



SIFMA Insights

A Deeper Look at US Listed Options Volumes

Additional Tracking of the SPX and VIX Contracts

May 2020 (Updated)

Key Takeaways

- Are floor closings or extreme market volatility causing the decline in index option volumes?
- Total options ADV increased: peak 47.3M, +119%; current 25.3M contracts, +17%
- Index options ADV dropped significantly in April to 1.6M contracts, -52% M/M and -11% 2019 avg
- SPX & VIX April ADV (contracts): SPX 1.2M, -16.0% historical levels; VIX 331K, -44.6%
- This report also includes a comprehensive market share assessment by exchange



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Executive Summary

The emergence of the global pandemic Covid-19 in the first quarter of 2020 caused severe economic and capital markets shocks. This turmoil was evidenced by heightened volatility and spikes in volumes in U.S. listed options markets, which closed the first quarter with their worst performance since the financial crisis. In light of the health crisis, many exchanges temporarily closed their physical trading floors.

Floor based trading continues to have a presence in U.S. listed options trading, which is not 100% electronic today. Three of the five exchange parent groups run a hybrid (electronic + human) model on at least one of their exchange licenses. The exchange landscape includes:

- Cboe, 4 exchanges, 1 hybrid model (Cboe floor temporarily closed March 16)
- Nasdaq, 6 exchanges, 1 hybrid model (PHLX floor temporarily closed March 17)
- NYSE, 2 hybrid exchanges (owned by Intercontinental Exchange; floors temporarily closed March 20, Arca reopened May 4, American scheduled to partially reopen May 26)
- MIAX, 3 all-electronic exchanges
- BOX, 1 all-electronic exchange (open outcry trading floor temporarily closed March 20, reopened May 4)

While markets have remained opened, market participants have wondered what impact the floor closings has had on order execution, particularly for more complex orders. We analyze this question inside this note.

In general, options volumes increased with the turmoil. Total options volumes ADV peaked at 47.3 million contracts on February 28, +119% from the start of the year. Options ADV remains slightly elevated at 25.3 million contracts (April 30), +17% from the start of the year. Yet, the increases in volumes were not equal across asset classes:

- Equity options peaked in March at 26.4M contracts, +41.5% versus last year's peak. Volumes came down in April to 24.2M, -8% M/M but are still elevated versus the 2019 average of 17.2M
- Index options peaked in March at 3.2M contracts, +43.2% versus last year's peak. Volumes dropped significantly in April to 1.6M contracts, -52% M/M and below the 2019 average of 1.8M
- The index trend continues down, averaging 1.2M (as of May 7), -34% to 2019 average. Conversely, the equity May trend (22.4M) is up 30% to 2019 average

As such, we have seen movements in the breakout of the equity and index segments as a percent of total volumes:

- In 2019, equity options represented 90.4% of total volumes versus index at 9.6%, on average
- 2020 has seen growth in equity, now 91.4% of the total and a peak of 93.9%. The trend is continuing in May (as of May 7), equity 94.5% of total
- While peaking at 11.0% of total volumes in March, index volumes fell to 6.1% of total in April, continuing to fall in May to 5.1%.

What has happened to index volumes? Index options volumes have come down. In this note we debate whether the closing of trading floors has negatively impacted index options or the extreme market volatility. The valuation and volatility, as well as trading complex multi leg strategies, become more complicated in times of market turmoil. You need to make a call on the future value of a whole index, essentially a whole economy, versus that for a single stock. This complexity is where the manual handling of orders benefits traders/investors, which is not available under the floor closings. On the other side of the debate, violent market moves are not conducive to executing some complex trading strategies. If the objective is to settle on a price for a product with twenty legs – and the market is moving hundreds of points – you cannot get these trades completed, and customers disappear.

This development is further displayed by trends in two popular index options contracts, the SPX (enables investors to gain broad exposure to the U.S. equities markets) and the VIX (enables investors to manage volatility and hedge portfolio volatility risk). These are proprietary products only offered to trade on the Cboe exchange, thereby impacted by the floor closure. Historically, SPX options represented 6%-7% of total options volumes (equity and index), with the VIX 2%-3%: SPX averaged 6.4% in 2019, VIX 2.5%. This percentage has fallen this year:

- SPX 2020 avg 5.6% through the end of April; peak 7.4%, trough 3.7%, April 4.3% (-2.1 pps to 2019 avg)
- SPX 2018 to April 2020 ADV 1.4 million contracts, versus 2020 ADV 1.6 million contracts and April 2020 ADV 1.2 million contracts (April 2020: -16.0% 2018 to April 2020 ADV, -25.3% 2020 ADV)
- VIX 2020 avg 2.2% through end of April; peak 5.2%, trough 1.0%, April 1.3% (-1.2 pps to 2019 avg)
- VIX 2018 to April 2020 ADV 597 thousand contracts, versus 2020 ADV 672 thousand contracts and April 2020 ADV 331 thousand contracts (April 2020: -44.6% 2018 to April 2020 ADV, -50.8% 2020 ADV)
- The drop in the VIX is greater than that of the SPX, as these strategies are even more complicated to be executed all electronically
- Conversely, SPY options volumes continue to grow: 2018 to April 2020 ADV 3.2 million contracts, vs. 2020 ADV 4.8 million contracts & April 2020 ADV 5.1 million contracts (April 2020: +59.5% 2019 ADV, +5.2% 2020 ADV). Market participants surmise people are switching to SPY from SPX in light of the floor closings.

This report also includes a comprehensive market share assessment by exchanges for total market volumes and within their own exchange complex: (please see greater details in the report and appendix)

- Total volumes (equity + index): For 1Q20: Cboe held the highest market share, 38.3%; followed by Nasdaq 32.9%, NYSE 16.5%, MIAX 10.0% and BOX 2.4%. At April 30: Cboe market share was +1.4 pps versus the start of the year, with NDAQ -1.0 pps, NYSE -2.0 pps, MIAX +1.8 pps and BOX -0.3 pps
- Index volumes only: For 1Q20: Cboe held the highest market share at 99.224%; followed by Nasdaq 0.610%, MIAX 0.163% and NYSE 0.004% (0% at BOX). At April 30: Cboe market share was +0.1 pps, with NDAQ -0.1 pps and both MIAX and NYSE flat
- SPY volumes: For 1Q20, Cboe held the highest market share at 34.3%; followed closely by Nasdaq 30.4% and then NYSE 19.1%, MIAX 14.9% and BOX 1.3%. At April 30: Cboe market share was +0.9 pps, with NDAQ -2.5 pps, NYSE -4.3 pps, MIAX +5.3 pps and BOX +0.5 pps

Market Volumes & Volatility

Market Overview

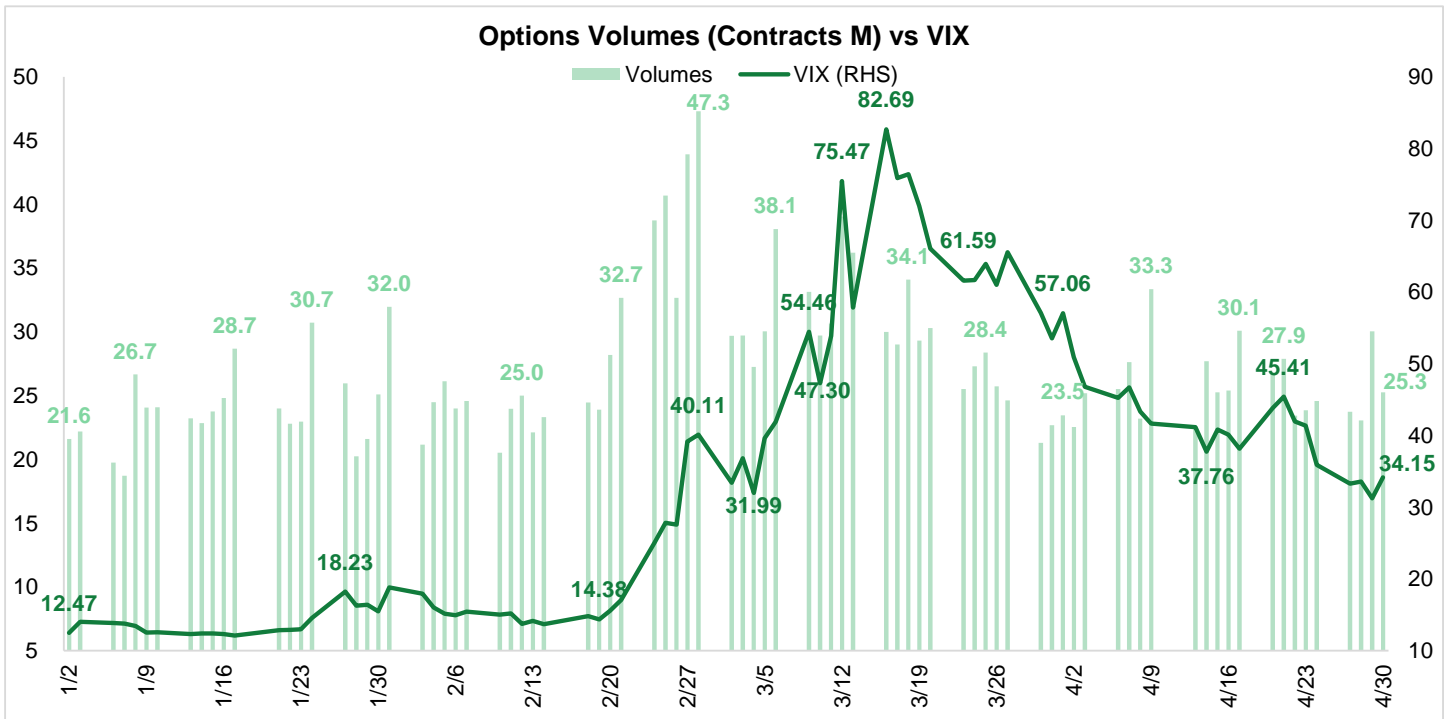
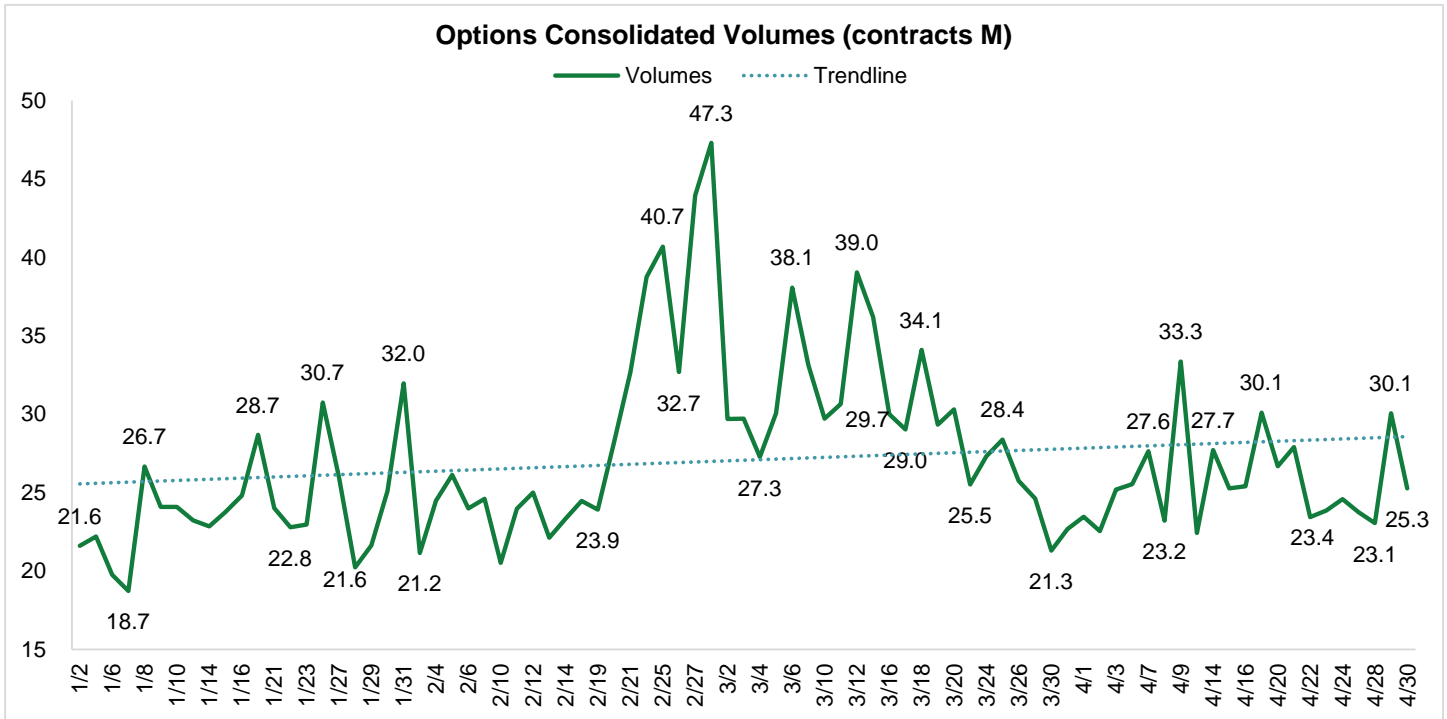
Analyzing volumes and volatility from January 2 to April 30, we note that options ADV began the year at a more normal level of 21.6 million contracts, while the VIX was at 12.47. Moving through the analysis time period, we highlight:

