

JULY 2025

Performance of Municipal Bond Exchange-Traded Funds During April 2025



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Introduction and Background¹

Beginning on April 3, 2025, global financial markets experienced severe volatility resulting from market uncertainty. Volatility was not limited to the equity market, where the S&P 500 Index declined 19% by April 8, less than two months after reaching an all-time high on February 19. Rather, it also affected fixed-income markets, including the municipal securities market. At first, interest rates declined on April 3 but then surged between April 4 and April 11. Consistent with previous MSRB research, higher yields and higher interest-rate volatility led to higher volumes in municipal securities, especially regarding the number of trades processed.² Specifically, the month of April 2025 recorded a new trade-count high of 1.72 million trades and the week of April 7 saw the most trades in a week at 450,000. Finally, the eight largest days for trades all occurred in April, culminating in 113,000 trades on April 9.³ Overall, market volatility was relatively short-lived and receded to levels seen prior to April 2 by month-end, however, this month provides a unique opportunity for analysis and introspection.

According to the Investment Company Institute (ICI), during April 2025, both tax-exempt mutual funds and tax-exempt exchange-traded funds (ETFs) experienced net outflows.⁴ Tax-exempt mutual funds experienced outflows of more than \$9 billion while tax-exempt ETFs experienced their largest single week of outflows totaling \$1.4 billion.⁵ Similar to all other securities and unlike mutual funds, ETFs can be traded throughout the day, making them attractive to investors who

¹ The views expressed in the research papers are those of the author(s) and do not necessarily reflect the views and positions of the MSRB Board and other MSRB staff.

² See Wu, Simon and John Bagley, "[What Drives Trading Volume in the Municipal Securities Market? A Study of Likely Factors](#)," Research Paper, Municipal Securities Rulemaking Board, February 2025.

³ See Bagley, John, Marcelo Vieira and Simon Wu, "[April 2025 Market Recap](#)," Research Paper, Municipal Securities Rulemaking board, May 2025.

⁴ Id.

⁵ Id.

want to react to market movements in real time. Most ETFs are designed to track a benchmark index closely. The supply, demand and pricing of ETF shares are controlled by a unique creation and redemption process. This process involves authorized participants engaging in arbitrage activities to adjust the price for ETFs and/or underlying securities so that ETF prices align with the net asset value (NAV) of their benchmark indices.⁶

Historically, under normal market conditions, ETFs will closely track the corresponding benchmark indices. However, during market stress periods, ETF prices can diverge from the indices significantly, albeit temporarily. One possible explanation is that some of the largest municipal bond ETFs are usually more actively traded than the underlying bonds.⁷ Unlike the ETFs, which trade in real time, the corresponding indices are priced at a preset frequency (at least daily) based on each underlying bond's evaluated price. When a bond does not trade often or not at all during a volatile period, its evaluated price may lag the actual market movement. This research paper analyzes how municipal bond ETFs behaved in April 2025 by empirically comparing the price movement of the three most frequently traded municipal bond ETFs to their respective targeted indices to make inferences about the larger muni ETF universe.

Data and Methodology

For this paper, we focus on three of the most-frequently traded tax-exempt municipal bond ETFs:⁸ the iShares National Muni Bond ETF (ticker symbol: MUB), which seeks to track the performance of the ICE AMT-Free US National Municipal Index ("ICE AMT-Free"),⁹ the Vanguard Tax-Exempt Bond Index Fund ETF (ticker symbol: VTEB), which seeks to track the S&P National AMT-Free Municipal Bond Index ("S&P AMT-Free"),¹⁰ and the VanEck Vector High Yield Municipal Index ETF (ticker symbol: HYD), which seeks to track the ICE Broad High Yield Crossover Municipal Index

⁶ In the case when there is a price deviation between ETFs and the NAV of their underlying securities, authorized participants create or redeem ETF shares as a way of arbitrage for profit making. See Wu, Simon Z. and Meghan Burns, "[Municipal Bond ETFs: Liquidity Impact on Municipal Bond Market](#)," MSRB Research Paper, April 2018.

⁷ The illiquid nature of many municipal bonds has been well-documented. See Wu, Simon Z., "[Transaction Costs for Customer Trades in the Municipal Bond Market: What is Driving the Decline?](#)" MSRB Research Paper, July 2018.

⁸ University of Chicago recently selected the same three municipal bond ETFs among the total of 11 municipal bond ETFs for their "consistent daily put/call trading volume" to be included in the University of Chicago Municipal Bond VIX index calculation.

⁹ See <https://www.ishares.com/us/products/239766/ishares-national-amtfree-muni-bond-etf>.

¹⁰ The daily net asset value of an index is determined by the weighted average of the evaluated price of each individual bond in the index. See <https://us.spindices.com/indices/fixed-income/sp-national-amt-free-municipal-bond-index>.

("ICE High Yield").¹¹ We obtained the ETF data from [nasdaq.com](https://www.nasdaq.com)¹² and the indices data directly from the vendors who created those indices. While both MUB and VTEB seek to replicate broad-based tax-exempt bond indices, HYD intends to track the performance of a niche segment of the municipal securities market, high-yield tax-exempt bonds.

All analyses below are conducted for each day in the period between January 2, 2025, and April 30, 2025, with the "Prior Period" covering January 2 through April 2 and the "Observation Period" covering April 3 through April 30. When necessary, our analyses present the results for HYD separately from MUB and VTEB because of the differences in the mix of securities in their respective portfolios.

Summary of Findings

Trading in Municipal Bond ETFs

While the municipal securities market witnessed heavy trading volume during April 2025,¹³ tax-exempt municipal bond ETFs experienced much more dramatic increases in trading volume amid market volatility, as shown in Chart 1. The average daily dollar volume traded¹⁴ was approximately \$790 billion for the three ETFs during the Prior Period but surged to nearly \$1.9 billion during the Observation Period. In addition, the daily dollar volume for the three ETFs hit over \$4.7 billion on April 9, when there was an announcement on tariffs during the trading day, nearly six times the average during the Prior Period. Subsequently, the daily trading volume gradually declined through the rest of the month from the April 9 peak.

