Index. However, MWCB halts are only declared during regular trading hours from 9:30 a.m. to 4:00 p.m. This means that if there were to be a significant market correction during the regular pre- or post-market, or in the overnight session, MWCB would not trigger and there would not be any corresponding cooling-off period. With two "near misses" on April 4 and 10, 2025, and continued macroeconomic uncertainty, thought should be given to whether and how to extend these protections to all sessions.

There are also practical considerations that must be discussed before extending MWCB beyond regular trading hours. For one, the S&P 500 Index is not currently calculated and published during these extended hours. As a practical matter, this means that some other reference price may have to be selected (e.g., an ETP like SPY).

There may also be concerns about whether any proxy for the U.S. equity market is meaningful at a time when most stocks are not trading.[17] This concern could be mitigated somewhat by switching the reference to an ETP as market participants are able to price in the value of components that are not actively trading. However, limited liquidity in such instruments today may raise other concerns making this choice unsuitable.

Concerns around liquidity and participation in the overnight session should also be factored into the decision of when to resume trading if a Level 3 decline occurs outside of regular trading hours. In such instances, halts should not extend to the core session. For example, if a Level 3 decline occurs at 1 a.m. on a Monday morning, trading could be allowed to resume at 9:30 a.m. that same day even though those times are on the same trade date.

65%

Yes, MWCB rules should be amended to allow halts to be triggered based on a drop in the S&P 500 Index outside of regular trading hours

35%

No, MWCB rules should not be amended to allow halts to be triggered based on a drop in the S&P 500 Index outside of regular trading hours

MEMX Recommendation:

- Continued discussion as to whether and how to extend MWCB to overnight trading, including selection of an appropriate reference product.
- If MWCB is extended to cover all hours, halts should be limited to pre- and post-market and not extended to regular trading hours.

17 A related consideration concerns the relationship between MWCB and any price bands, which may impact how far the market can drop in the overnight session.

Q5. When should the market reopen after MWCB Level 3?

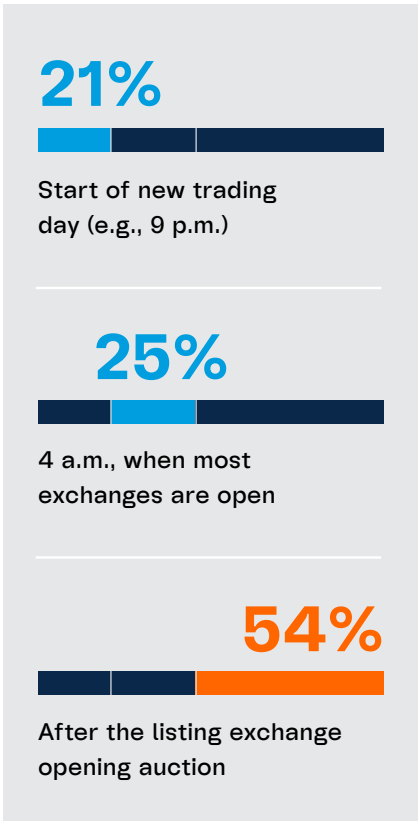
The final question of our poll covers the MWCB resumption process. MWCB rules provide that the market shall be halted if the S&P 500 Index declines by 20% during regular trading hours. Unlike a Level 1 or Level 2 decline, both of which trigger a short 15-minute cooling-off period, a Level 3 decline in the S&P 500 Index triggers a halt for the rest of the trading day.

Currently, trading is set to resume as normal the next trading day with the start of pre-market trading at 4 a.m. Generally, this 4 a.m. start time reflects a judgment that operational resiliency would be better served by not requiring that market participants be prepared to use special procedures to handle the re-open after a rare but significant market event.

However, exchange rules do not explicitly reference this 4 a.m. start time. Instead, those rules state that the market will remain halted "for the remainder of the trading day."[18] As a result, unless existing MWCB rules are amended, the start time following a Level 3 decline would shift to coincide with the start of the new trade date. A minority of respondents seem to prefer that next day resumption continues to operate under this logic when exchanges eventually expand their trading hours, putting the new re-opening time around 9 p.m.

By contrast, the vast majority of respondents seem to want this to change with more than half suggesting that the market should re-open with the listing exchange opening auction, and the remainder preferring some pre-market trading starting at 4 a.m. Given the significance of a Level 3 MWCB trigger, it's not surprising that market participants would want to wait until the full panoply of venues and market participants are available to trade.

As between 4 a.m. and 9:30 a.m., a handful of factors noted by respondents weigh in favor of waiting for the opening auction. First, it's not clear that exchanges that trade overnight will do so with a separate session, and market participants have expressed a preference for extending the existing pre-market session. This means that there may be no 4 a.m. demarcation point, at least on exchanges that would ordinarily trade during the overnight session. Second, in the absence of operational reasons to continue with a 4 a.m. resume time, the market may be better served by a longer cooling-off period following an extremely significant market-wide event. Finally, and perhaps most importantly, listing exchange opening processes are designed to consolidate liquidity and aid in robust price discovery. Using these mechanisms may therefore help the market to efficiently transition to a new price, helping to temper volatility and promoting stability at a time of market uncertainty.



MEMX Recommendation:

If a Level 3 decline occurs and the market is halted, trading should resume with the opening auction on the primary listing exchange.

18 See, e.g., MEMX Rule 11.23(b)(2).

Conclusion

MEMX appreciates all those who took part in our member poll. While there does not appear to be full consensus on all questions, the survey responses highlight how market participants are thinking about our investor protection regime and the changes that should be considered as we move toward a 24-hour U.S. equity market.

Clearly there is work to be done across all key investor protections discussed in the survey, i.e., LULD, clearly erroneous, and MWCB. Such investor protections often have a long shelf-life as they become ingrained elements of U.S. equity market structure. Putting thought into these questions now will ensure that they are fit for purpose as this market evolves over time.