- Options ADV peaked at 47.3 million contracts on February 28, +119% from the start of the year
- Options ADV remains slightly elevated at 25.3 million contracts (April 30), +17% from the start of the year
- The VIX peaked at 82.69 on March 16, +563% from the start of the year
- The VIX remains elevated at 34.15 (April 30), +174% from the start of the year
- Volumes remain elevated, but the slope of the trendline has levelled off (May average 23.7 million contracts, as of May 7)

	Options ADV	Equity ADV	ETFs ADV	ETF % Equity	VIX
Jan 2	21.6	7.7	1.5	19.1%	12.47
Peak	47.3	19.4	5.6	29.8%	82.69
Peak/Jan 2	119%	150%	278%	55.8%	563%
Trough	18.7	6.7	1.1	15.6%	12.10
Apr 30	25.3	13.3	2.3	17.2%	34.15
Apr30/Jan 2	17%	71%	54%	-9.9%	174%
Jan ADV	24.1	7.6	1.5	19.3%	13.94
Feb ADV	28.8	9.3	2.0	21.9%	19.63
Feb/Jan	20%	21%	38%	13.6%	41%
Mar ADV	29.6	15.6	4.2	26.5%	57.74
Mar/Jan	23%	1.1	182%	37.5%	314%
Apr ADV	25.7	12.3	2.8	22.5%	41.45
Apr/Jan	7%	62%	89%	16.8%	197%

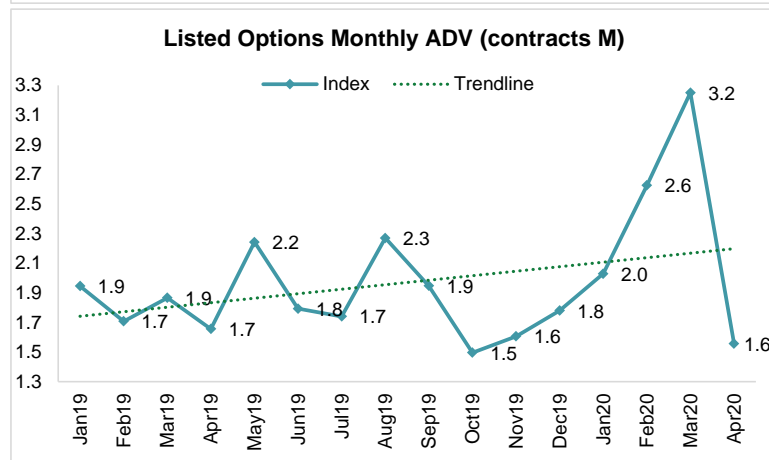
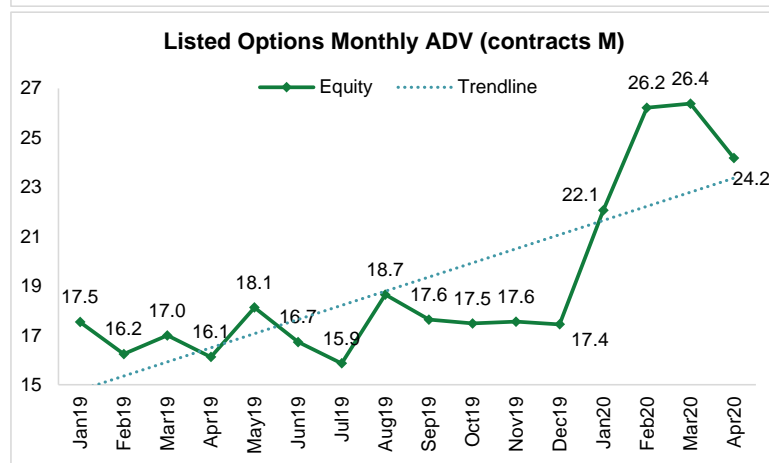
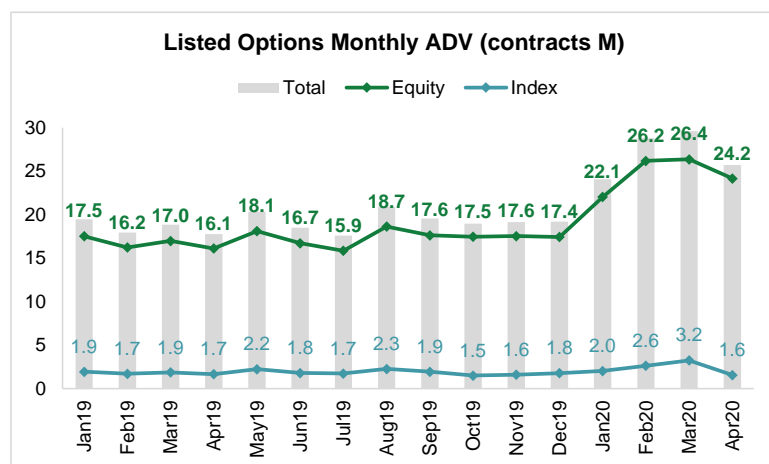
Source: Bloomberg, CBOE Global Markets, SIFMA estimates

Note: Options ADV = contracts millions; Equities & ETF ADV = shares billions



Bloomberg, Cboe Global Markets, SIFMA estimates

Volumes by Asset Class



Source: Cboe Global Markets, SIFMA estimates

Equity options peaked in March at 26.4M contracts, +41.5% versus last year's peak. Volumes came down in April to 24.2M but are still elevated versus the 2019 average of 17.2M. 2020 has also experienced a greater peak to trough differential, 1.6x last year.

Index options peaked in March at 3.2M contracts, +43.2% versus last year's peak. Index 2020 peak to trough differential is greater than equity at 2.2x the 2019 figure.

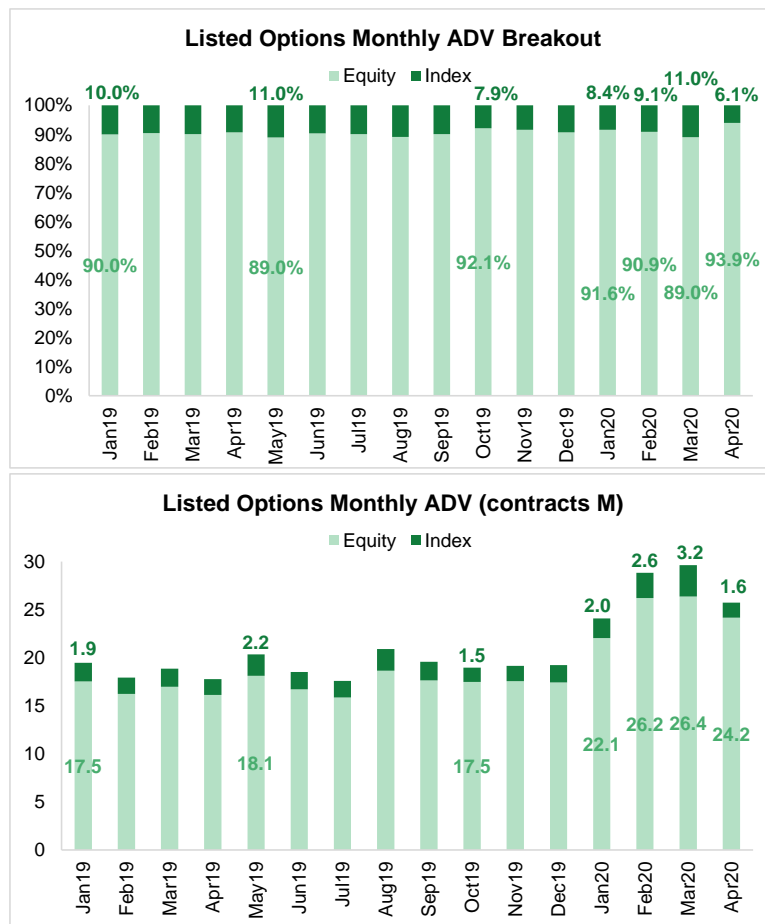
Index volumes dropped significantly in April to 1.6M contracts, -52% M/M and below the 2019 average of 1.8M. Conversely, equities fell only 8% M/M. The index trend continues down, averaging 1.2M (as of May 7), -34% to 2019 average. Conversely, the equity May trend (22.4M) is up 30% to 2019 average.

While both segments are trending up for the year, index is slowing, as shown by the trendline equations: $y(\text{equity}) = 0.5725x + 14.21$ versus $y(\text{index}) = 0.0305x + 1.7103$. The slope for index is much smaller than equity and much <1 (i.e. the slope is modest).

	Equity	Index	Total
2019			
Peak	18.7	2.3	20.9
Trough	15.9	1.5	17.6
Average	17.2	1.8	19.0
2020			
Peak	26.4	3.2	29.6
% Change	41.5%	43.2%	41.6%
Trough	22.1	1.6	24.1
% Change	39.0%	4.1%	36.8%
Average	24.7	2.4	27.1
% Change	43.7%	28.7%	42.2%
Peak-Trough			
2019	2.8	0.8	3.3
2020	4.3	1.7	5.5
% Change	1.6x	2.2x	1.7x

Source: Cboe Global Markets, SIFMA est

Asset Class Breakout



Source: Cboe Global Markets, SIFMA estimates

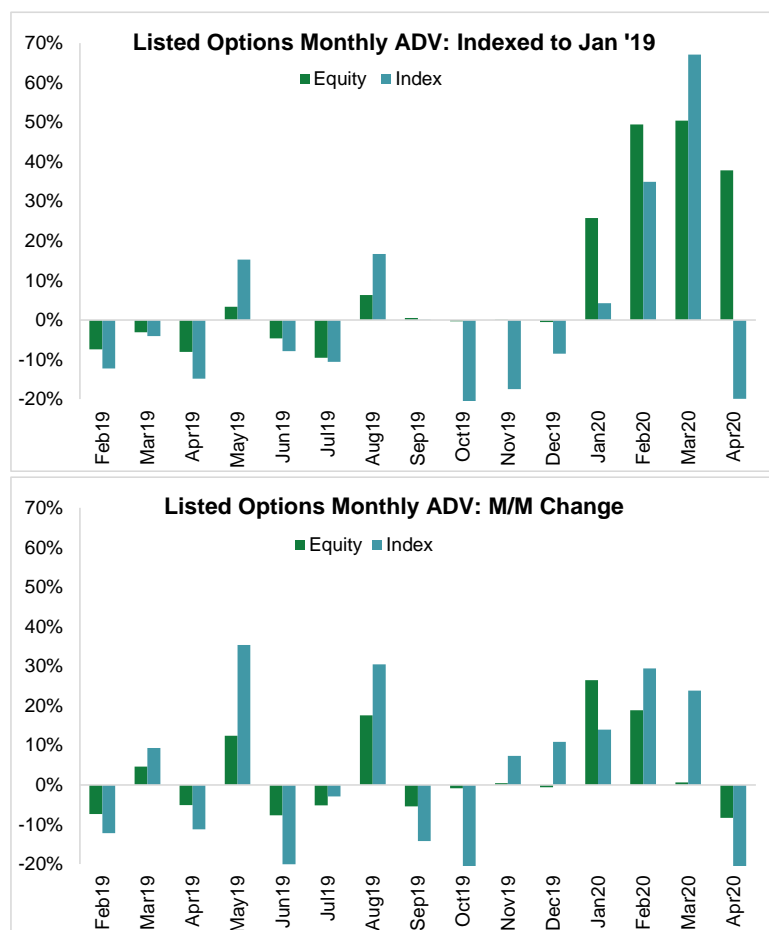
In 2019, equity options represented 90.4% of total volumes versus index at 9.6%, on average. 2020 has seen growth in equity, now 91.4% of the total and a peak of 93.9%. The trend is continuing in May (as of May 7), equity 94.5% of total.

What has happened to index volumes? While peaking at 11.0% of total volumes in March, this fell to 6.1% in April, continuing to fall in May to 5.1%.