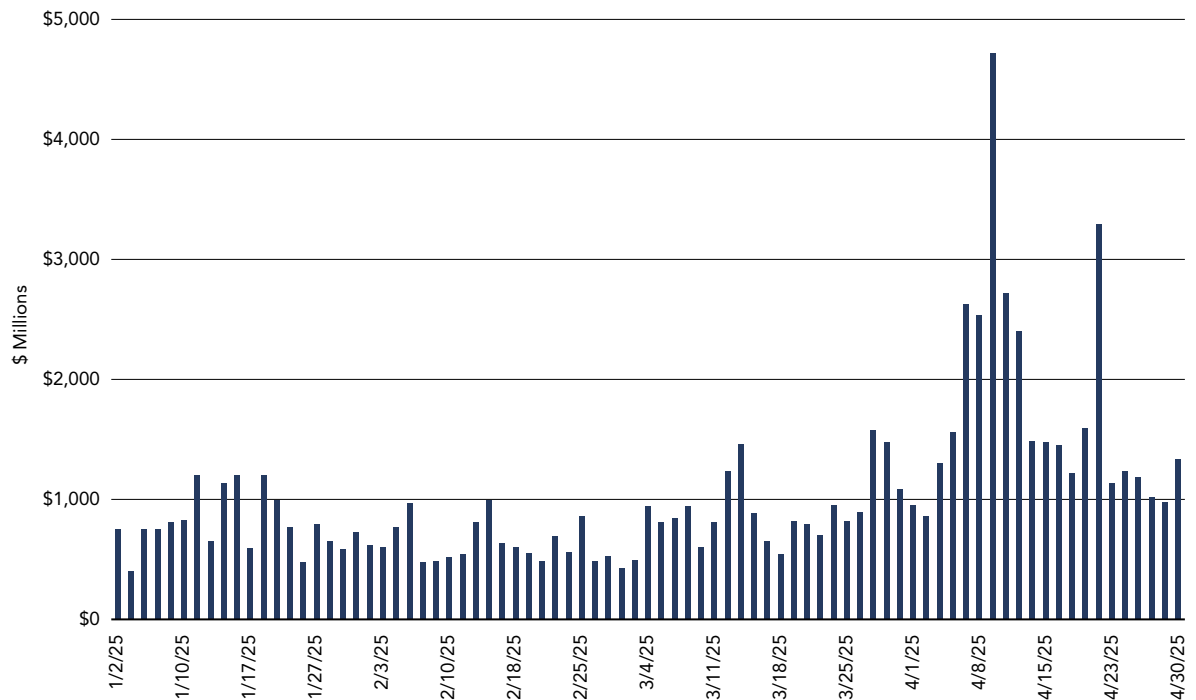
¹¹ A broad-based benchmark that measures the non-investment grade and non-rated, US dollar-denominated, fixed-rate high yield long-term tax-exempt bond market. See <https://www.vaneck.com/us/en/investments/high-yield-muni-etf-hyd/overview/>.

¹² Nasdaq, *iShares National Muni Bond ETF (MUB) Historical Data*, accessed May 30, 2025, <https://www.nasdaq.com/market-activity/etf/mub/historical>; Nasdaq, *Vanguard Tax-Exempt Bond ETF (VTEB) Historical Data*, accessed May 30, 2025, <https://www.nasdaq.com/market-activity/etf/vteb/historical>; Nasdaq, *VanEck High Yield Muni ETF (HYD) Historical Data*, accessed May 30, 2025, <https://www.nasdaq.com/market-activity/etf/hyd/historical>.

¹³ See Bagley, John, Marcelo Vieira and Simon Wu, "[April 2025 Market Recap](#)," Research Paper, Municipal Securities Rulemaking board, May 2025.

¹⁴ Calculated as the number of daily shares traded multiplied by the closing price.

Chart 1. Daily Dollar Volume Traded for Top Three Municipal Bond ETFs
January 2, 2025–April 30, 2025



Source: MSRB's analysis of ETF historical data downloaded from nasdaq.com

Market Volatility

Not surprisingly, volatility spiked during the Observation Period when compared to the Prior Period. For this analysis, we calculated the intra-day volatility for the three municipal bond ETFs, MUB, VTEB and HYD. Intra-day volatility is calculated as the difference between the daily high price and daily low price as a percentage of the daily average price.

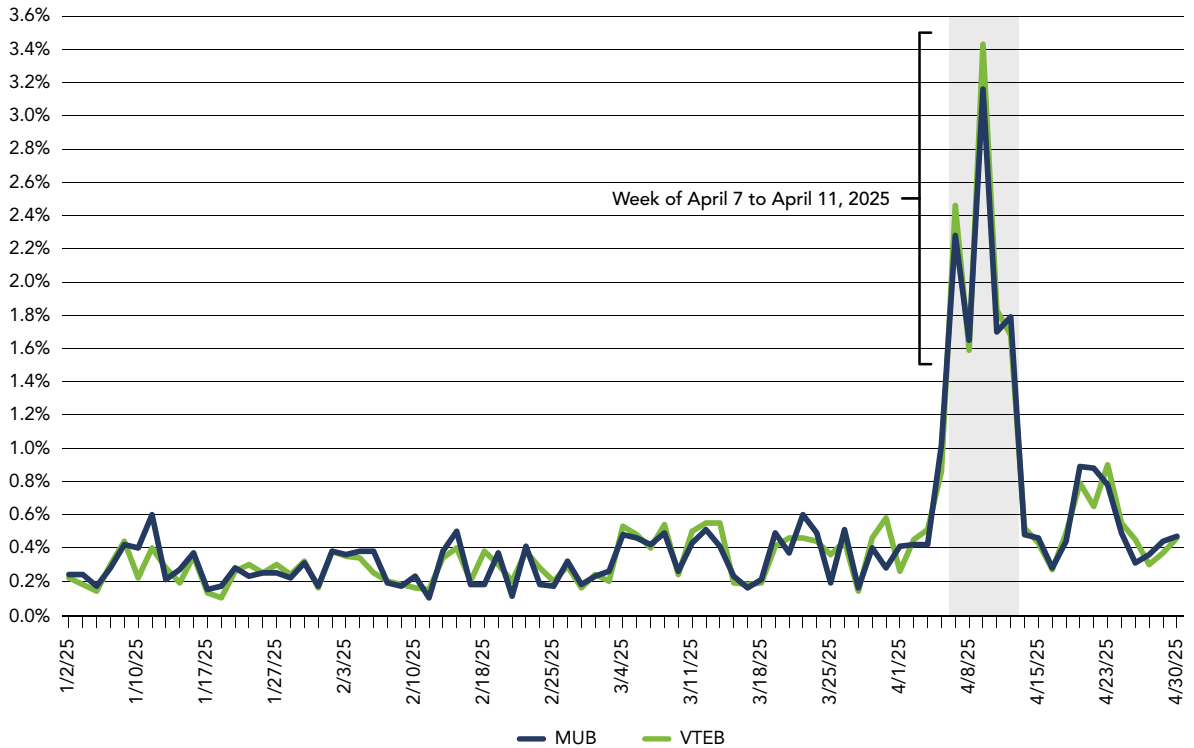
While day-to-day volatility¹⁵ is another method to measure market volatility over time,¹⁶ we chose to focus on intra-day volatility due to the uniqueness of April 9 and April 10, when market uncertainty and unexpected policy announcements caused large movements in prices during trading hours across financial markets.