	Equity	Index
2019		
Peak	92.1%	11.0%
Trough	89.0%	7.9%
Average	90.4%	9.6%
2020		
Peak	93.9%	11.0%
% Change	2.0%	-0.4%
Trough	89.0%	6.1%
% Change	0.0%	-23.2%
Average	91.4%	8.6%
% Change	1.1%	-10.3%
Peak-Trough		
2019	3.1%	3.1%
2020	4.9%	4.9%
% Change	1.8%	1.8%

Source: Cboe Global Markets, SIFMA est

Market Movements



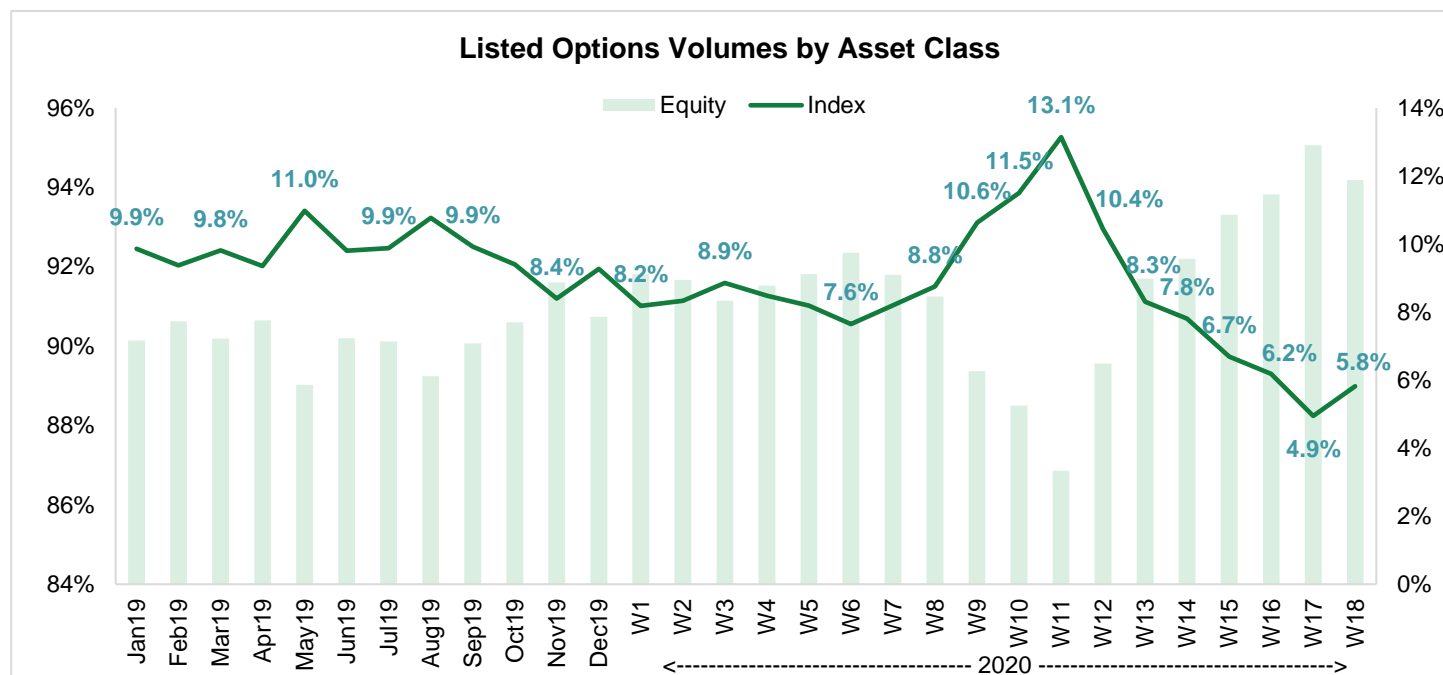
Source: Cboe Global Markets, SIFMA estimates

First, we look at monthly ADV indexed to January 2019, a more normalized volume time period. In general, index options showed more declines than equity, a total of 9 negative results (in 15 periods, or 60% negative results). Further, when both asset classes were negative, the index group showed greater declines than that of equity. We also note the broken correlation in April 2020 – typically both segments moved in the same direction – equity continued to grow while index declined.

Next, we look at M/M changes in ADV by asset class. Index fared better here, with only 7 periods of decline (47% of total). Its April performance, however, still breaks from equities. While both segments are down from March peaks, index showed a much greater decline: -52.1% index vs. 8.4% equity. 6.2x the decline.

A More Granular Look

Taking a more granular look by week, index options as a percent of total options peaked in Week 11 (March 9) at 13.1%. They then set off on a downward trend, troughing at 4.9% in Week 17 (April 20). While rebounding a bit in Week 18 (April 27) at 5.8% of total volumes, index volumes remain below historical levels (9.7% 2019 average).



Source: OCC, SIFMA estimates

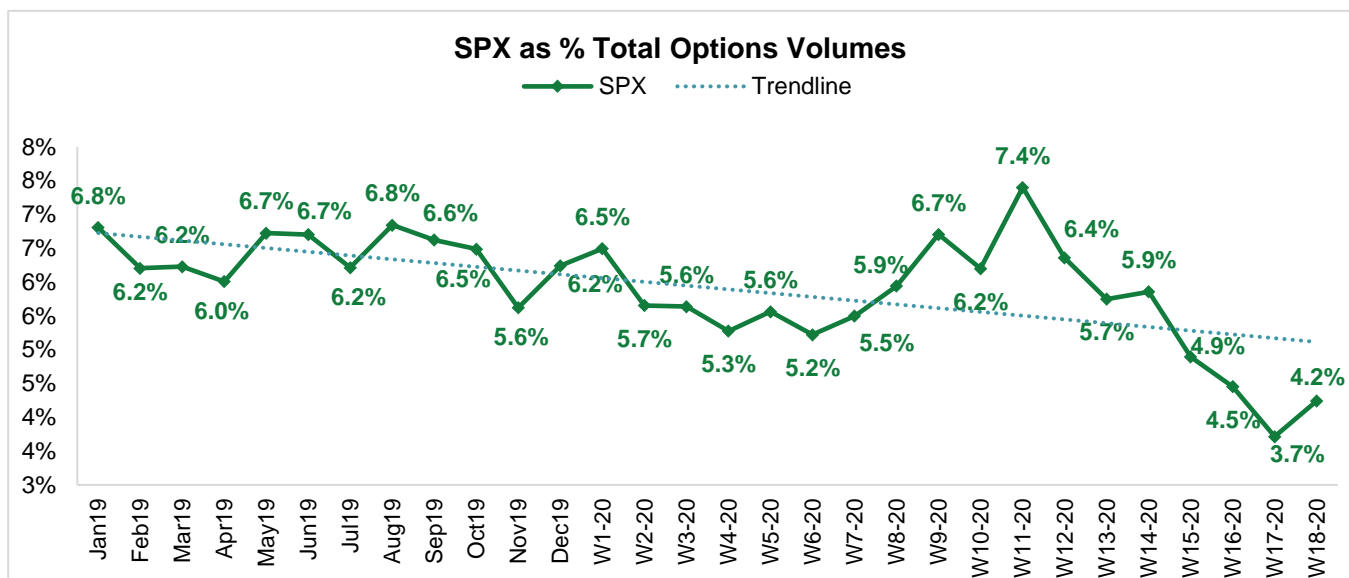
SPX & VIX Contracts Volumes

SPX Volumes

The S&P 500 is a leading indicator of U.S. equity markets. Cboe introduced S&P 500 Index options (SPX) in 1983, to provide market participants tools to gain broad exposure to the market. (These are proprietary products only offered by Cboe.¹)

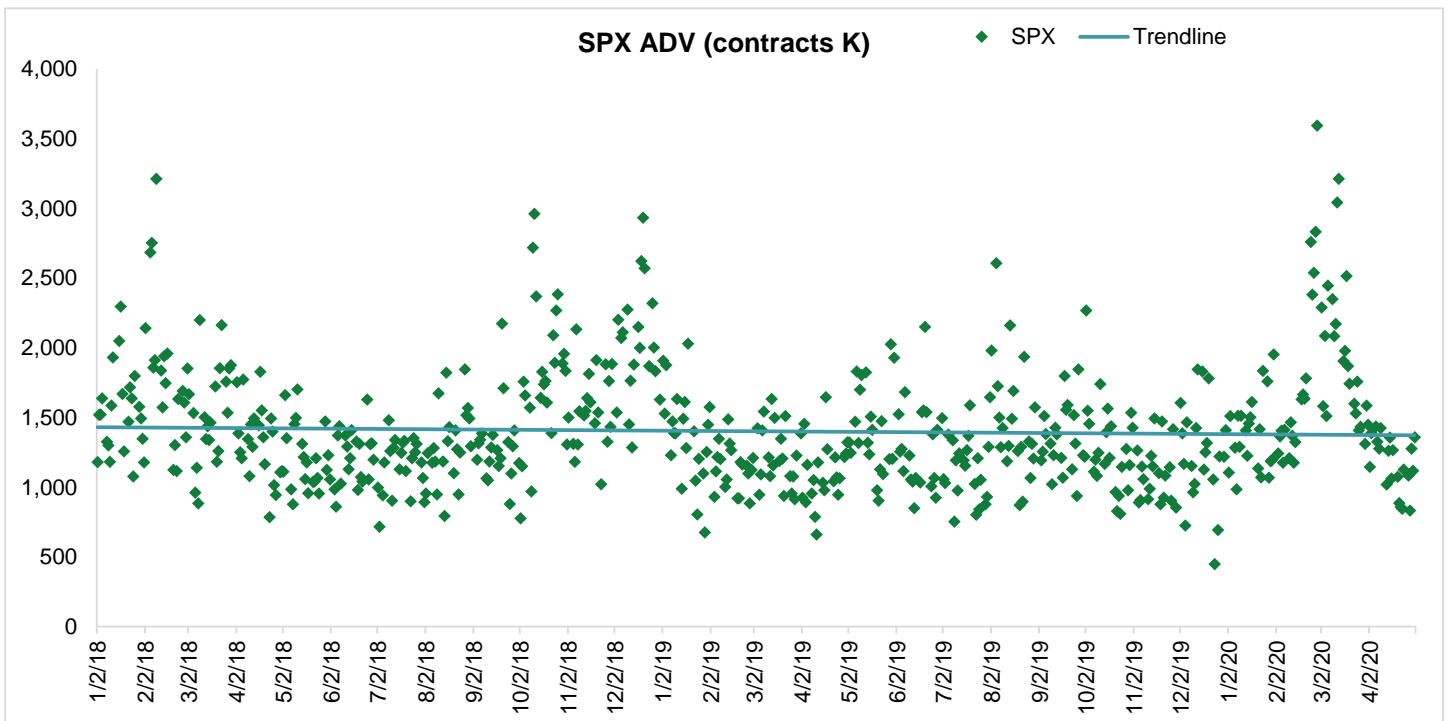
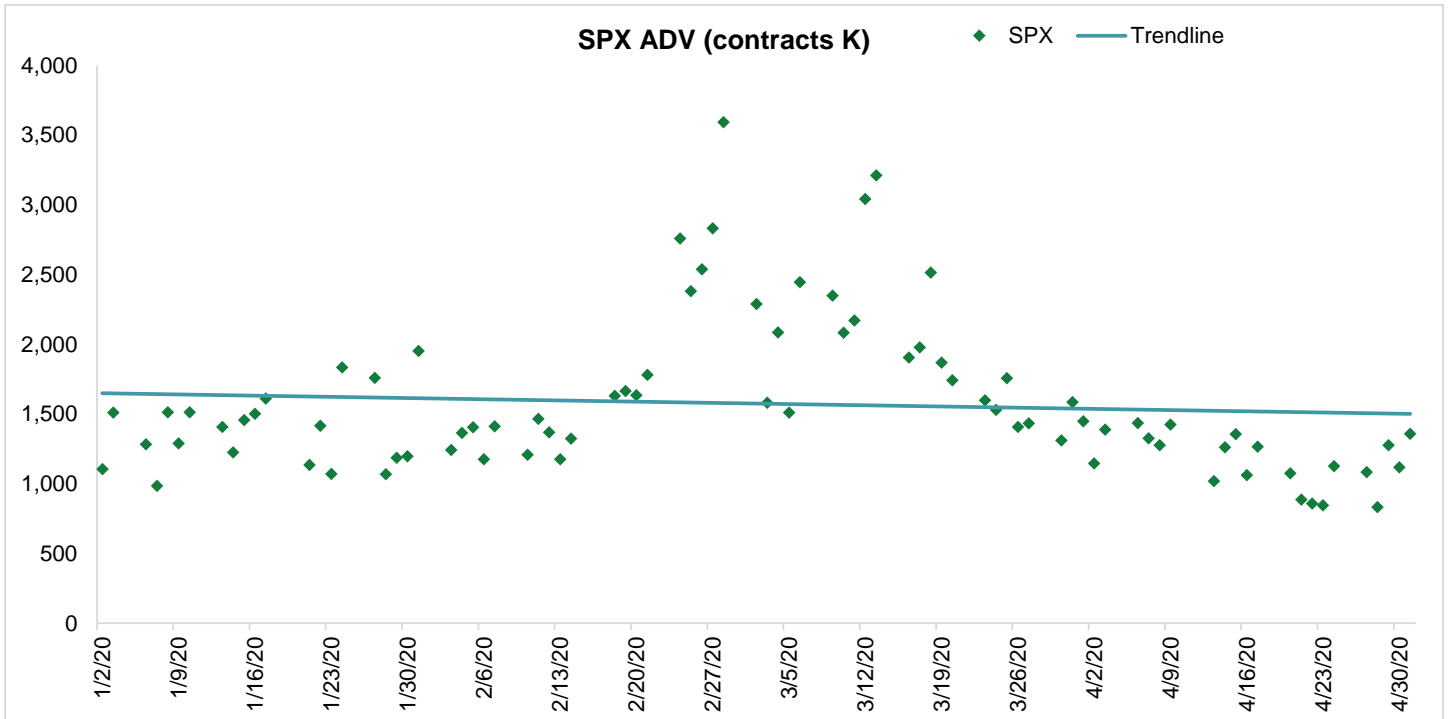
Historically, SPX options represented 6-7% of total options volumes (equity and index), averaging 6.4% in 2019. This percentage has fallen this year – averaging 5.6% in 2020 through the end of April and 4.3% in April – as shown by the downward sloping trendline in the chart below. At first, it looked like volumes might be growing, after peaking at 7.4% at the height of market volatility. Yet, this ratio has dropped with the closing of the Cboe trading floor (Week 12), as some options strategies are too complicated to execute electronically. The low point was 3.7% in Week 17, recovering somewhat in Week 18 to 4.2% but still 2.2 pps behind the 2019 average.

Looking at the volume charts on the next page, the SPX product suite (all contracts) has a slightly downward sloping trendline from 2018 to April 2020. There are several periods of spikes, as investors/traders turn to this broad market representation in heightened volatility times to diversify exposure, but in general the contract remained essentially stable. The 2020 trendline is slightly downward sloping, as volumes came down in April: 2018 to April 2020 ADV 1.4 million contracts, versus 2020 ADV 1.6 million contracts and April 2020 ADV 1.2 million contracts (April 2020: -16.0% 2018 to April 2020 ADV, -25.3% 2020 ADV). Volumes have come down with the Cboe floor closing, as some market participants have indicated they are choosing to execute more complex orders OTC since they are unable to do so electronically on the exchange.



Source: Cboe Global Markets, OCC, SIFMA estimates

¹ The indexes are licensed from S&P Dow Jones Indices



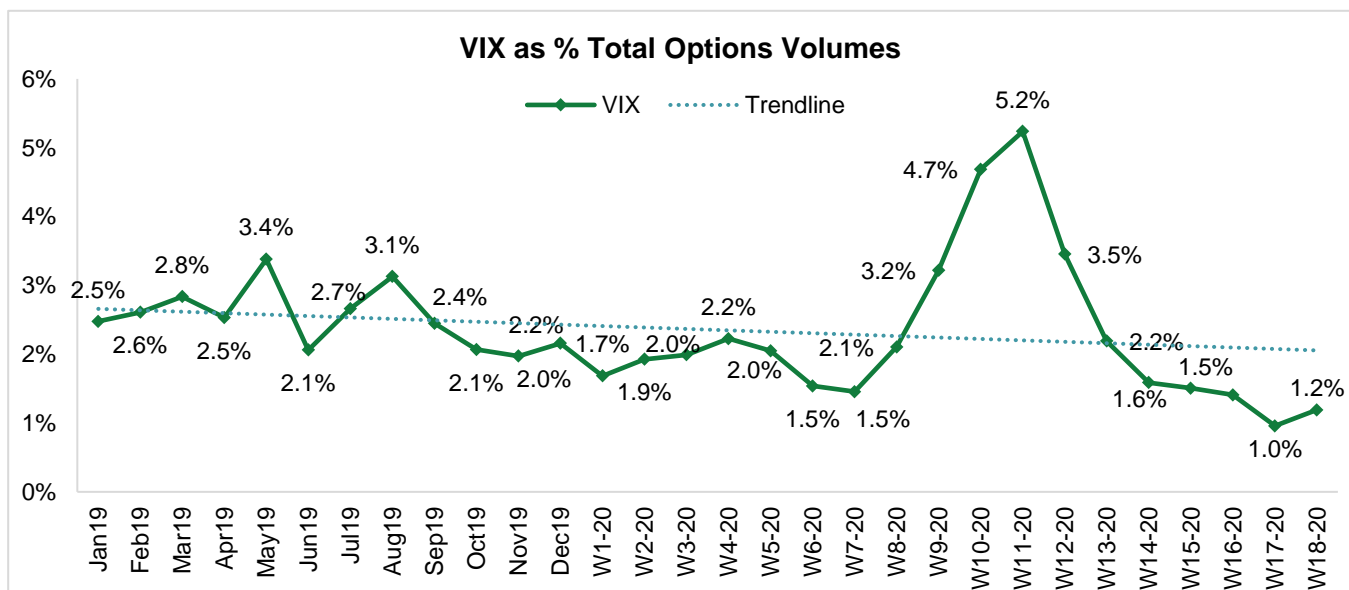
Source: Cboe Global Markets, SIFMA estimates

VIX Volumes

The Cboe Volatility Index (VIX) is a benchmark index measuring the market's expectation of future volatility. It estimates expected volatility by aggregating the weighted prices of S&P 500 Index puts and calls over a range of strike prices (midpoints of real-time SPX option bid/ask price quotations). Cboe introduced VIX options in 2006 to provide market participants tools to manage volatility and hedge portfolio volatility risk. (These are proprietary products only offered by Cboe.²)

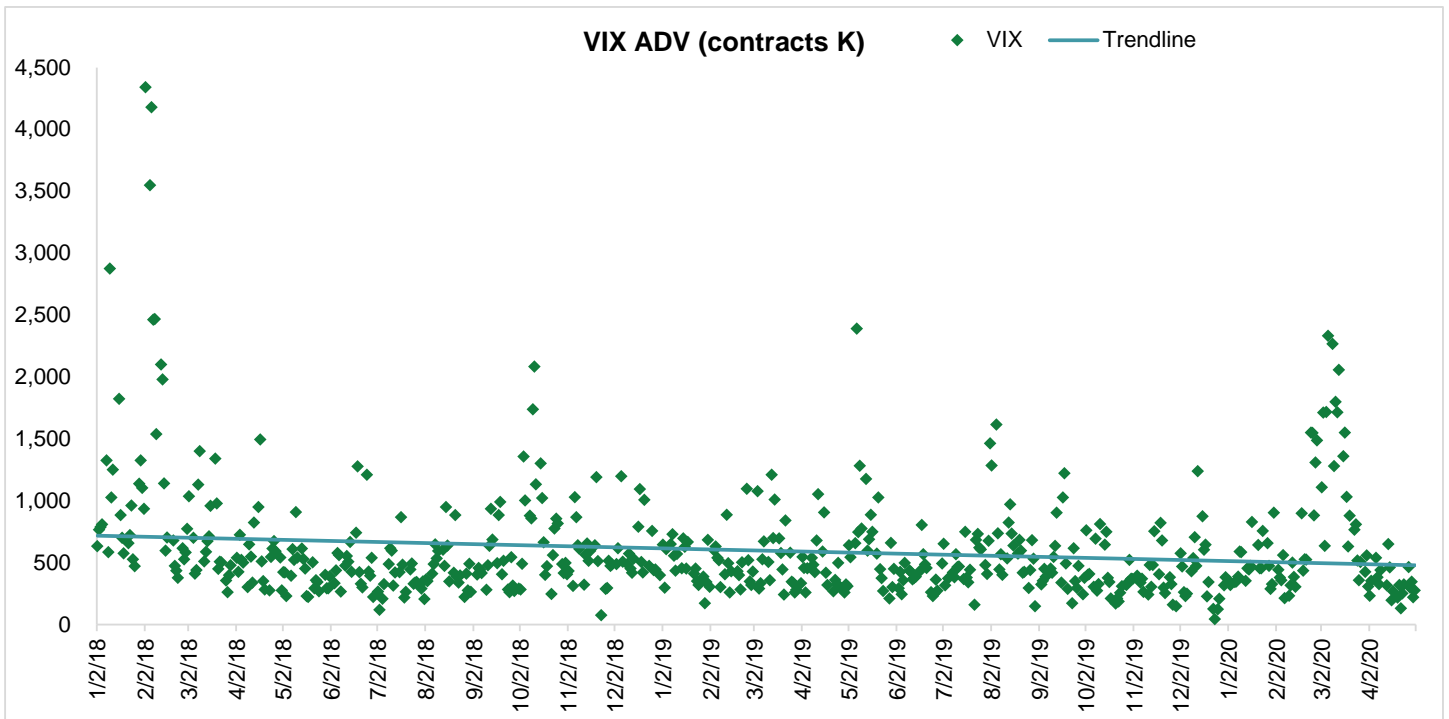
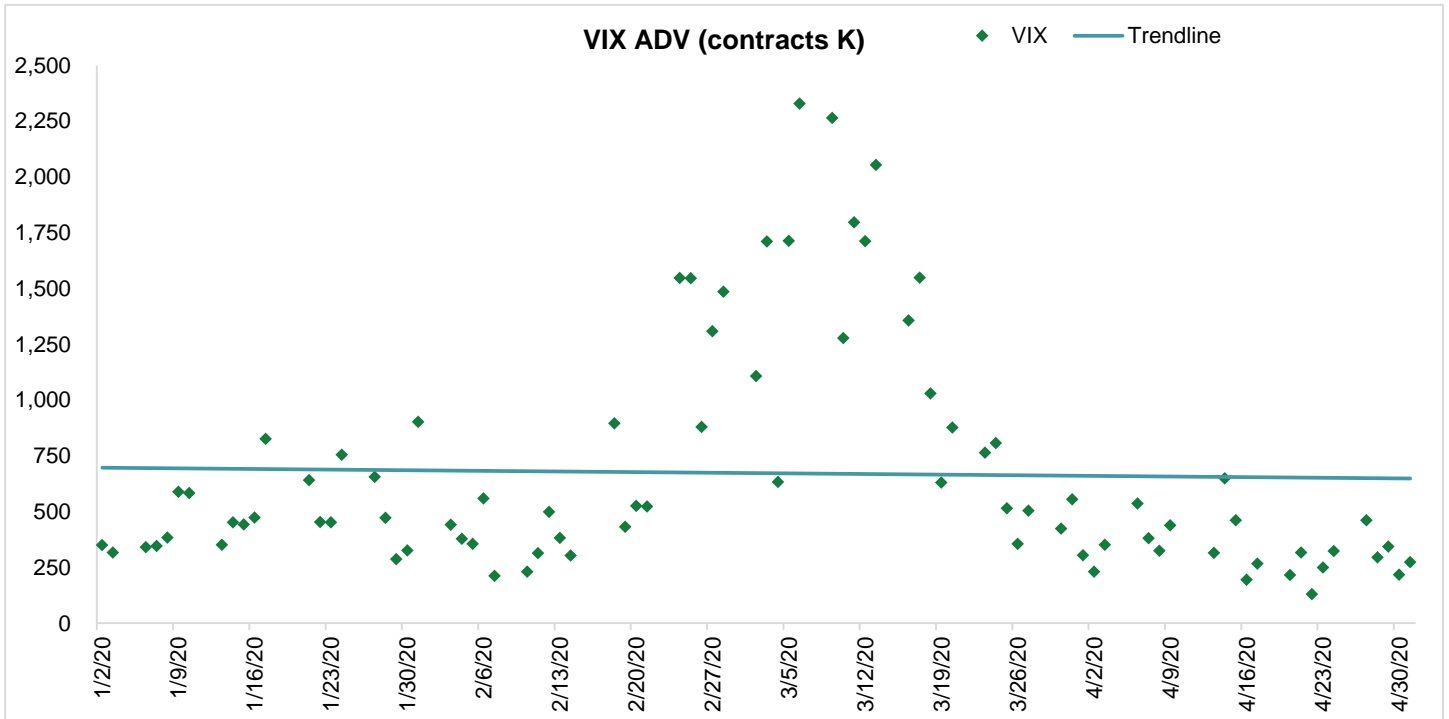
Historically, VIX options represented 2-3% of total options volumes, averaging 2.5% in 2019. This percentage has fallen this year – averaging 2.2% in 2020 through the end of April and 1.3% in April – as shown by the downward sloping trendline in the chart below. Volumes peaked at 5.2% at the height of market volatility. Yet, this ratio has dropped with the closing of the Cboe trading floor (Week 12). The low point was 1.0% in Week 17, recovering somewhat in Week 18 to 1.2% but still 1.3 pps behind 2019 average.