¹⁵ Day-to-day volatility is calculated by using the standard deviation (the square root of variance) of the daily return over a period. It is used as a statistical measure of market volatility to assess how widely prices are dispersed from the average price.

¹⁶ We found a similar spike in volatility during the post-April 2 period in April 2025 (Observation Period) when using the standard deviation of daily returns, with the increase exceeding the scale of the previous rise in 2022 and 2023 when the inflation rate surged.

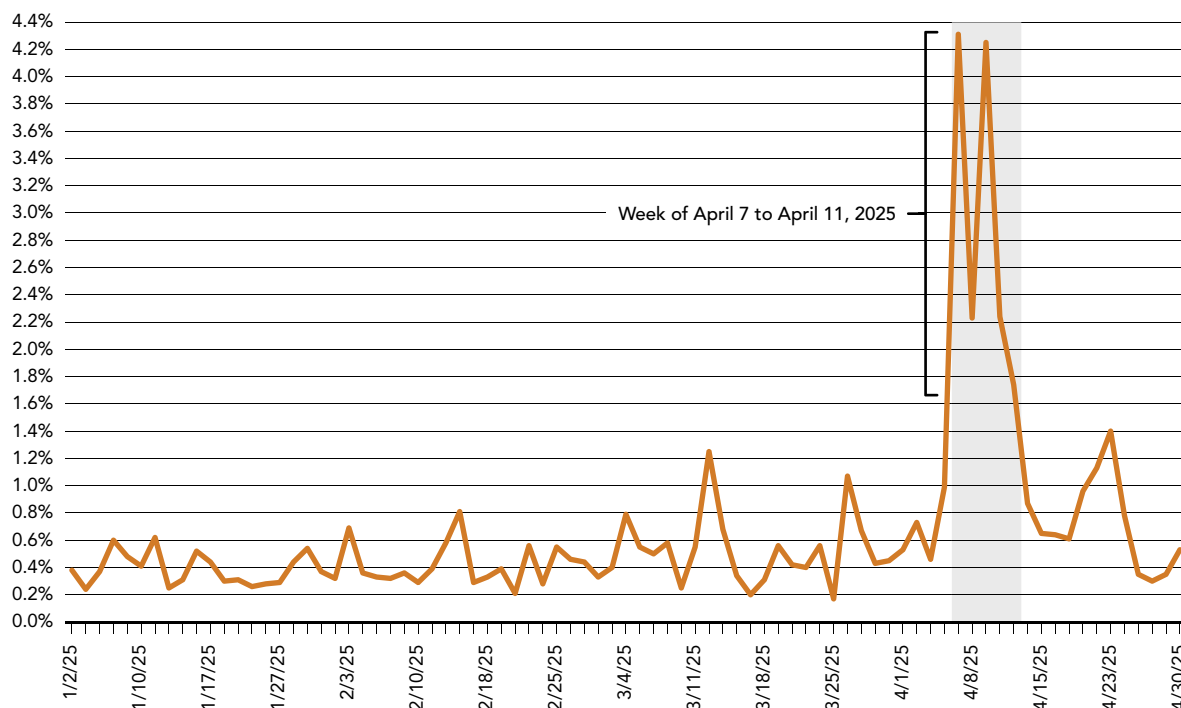
Chart 2A examined the intra-day volatility for MUB and VTEB by calculating the difference between the daily high price and daily low price as a percentage of the daily average price, while Chart 2B presented the intra-day volatility for HYD. The intra-day volatility for all three ETFs increased dramatically on Friday, April 4 and then continued to soar until hitting a peak on April 9, when the 90-day pause on tariffs was announced. For the rest of April, the intra-day volatility for all three ETFs gradually returned to the level prior to April 2.

Chart 2A. Intra-Day Volatility for MUB and VTEB, January 2, 2025–April 30, 2025



Source: MSRB's analysis of ETF historical data downloaded from nasdaq.com

Comparing intra-day volatility among the three ETFs in Charts 2A and 2B, HYD consistently experienced higher intra-day volatility than MUB and VTEB, with an average intra-day volatility of 0.7% during the Prior Period, as compared to 0.5% for both MUB and VTEB. In addition, HYD's intra-day volatility reached a peak of around 4.3% on both April 7 and April 9, while the peak for MUB was 3.2% and for VTEB was 3.4% on April 9.