Looking at the volume charts on the next page, the VIX product suite (all contracts) has a slightly downward sloping trendline from 2018 to April 2020. There are several periods of spikes, in line with heightened market volatility. Despite the February/March spikes, the 2020 trendline remains slightly downward sloping, and volumes have come down in April in a more pronounced fashion than the SPX: 2018 to April 2020 ADV 597 thousand contracts, versus 2020 ADV 672 thousand contracts and April 2020 ADV 331 thousand contracts (April 2020: -44.6% 2018 to April 2020 ADV, -50.8% 2020 ADV). Volumes have come down with the Cboe floor closing, as market participants have indicated they are choosing to execute more complex orders OTC since they are unable to do so electronically on the exchange.



Source: Cboe Global Markets, OCC, SIFMA estimates

² The indexes are licensed from S&P Dow Jones Indices



Source: Cboe Global Markets, SIFMA estimates

Comparing to SPY Volumes

As an alternative to investing in SPX contracts to gain broad exposure to the equities markets, market participants can turn to SPY options. SPY is the ticker symbol for the SPDR S&P 500 ETF. The SPX and SPY options differ in the following manner:

	SPX	SPY
Dividend Paid	N/A	Quarterly
Option Style	European	American
Expiration	COB Monday, Wednesday, Friday, end of month & end of quarter	COB Monday, Wednesday, Friday, end of month & end of quarter
Settlement	Cash	Shares

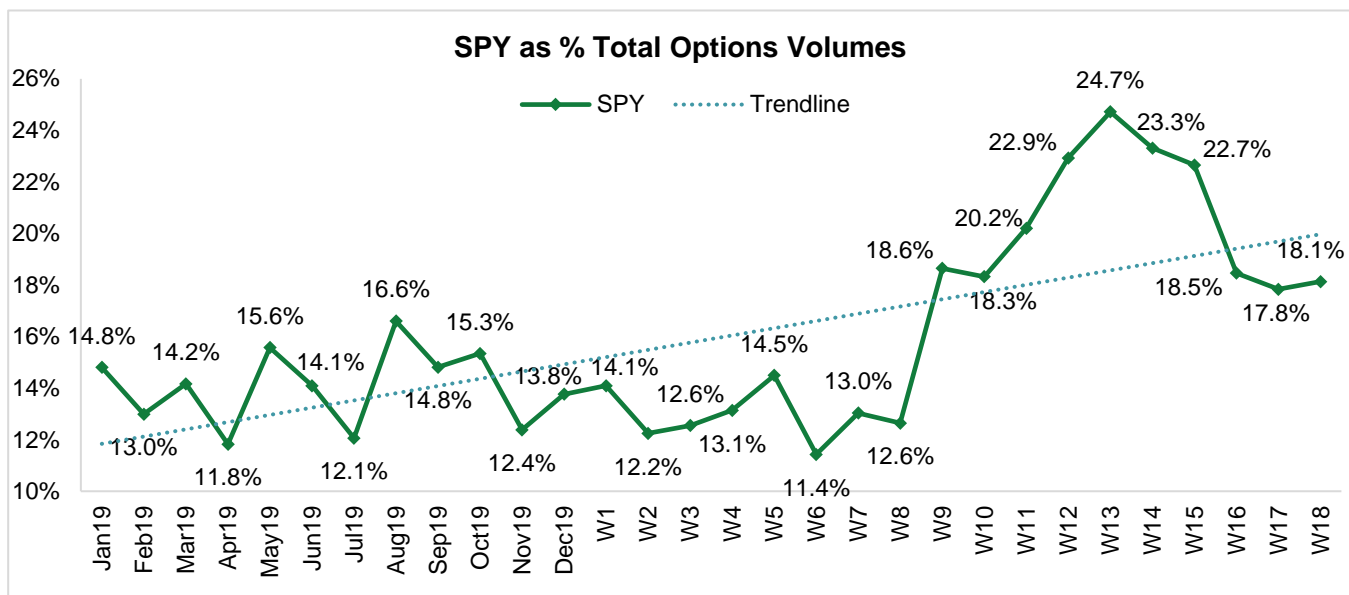
Note: American = exercise any time before expiration; European = exercise at expiration

Quantity: One SPX option with the same strike price and expiration equals 10x the value of one SPY option. For example: SPX = 2,500, SPY 250; 1 at-the-money SPX option = right to buy \$250,000 worth of the underlying asset; 1 at-the-money SPY option = right to buy \$25,000 worth of ETF shares, or 10% of \$250,000. If you trade/invest in a lot of options, the amount of SPY contracts you will need to buy to match returns on an SPX contract – and, correspondingly, commission dollars – start to add up.

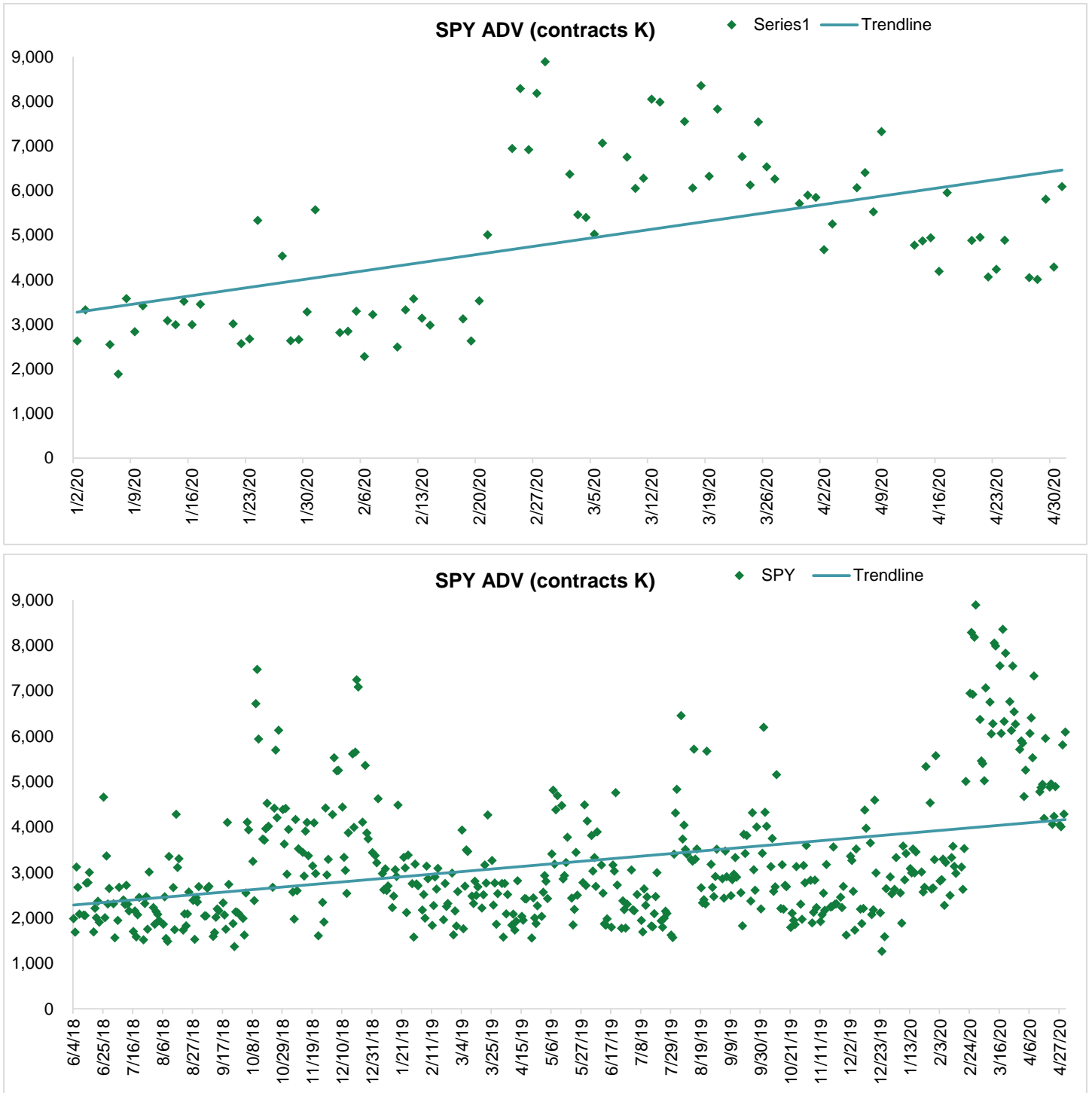
Price: The other side of the equation will be the cost to execute the trade. We note that finding an average cost to trade from a fee schedule is a complex endeavor. Product fees can vary based on order type (customer, market maker, etc.), order size, transaction type (manual, electronic, Cboe's Automated Improvement Mechanism/AIM), liquidity provider sliding scales, etc. With retail brokers reducing commissions to zero or near zero, the SPY is often viewed as a low cost product for customers. The cost of executing SPY relative to SPX for a market maker may be cheaper on Cboe but will vary based on where they fall in each of the respective sliding scales. That said, while it often appears the SPY trades for free, maker-taker exchanges still charge liquidity takers in SPY options and those venues account for almost half of exchange volume. Further, prior to Covid-19, the SPX was not eligible for trading on AIM, a mechanism for providing potential price improvement, particularly beneficial for attracting retail order flow. Some SPX products have been made AIM eligible during this market turmoil.

While the price equation is not as black-and-white as quantity, where 1 SPX = 10 SPY, the tradeoff between the two will be the customer's choice.

SPY options averaged 14.0% of total options volumes in 2019. This percentage continues to grow, albeit the pace of growth has slowed: averaging 17.2% in 2020 through the end of April and 19.3% in April. Looking at volume charts on the next page, the SPY has an upward sloping trendline from 2018 to April 2020. 2018 to April 2020 ADV 3.2 million contracts, versus 2020 ADV 4.9 million contracts and April 2020 ADV 5.1 million contracts (April 2020: +59.5% 2018 to April 2020 ADV, +5.2% 2020 ADV). As SPY options are traded on multiple exchanges, versus only Cboe for the SPX and VIX, volumes were not affected by floor closings: average since the close (March 16) 5.7 million contracts. Market participants surmise people could be switching to SPY options away from SPX in light of the floor closings. Additionally, the SPY is more of a retail product, which has benefited from the reduction in retail broker commissions.



Source: OCC, SIFMA estimates



Source: Cboe Global Markets, SIFMA estimates

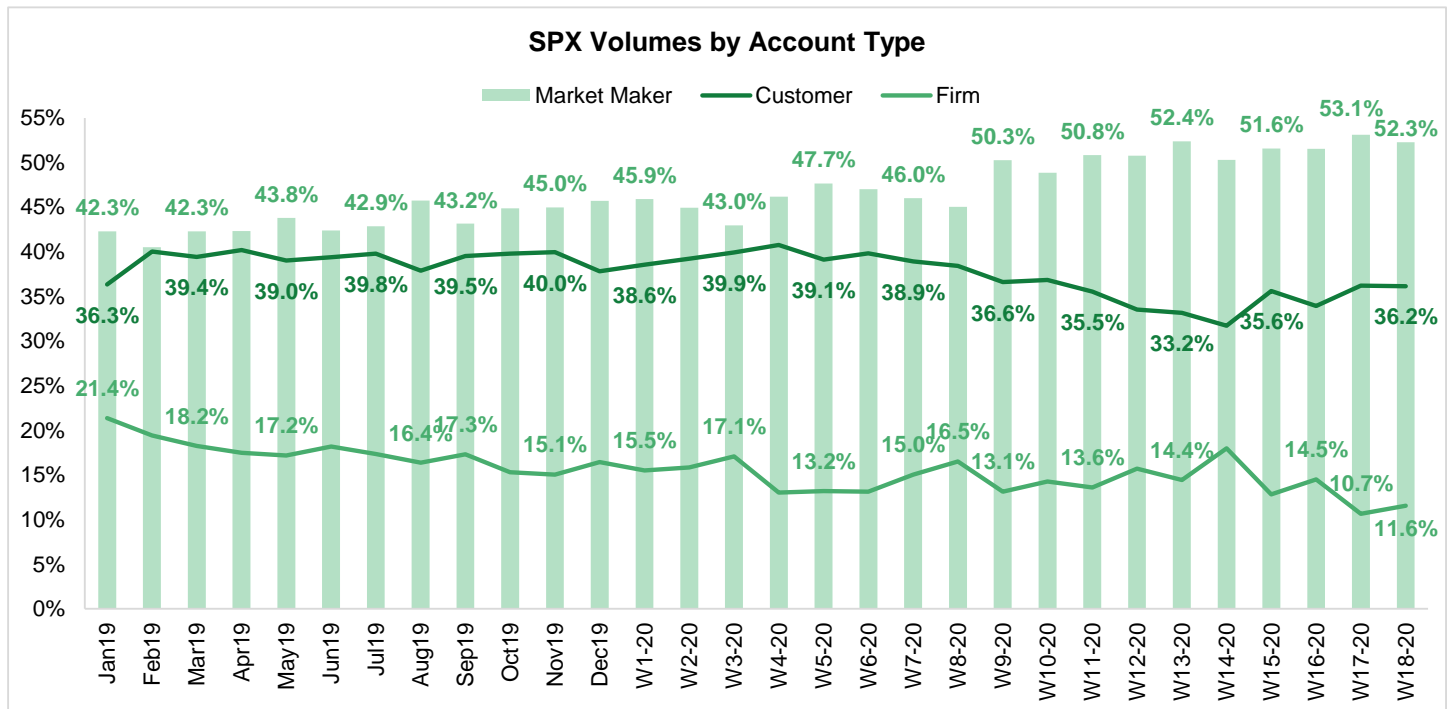
SPX & VIX Volumes by Account Type

All option orders are required to be marked as C, F or MM, indicating the range that the trade clears in at OCC: Customer (trades cleared by a clearing member on behalf of securities customers); Firm (trades cleared by a clearing member for its own account); or Market Maker (trades cleared by a clearing member on behalf of a market maker). Exchange fees are based on these clearing ranges, as well as execution status for exchanges using customer priority models. In this section we see how patterns across account types have shifted for the SPX and VIX options contracts since Week 12, the week of the floor closure at Cboe.

SPX: Market maker accounts increased across all time periods, while customer accounts declined. Firm account volumes decreased for the 2020 average and Week 18 but increased in Week 12 vs. 2020 average.

	Customer	Firm	Market Maker
2019 Avg	39.1%	17.5%	43.4%
2020 Avg	36.9%	14.3%	48.8%
2020/2019	-2.2%	-3.1%	5.3%
Week 12	33.5%	15.7%	50.8%
W12/2019	-5.6%	-1.8%	7.4%
W12/2020	-3.4%	1.4%	2.0%
Week 18	36.2%	11.6%	52.3%
W18/2019	-2.9%	-5.9%	8.8%
W18/2020	-0.7%	-2.8%	3.5%

Source: OCC, SIFMA estimates

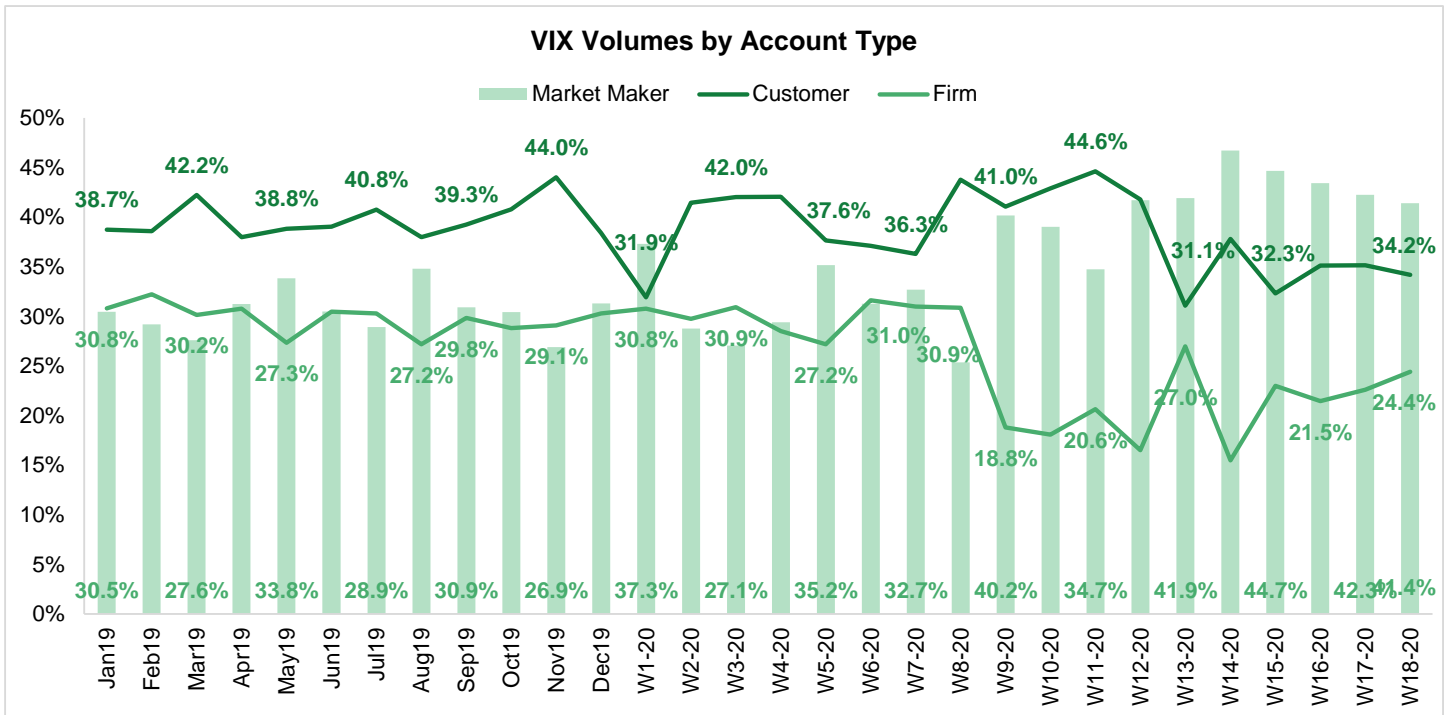


Source: OCC, SIFMA estimates

VIX: Market maker accounts increased in all time periods, while firm accounts declined. From 2020 to 2019 and Week 18, volumes moved out of customer accounts, but increased in Week 12.

	Customer	Firm	Market Maker
2019 Avg	39.7%	29.8%	30.5%
2020 Avg	38.2%	24.9%	36.8%
2020/2019	-1.5%	-4.8%	6.3%
Week 12	41.8%	16.5%	41.7%
W12/2019	2.1%	-13.3%	11.2%
W12/2020	3.5%	-8.4%	4.9%
Week 18	34.2%	24.4%	41.4%
W18/2019	-5.5%	-5.4%	10.9%
W18/2020	-4.1%	-0.5%	4.6%

Source: OCC, SIFMA estimates



Source: OCC, SIFMA estimates

The Index Volume Decline Debate

Q: Are volumes down because of floor closures, market turmoil or a combination of both?

As we just showed, volumes are down. There is no debate there, but the question becomes why. On one side of the debate, we surmise the closing of trading floors has negatively impacted index options. Keep in mind, Cboe as a group trades 99.2% of total index volumes (market share details later in this report). Within its own exchange complex of four exchanges, the Cboe exchange handles 99.5% of this volume. The Cboe exchange runs a hybrid model and therefore closed its floor temporarily on March 16. Therefore, almost all index options volumes have been impacted by floor closings.

Index options are based on an intangible, the underlying stock index. The valuation and volatility of an index option can be affected by general macroeconomic factors (unemployment, inflation expectations, interest rates, etc.), in addition to the underlying stocks. Valuation and trading strategies become more complicated in times of market turmoil – you need to make a call on the future value of a whole index, essentially a whole economy, versus that for a single stock. This complexity is where the manual handling of multi leg strategy orders benefits traders/investors, which is not feasible using electronic systems under the floor closings.

There is evidence to show that volumes have come down with the Cboe floor closing. Market participants learned from Cboe itself that the activity in complex transactions with greater than six legs is way down, as the functionality to execute these trades electronically is difficult if not nonexistent. As such, some market participants have indicated they are choosing to execute more complex orders OTC since they are unable to do so electronically on the exchange.

On the other side of the debate, violent market moves, as shown by 100+ plus point intraday swings like we have seen during this period of market turmoil, are not conducive to executing some complex index options trading strategies. If the objective is to settle on a price for a product with twenty legs – and the market is moving hundreds of points – you cannot get these trades completed, and customers disappear. Some of these customers can shift to SPY contracts (discussed in more detail later in this report), the quickest way to hedge or capture market moves. And this can be done electronically.

A: The conclusion is that volumes are down given a combination of both factors, floor closing and heightened volatility.

Either way, Cboe is not sitting around on its hands. With the closing of the floor, the exchange has expanded utilization of its Automated Improvement Mechanism (AIM) to SPX products (previously not allowed). AIM is an automated process for crossing of any origin type, which provides the potential for price improvement and a participation right through an auction process. The AIM crossing mechanism enables order flow providers the ability to participate against their customers' orders (facilitation) or solicit another firm's liquidity (solicitation). This provides greater potential for price improvement, particularly beneficial for attracting retail order flow.

Exchange Market Shares: Total Options Volumes

All Exchange Comparison

In this section, we analyze market share movements across exchange groups³, for total options volumes (equity + index), highlighting the following trends:

- For 1Q20, Cboe held the highest market share, 38.3%; followed by Nasdaq 32.9%, NYSE 16.5%, MIAX 10.0% and BOX 2.4%
- February versus January averages: Cboe market share was flat (+0.2 pps), with NDAQ -1.5 pps, NYSE +0.7 pps, MIAX +0.5 pps and BOX flat
- March versus January averages: Cboe market share was +2.6 pps, with NDAQ -3.5 pps, NYSE +0.6 pps, MIAX +0.8 pps and BOX -0.5 pps
- April versus January averages: Cboe market share was -0.7 pps, with NDAQ +2.0 pps, NYSE -2.9 pps, MIAX +2.1 pps and BOX -0.4 pps
- At the end of the time series (April 30): Cboe market share was +1.4 pps, with NDAQ -1.0 pps, NYSE -2.0 pps, MIAX +1.8 pps and BOX -0.3 pps