Chart 2B. Intra-Day Volatility for HYD, January 2, 2025–April 30, 2025

Source: MSRB's analysis of ETF historical data downloaded from nasdaq.com

Price Movement of ETFs and Indices

In Charts 3A, 3B and 3C, we compared the day-to-day price movement of the three ETFs in April 2025 with their respective benchmark indices. There have been persistent debates on the market efficiency of ETFs when their prices diverge from the values of their corresponding indices. While there are contending schools of thought on why fixed-income ETFs may trade at large discounts during volatile periods, researchers and market participants focus on two possible explanations. One explanation is that during a market stress period, market illiquidity may impact an ETFs' arbitrating mechanism, leading to a significant price divergence between the fixed-income ETFs and the benchmark indices.¹⁷ For some fixed-income ETFs, because the underlying securities tend to be less liquid than the ETFs themselves, authorized participants may have a harder time executing arbitrating activities by selling the bonds they received for ETF share redemption efficiently enough to swiftly narrow the pricing gap.¹⁸ This may be especially true when liquidity is severely squeezed during a stress period,¹⁹ causing ETF prices to deviate from

¹⁷ Kevin Pan and Yao Zeng, "ETF Arbitrage Under Liquidity Mismatch," *Working Paper Series No. 59* (December 2017), European Systemic Risk Board.

¹⁸ Or vice versa, by buying bonds to create more ETF shares for selling into the market.

¹⁹ This is often referred to as "liquidity mismatch," which would negatively affect the price-tracking ability of those fixed-income ETF products.

their corresponding indices' values. The other explanation is that since many bonds in an index rarely trade, their evaluated bond prices provided by vendors may lag rapid market movements, especially during a volatile period. This is further complicated by the fact that indices are not priced in real time, unlike ETFs which are traded constantly in the open market. Because of the real-time trading capability of an ETF, the ETF may reflect the "true" value of an index better than the calculated NAV for the index, with the divergence caused by the "laggard" NAV. Regardless of the explanation, MSRB's past research illustrated that a broad-based ETF, such as MUB and VTEB, would likely perform better than a more targeted ETF, such as HYD, during a stress period because of the different mix of bonds in each fund.²⁰

We chose the week of March 17, two weeks prior April 2, rather than January 2 as the starting point to focus on the critical period leading to April 2025. Both the ETF prices and their corresponding benchmark indices' values were normalized as of March 17, 2025. For MUB in Chart 3A and VTEB in Chart 3B, both ETFs were tracking their corresponding indices closely until April 2, when both ETFs' prices dipped lower than the indices' NAVs. Those gaps persisted until April 22 (except for April 9), when the ETF prices and indices' values closed their disparities almost entirely and then mirrored each other's movement for the rest of the month.

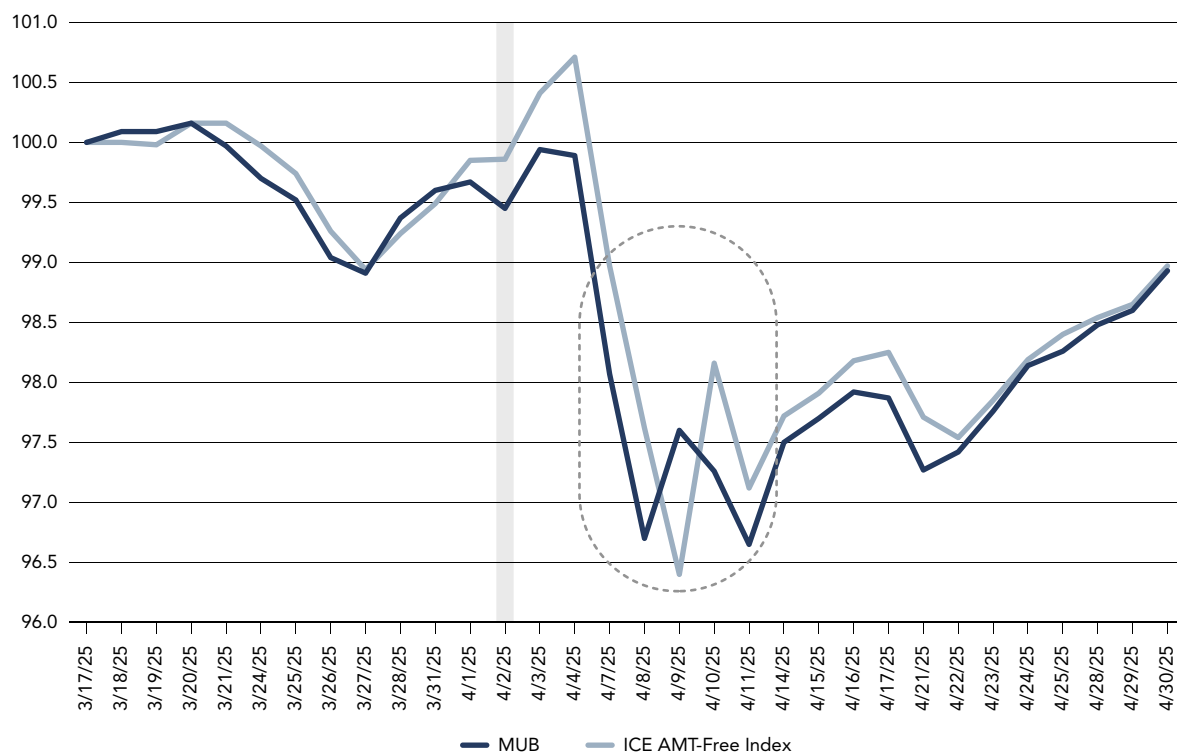
In addition to the persistent gaps between April 2 and April 22, the week of April 7 through April 11 experienced massive daily swings in prices for both ETFs and their indices, with the ETFs and indices moving in opposite directions on April 9 and April 10. For comparison, these daily swings were also experienced by benchmark tax-exempt yield curves. For the most volatile week of April 7 through April 11, it appears that the prices of MUB and VTEB were less volatile than their respective benchmark indices' NAVs, as illustrated in Charts 3A and 3B inside the ovals. ETF prices also seemed to have adjusted more quickly than the indices' values in a rapidly changing market.²¹ The gaps between the two ETFs' prices and their respective benchmark indices' values returned to the Prior Period level by the following week of April 14. Both MUB and VTEB reached the new "equilibrium" values by exhibiting less price fluctuation than their respective benchmark

²⁰ See Wu, Simon, "[Trading in Municipal Bond ETFs During the COVID-19 Crisis: Price versus Net Asset Value.](#)"

²¹ The real-time trading price of ETFs can be a source of price discovery of where investors are valuing the underlying portfolio of bonds.

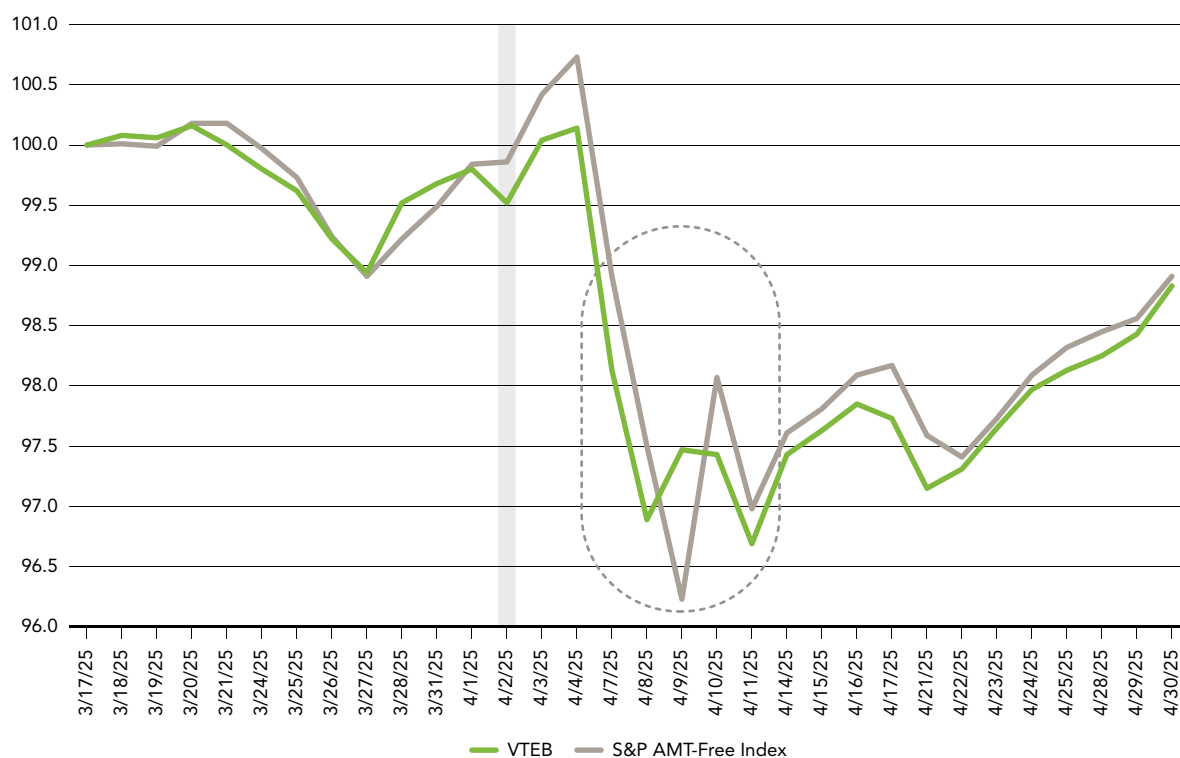
indices. These results contrast with MSRB's previous study on ETF pricing in March 2020, when the COVID-19 pandemic caused a brief and severe market disruption. MSRB's study showed that market illiquidity more so than volatility appeared to have impacted the ETF tracking mechanism, leading to a significant price divergence between fixed-income ETFs and their benchmark indices and higher volatility for the ETFs.²²

Chart 3A. Price Movement of MUB and ICE AMT-Free Index, Normalized as of March 17, 2025



Source: MSRB's analysis of ETF historical data downloaded from nasdaq.com and index data from ICE

²² See Wu, Simon "Trading in Municipal Bond ETFs During the COVID-19 Crisis: Price versus Net Asset Value." In particular, the degree of price divergence between ETFs and benchmark indices seemed to be related to the liquidity of underlying bonds in the indices in March 2020, where an illiquid portfolio such as the high-yield municipal bond portfolio exhibited a much larger divergence than the more liquid investment-grade municipal bond portfolio.

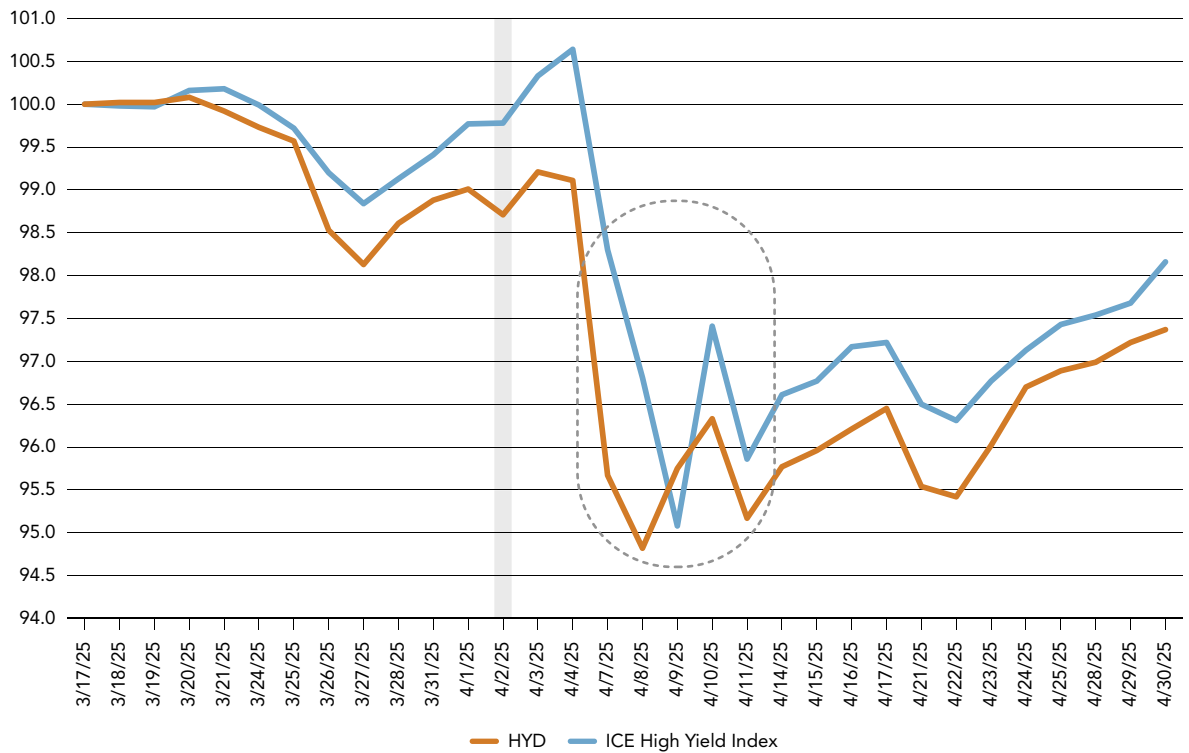
Chart 3B. Price Movement of VTEB and S&P AMT-Free Index, March 17, 2025–April 30, 2025, Normalized as of March 17, 2025