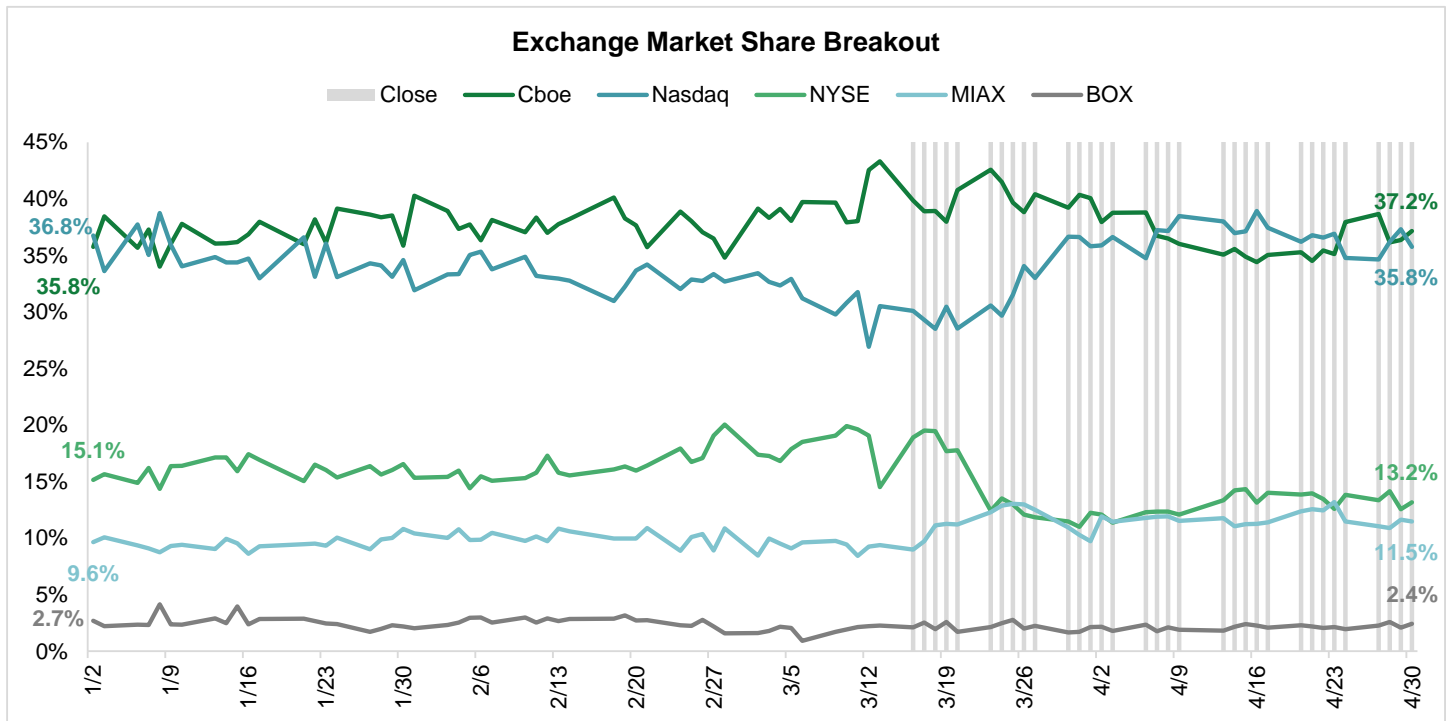
% Total Market

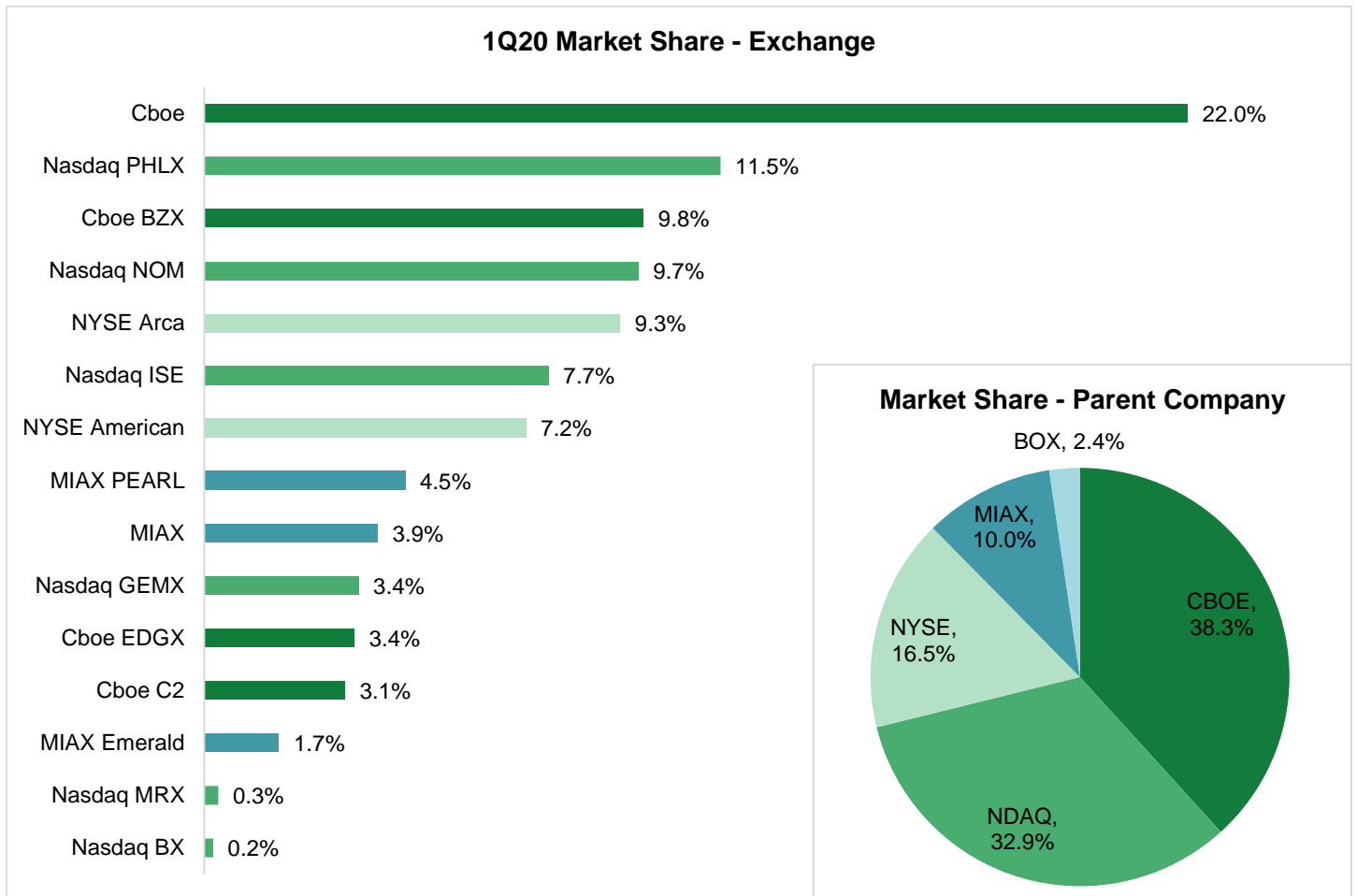
	CBOE	NDAQ	NYSE	MIAX	BOX
Jan 2	35.8%	36.8%	15.1%	9.6%	2.7%
Peak	43.3%	38.9%	20.0%	13.2%	4.1%
Peak/Jan 2	7.6%	2.2%	4.9%	3.5%	1.4%
Trough	34.0%	26.9%	11.0%	8.4%	0.9%
Average	37.8%	34.0%	15.4%	10.4%	2.3%
Avg/Jan 2	2.0%	-2.7%	0.3%	0.8%	-0.4%
Apr 30	37.2%	35.8%	13.2%	11.5%	2.4%
Apr 30/Jan 2	1.4%	-1.0%	-2.0%	1.8%	-0.3%
Jan ADV	37.2%	34.7%	16.0%	9.6%	2.6%
Feb ADV	37.4%	33.2%	16.7%	10.1%	2.6%
Feb/Jan	0.2%	-1.5%	0.7%	0.5%	0.0%
Mar ADV	39.8%	31.2%	16.6%	10.4%	2.0%
Mar/Jan	2.6%	-3.5%	0.6%	0.8%	-0.5%
Apr ADV	36.4%	36.7%	13.1%	11.6%	2.1%
Apr/Jan	-0.7%	2.0%	-2.9%	2.1%	-0.4%

Source: CBOE Global Markets, SIFMA estimates

³ Note: market shares can fluctuate based on day, month or time period chosen
SIFMA Insights

Exchange Market Shares: Total Options Volumes





Source: Cboe Global Markets, SIFMA estimates

Looking Within the Cboe Complex

Looking at market share movements across the Cboe complex of exchanges⁴, we highlight the following trends in market shares as a percent of total market volumes and percent of total Cboe volumes:

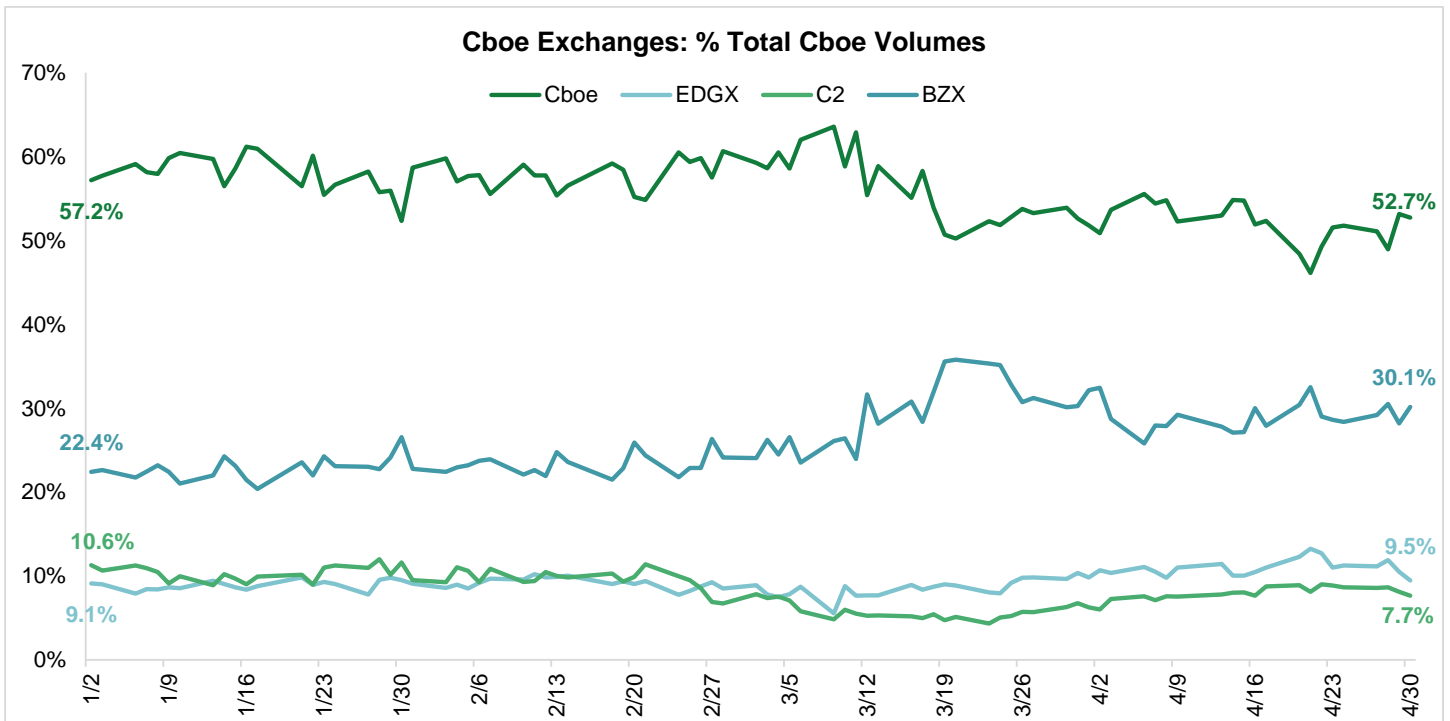
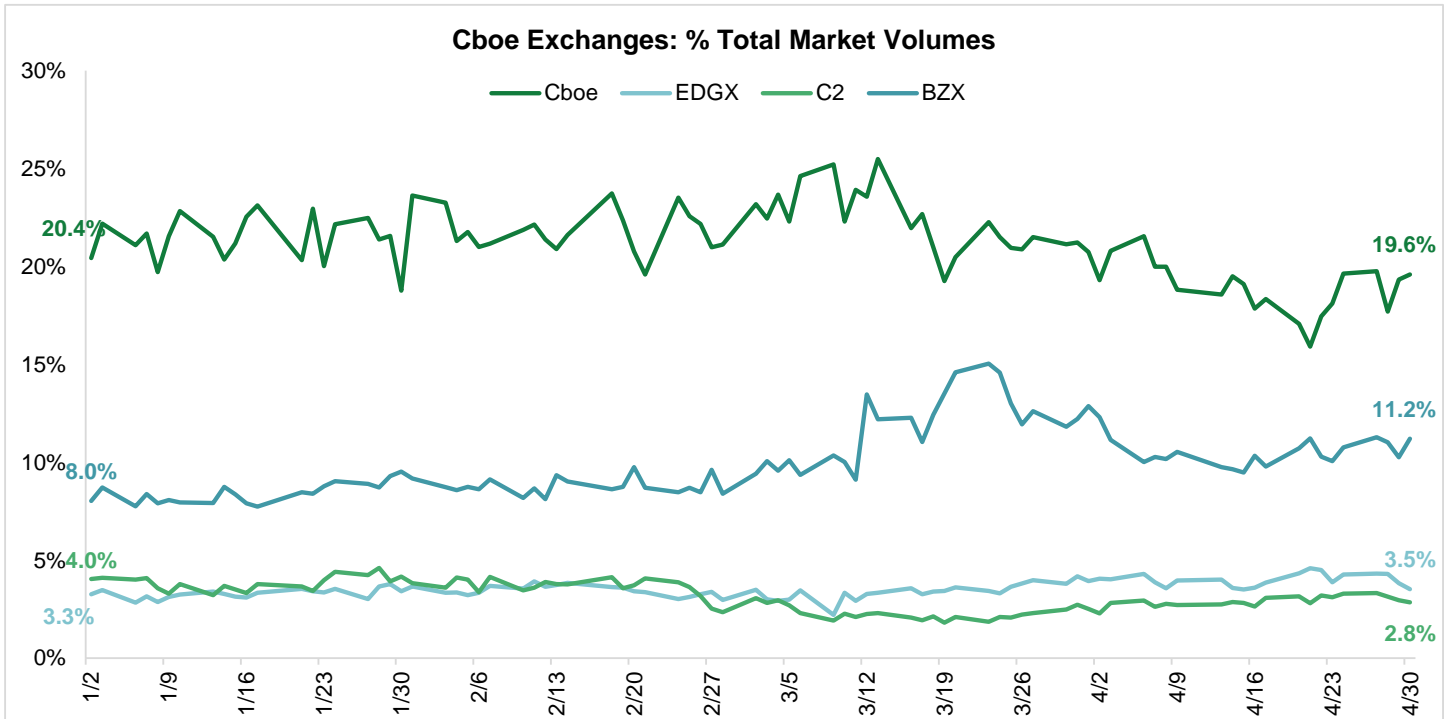
- Total Cboe volumes (right side of table): For 1Q20, the Cboe exchange represented 57.4% of total Cboe group volumes; followed by BZX 25.6%, EDGX 8.8% and C2 8.2%
 - Cboe exchange = hybrid model, all else fully electronic
 - Cboe lost share from April to January monthly ADV, -5.9 pps, and ended April down 4.4 pps from January 2
 - BZX gained share from April to January monthly ADV, +6.3 pps, and ended April +7.7 pps from January 2
 - From end April to January 2, EDGX was up 0.3 pps while C2 was down 3.6 pps
- Total market volumes (left side of table): For 1Q20, the Cboe exchange represented 22.0% of total market volumes; followed by BZX 9.8%, EDGX 3.4% and C2 3.1%
 - From end April to January 2, Cboe market share fell 0.8 pps; versus BZX +3.2 pps, EDGX +0.3 pps and C2 -1.2 pps