Source: MSRB's analysis of ETF historical data downloaded from [nasdaq.com](https://www.nasdaq.com) and index data from S&P Global

The price movement of HYD in relation to its corresponding index, the ICE High Yield Index, was similar to the movements of MUB and VTEB, where the ETF price underperformed the index NAV throughout most of April. However, Chart 3C shows that the price gap between the index and HYD started developing on March 26, one week earlier than the gaps for MUB and VTEB. The price gap widened after April 2 before narrowing towards the end of April, though the gap was never totally bridged as of April 30.²³ In addition, like MUB and VTEB, HYD and its corresponding ICE High Yield Index also experienced severe price fluctuation during the week of April 7 through April 11, with HYD and the ICE High Yield Index moving in opposite directions on April 9, and the price for HYD briefly exceeding the price for the index on April 9 before falling behind again on April 10. Unlike MUB and VTEB, HYD's price volatility appeared to be similar to the volatility of the index NAV during the week of April 7 through April 11, as shown in the oval in Chart 3C.

²³ The slow narrowing of the gap between HYD and its corresponding index relative to MUB and VTEB was also present during the COVID-19 market crisis in March 2020. See [Trading in Municipal Bond ETFs During the COVID-19 Crisis: Price versus Net Asset Value](#).

Chart 3C. Price Movement of HYD and ICE High Yield Index, March 17, 2025–April 30, 2025
Normalized as of March 17, 2025

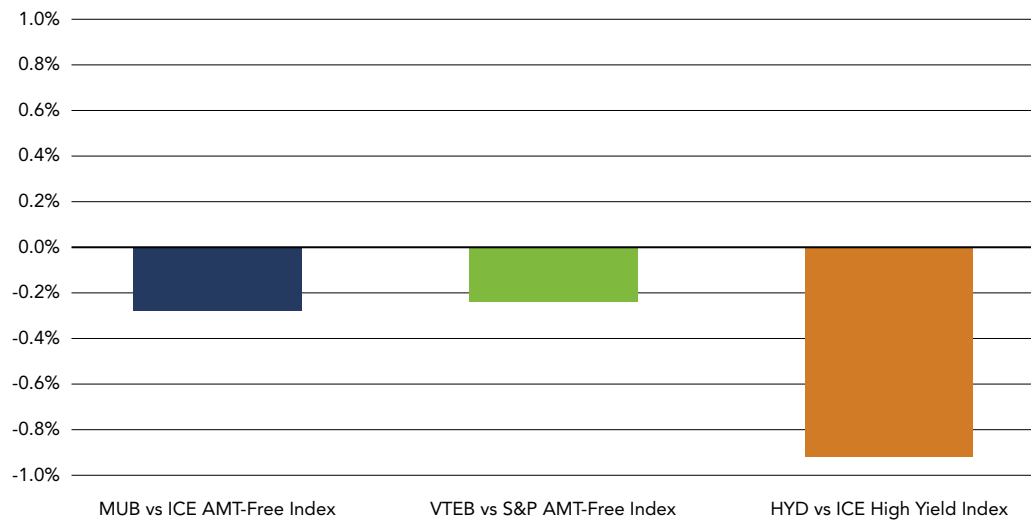


Source: MSRB's analysis of ETF historical data downloaded from nasdaq.com and index data from ICE

Overall, there are differences in the price gaps between the three ETFs during the Observation Period, as shown in Charts 3A, 3B and 3C. Chart 4 summarizes the average daily price deviation between the three ETFs and their respective benchmark indices for the Observation Period. The average daily deviation was -0.28% for MUB (MUB's price was 0.28% lower than the index's NAV, on average) and -0.24% for VTEB, while it was -0.92% for HYD, showing that HYD deviated much more from its corresponding index than MUB and VTEB.²⁴

²⁴ It should be noted that over time, ETF prices are slightly lower than indices' NAV due to the fees embedded in ETF products.

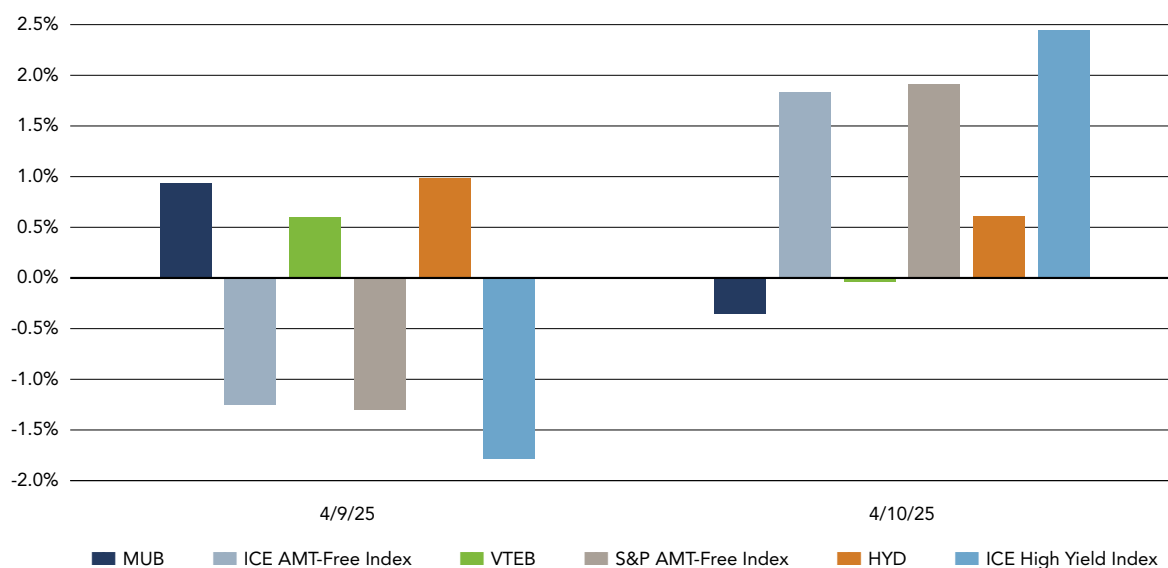
Chart 4. Average Daily Price Deviation Between Three ETFs and Corresponding Benchmark Indices, April 3, 2025–April 30, 2025 (Observation Period), Normalized as of March 17, 2025



Source: MSRB's analysis of ETF historical data downloaded from nasdaq.com and index data from ICE

Uniqueness of April 9 and April 10, 2025

As mentioned earlier, the prices of the three municipal bond ETFs and the NAVs of their corresponding benchmark indices fluctuated wildly after April 2. In particular, there are two days that stand out more than others—April 9 and April 10. On these two days, the movements of all three ETFs diverged significantly from their corresponding indices. Chart 5 illustrates that all three ETFs moved in the opposite direction of their respective indices on April 9, while two out of the three ETFs did the same thing on April 10.

Chart 5. Daily Movement Comparison for Three ETFs and Corresponding Benchmark Indices, April 9 and April 10, 2025

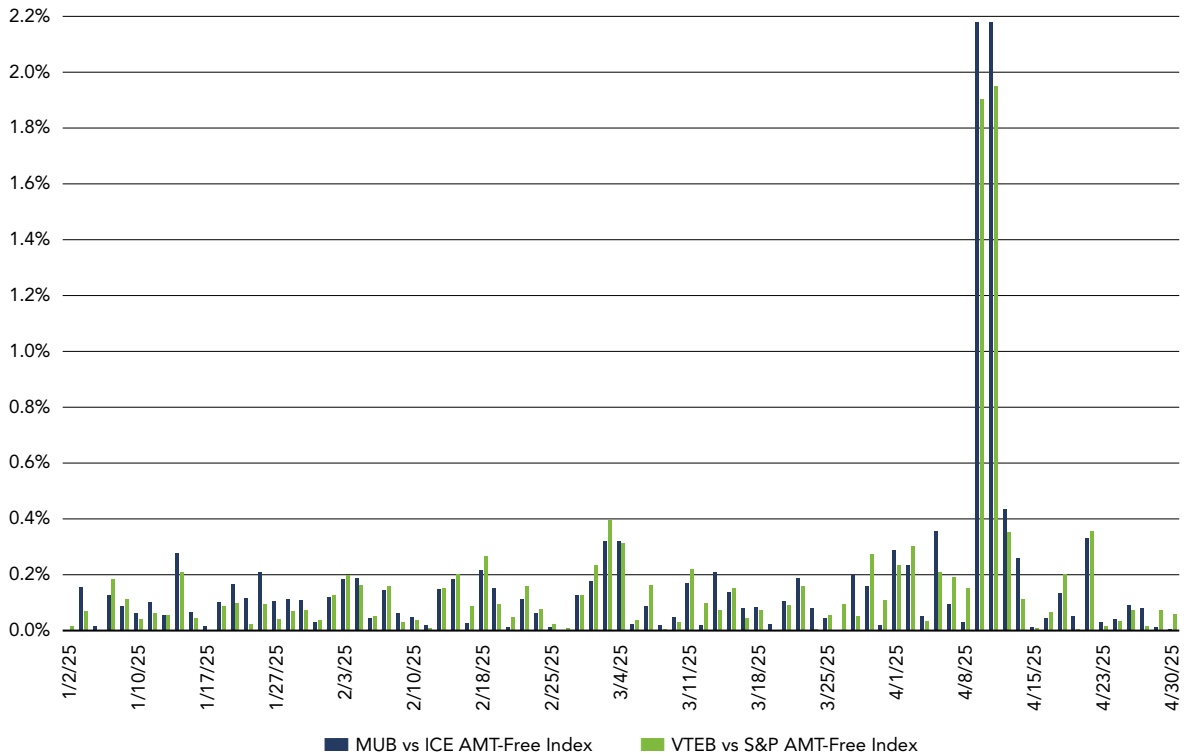
Source: MSRB's analysis of ETF historical data downloaded from nasdaq.com and indices data from ICE and S&P Global

While it was not the first time that ETFs and their corresponding indices moved in opposite directions, nor was it entirely rare during the studied period from January 2 through April 30, 2025,²⁵ the degree of divergence in the daily movements was substantial for April 9 and April 10. Charts 6A and 6B calculate the absolute difference in daily returns between the three ETFs and their corresponding benchmark indices and show that the differences on April 9 and April 10 were significantly higher when compared to other days during the relevant period. For MUB and VTEB, the typical daily absolute difference between the price returns was no more than 0.4%, with an average of only 0.1% for the Prior Period. On April 9 and April 10, however, the difference reached nearly 2.2% for MUB and about 1.9% for VTEB. One possible explanation for April 9 was that the tariff-related news arrived late in the trading hours when the indices' closing NAV may have already been set for the day,²⁶ causing the NAV to miss the dramatic market movements in the last hours of trading.

²⁵ Divergence occurred for 16% of days for MUB and HYD, or one in six, and 12% of days for VTEB, or one in eight.

²⁶ Anecdotal evidence suggests that the daily closing NAV for bond indices is usually set between 2 pm and 3 pm when the market is still relatively liquid, rather than the actual market closing time of 5 pm. ICE stated that NAV price may be calculated at 3 pm: <https://www.ice.com/insights/market-pulse/exchange-traded-funds-in-volatile-markets>. See also BlackRock, "Lessons from COVID-19: ETFs as a Source of Stability," July 2020, which stated that "NAV is calculated and published at the end of day's trading for US markets, typically at 3 pm New York time for this exposure."

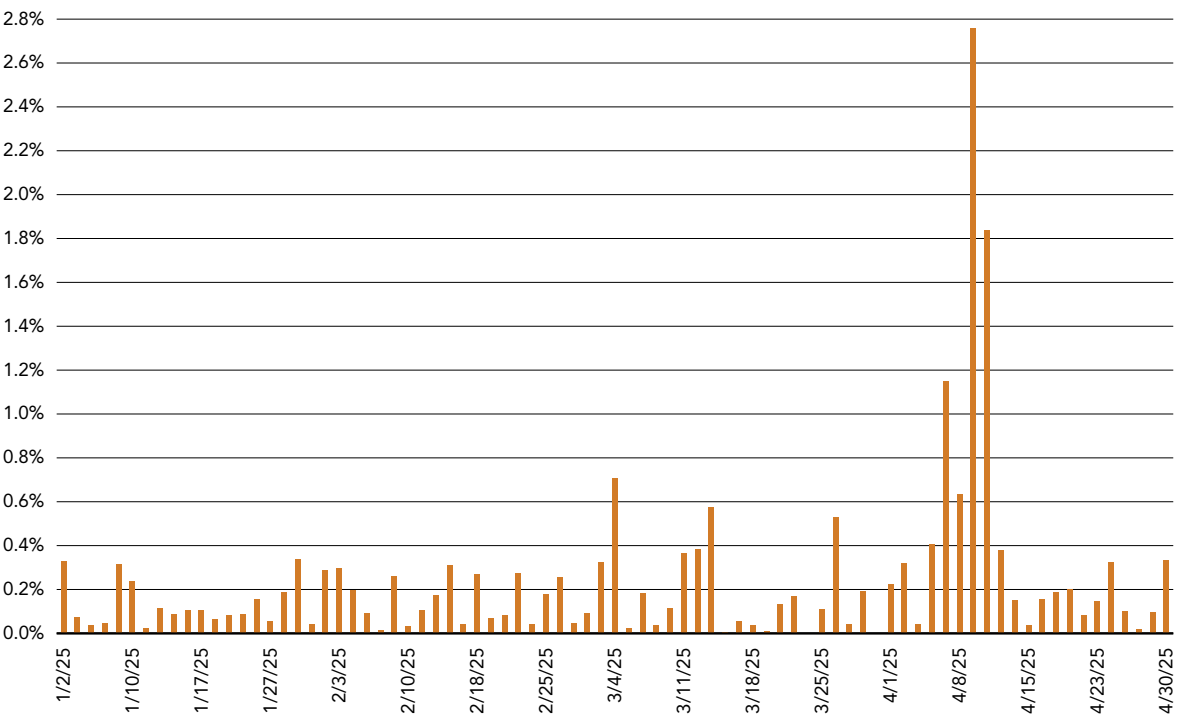
Chart 6A. Absolute Difference in Daily Return Between MUB and ICE AMT-Free Index, and Between VTEB and S&P AMT-Free Index, January 2, 2025–April 30, 2025



Source: MSRB's analysis of ETF historical data downloaded from nasdaq.com and the indices data from ICE and S&P Global

Similarly, HYD also experienced a sharp rise in the absolute difference of the daily returns on those two days, reaching 2.8% on April 9 and 1.8% on April 10. The average absolute difference was a bit higher for HYD than for MUB and VTEB for the Prior Period, nearly 0.2%, but still significantly below the levels on April 9 and April 10.

Chart 6B. Absolute Difference in Daily Return Between HYD and ICE High Yield Index, January 2, 2025–April 30, 2025



Source: MSRB's analysis of ETF historical data downloaded from nasdaq.com and indices data from ICE and S&P Global

Conclusions

Tax-exempt municipal bond ETFs experienced high trading volume and volatility during the month of April 2025, similar to the municipal securities market. Since ETFs are designed to track an index's NAV for a portfolio of bonds, deviation from the NAV can result in investors purchasing or selling a financial product whose value is different from what investors reasonably believe it to be. So, how did these ETFs perform in April 2025?

While there are different theories on why pricing divergence may happen during market stress periods, the April 2025 period indicates that frequently traded municipal bond ETFs, such as MUB and VTEB, differed in pricing from the underlying assets that compose their benchmark indices. They also exhibited a steadier progression to new equilibrium values by the end of the month than the indices. Those ETFs' prices appeared to have less volatility than the corresponding indices' NAVs during the critical week of April 7 to April 11 and have since adjusted quickly and smoothly in a rapidly changing market. This is likely because ETFs are traded in real-time in the market while many underlying bonds that comprise the index do not trade often, leading to a slower reaction of the index to the fast-changing market dynamics. In addition, the tariff-related news arrived late in the trading hours of April 9, when indices' closing NAVs may have already been set for the day, causing the NAVs to miss the dramatic market movements in the last hours of trading. This finding contrasts with MSRB's previous study on ETF pricing during the COVID-19 crisis, which showed that market illiquidity more so than volatility appeared to have impacted the ETF tracking mechanism, leading to a significant price divergence between fixed-income ETFs and their benchmark indices.

ABOUT MSRB

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