	% Total Market				&	Within Cboe			
	Cboe	BZX	EDGX	C2		Cboe	BZX	EDGX	C2
Jan 2	20.4%	8.0%	3.3%	4.0%	35.8%	57.2%	22.4%	9.1%	11.3%
Peak	25.5%	15.0%	4.6%	4.6%	43.3%	63.6%	35.8%	13.3%	12.0%
Peak/Jan 2	5.0%	7.0%	1.3%	0.6%	7.6%	6.4%	13.4%	4.1%	0.7%
Trough	15.9%	7.7%	2.2%	1.8%	34.0%	46.1%	20.4%	5.5%	4.3%
Average	21.1%	10.0%	3.5%	3.1%	37.8%	56.0%	26.3%	9.4%	8.4%
Avg/Jan 2	0.7%	1.9%	0.3%	-0.9%	2.0%	-1.2%	3.9%	0.2%	-2.9%
Apr 30	19.6%	11.2%	3.5%	2.8%	37.2%	52.7%	30.1%	9.5%	7.7%
Apr 30/Jan 2	-0.8%	3.2%	0.3%	-1.2%	1.4%	-4.4%	7.7%	0.3%	-3.6%
Jan ADV	21.6%	8.5%	3.3%	3.8%	37.2%	58.0%	22.8%	8.9%	10.3%
Feb ADV	21.7%	8.8%	3.4%	3.5%	37.4%	58.0%	23.4%	9.1%	9.4%
Feb/Jan	0.2%	0.3%	0.1%	-0.3%	0.2%	0.1%	0.6%	0.1%	-0.9%
Mar ADV	22.5%	11.7%	3.3%	2.3%	39.8%	56.4%	29.4%	8.4%	5.7%
Mar/Jan	0.9%	3.2%	0.0%	-1.5%	2.6%	-1.5%	6.6%	-0.5%	-4.6%
Apr ADV	19.0%	10.6%	4.0%	2.9%	36.4%	52.1%	29.1%	10.9%	7.9%
Apr/Jan	-2.6%	2.1%	0.7%	-1.0%	-0.7%	-5.9%	6.3%	2.0%	-2.4%

Source: CBOE Global Markets, SIFMA estimates

⁴ Note: market shares can fluctuate based on day, month or time period chosen

Exchange Market Shares: Total Options Volumes



Source: Cboe Global Markets, SIFMA estimates

Looking Within the Nasdaq Complex

Looking at market share movements across the Nasdaq complex of exchanges⁵, we highlight the following trends in market shares as a percent of total market volumes and percent of total Nasdaq volumes:

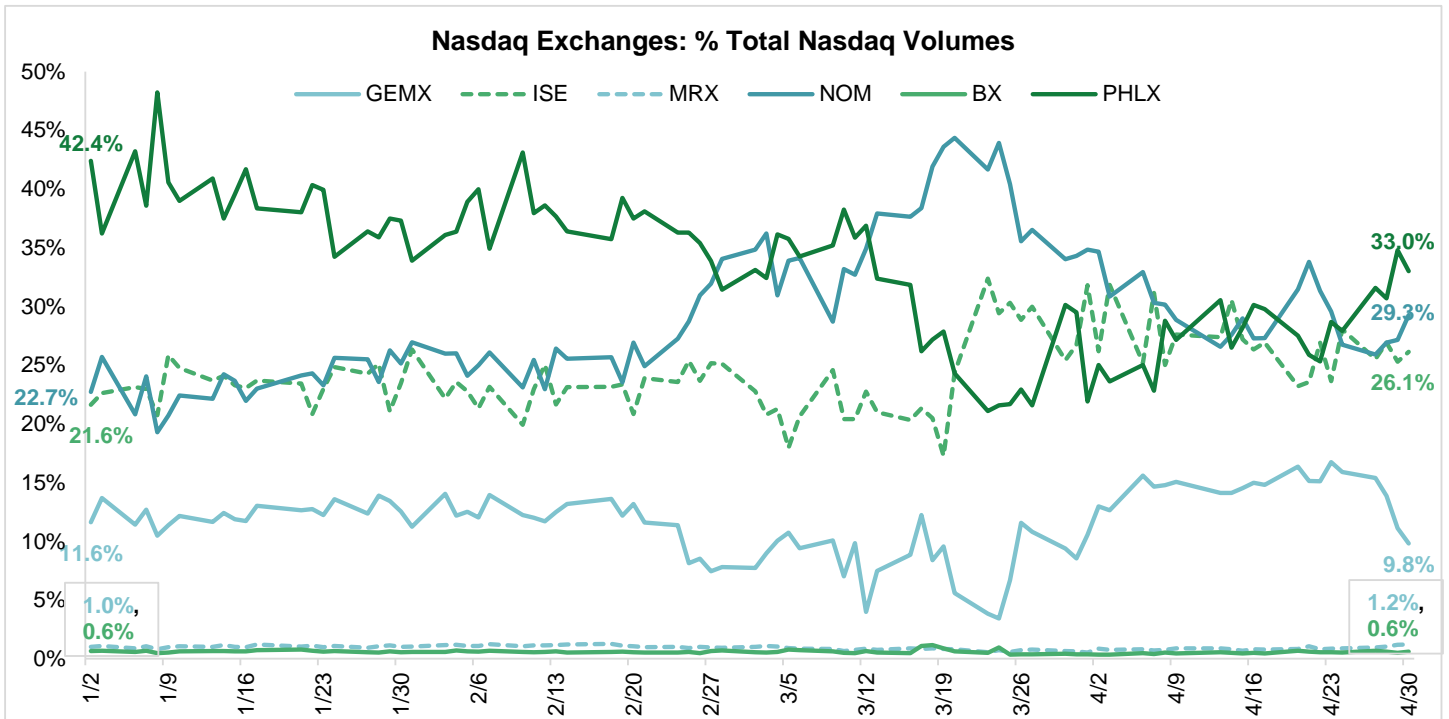
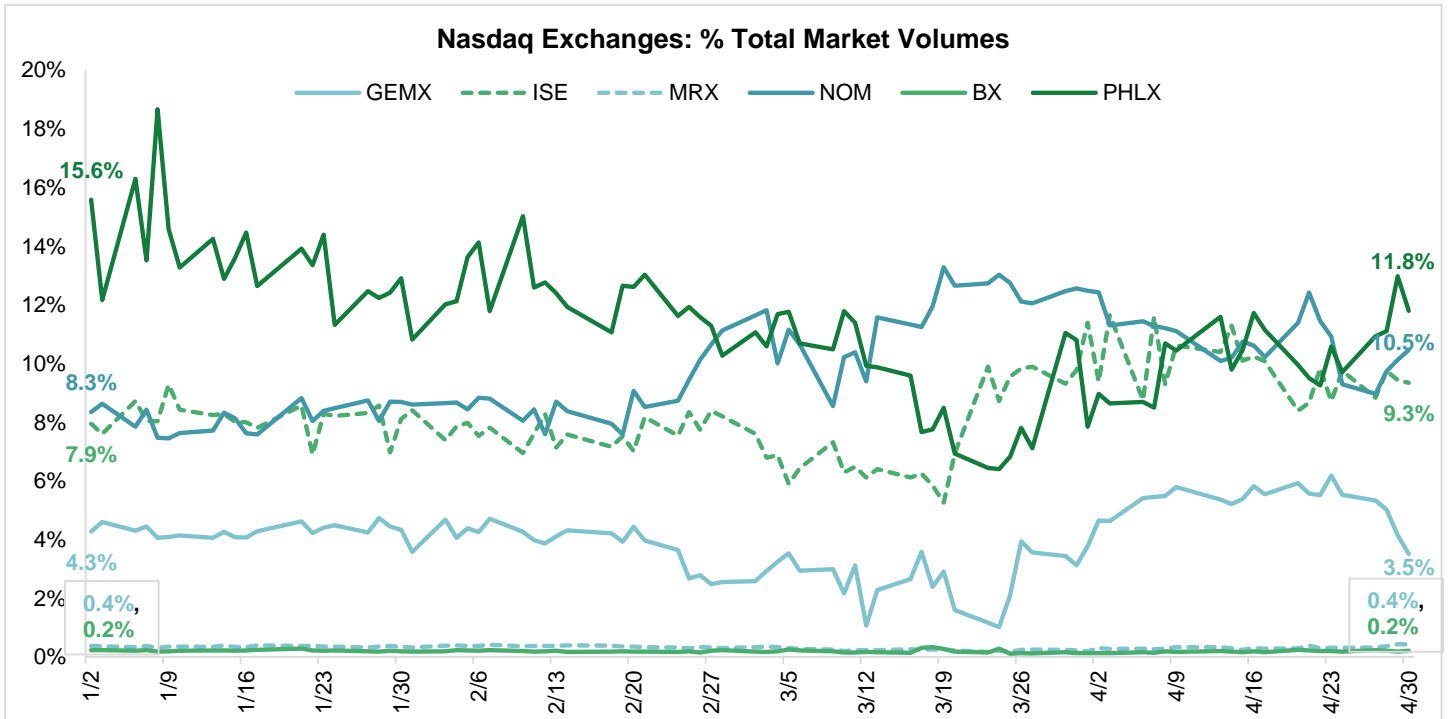
- Total Nasdaq volumes (right side of table): For 1Q20, PHLX represented 35.1% of total Nasdaq volumes; followed by NOM 29.5%, ISE 23.4%, GEMX 10.5%, MRX 1.0% and BX 0.6%
 - PHLX = hybrid model, all else fully electronic
 - PHLX lost share from April to January monthly ADV, -11.2 pps, and ended April -9.4 pps from January 2
 - NOM gained share from April to January monthly ADV, +6.0 pps, and ended April +6.6 pps from January 2
 - From end April to January 2, ISE was +4.5 pps, GEMX -1.8 pps, MRX +0.2 pps and BX flat
- Total market volumes (left side of table): For 1Q20, PHLX represented 11.5% of total market volumes; followed by NOM 9.7%, ISE 7.7%, GEMX 3.4%, MRX 0.3% and BX 0.2%
 - From end April to January 2, PHLX market share fell 3.8 pps; versus NOM +2.1 pps, ISE +1.4 pps, GEMX -0.8 pps, MRX +0.2 pps and BX flat

	% Total Market						&		Within Nasdaq					
	PHLX	NOM	ISE	GEMX	MRX	BX	Total		PHLX	NOM	ISE	GEMX	MRX	BX
Jan 2	15.6%	8.3%	7.9%	4.3%	0.4%	0.2%	36.8%		42.4%	22.7%	21.6%	11.6%	1.0%	0.6%
Peak	18.7%	13.3%	11.7%	6.2%	0.4%	0.3%	38.9%		48.2%	44.4%	32.4%	16.7%	1.2%	1.2%
Peak/Jan 2	3.1%	4.9%	3.7%	1.9%	0.1%	0.1%	2.2%		5.8%	21.7%	10.8%	5.1%	0.2%	0.5%
Trough	6.4%	7.4%	5.3%	1.0%	0.2%	0.1%	26.9%		21.1%	19.3%	17.3%	3.4%	0.5%	0.3%
Average	11.3%	9.9%	8.3%	4.0%	0.3%	0.2%	34.0%		33.3%	29.3%	24.3%	11.6%	0.9%	0.6%
Avg/Jan 2	-4.3%	1.5%	0.3%	-0.3%	-0.1%	0.0%	-2.7%		-9.1%	6.6%	2.7%	0.0%	-0.1%	-0.1%
Apr 30	11.8%	10.5%	9.3%	3.5%	0.4%	0.2%	35.8%		33.0%	29.3%	26.1%	9.8%	1.2%	0.6%
Apr 30/Jan 2	-3.8%	2.1%	1.4%	-0.8%	0.1%	0.0%	-1.0%		-9.4%	6.6%	4.5%	-1.8%	0.2%	0.0%
Jan ADV	13.5%	8.2%	8.1%	4.3%	0.4%	0.2%	34.7%		39.0%	23.6%	23.5%	12.3%	1.0%	0.6%
Feb ADV	12.2%	9.0%	7.8%	3.7%	0.4%	0.2%	33.2%		36.7%	27.2%	23.4%	11.1%	1.1%	0.6%
Feb/Jan	-1.4%	0.9%	-0.4%	-0.6%	0.0%	0.0%	-1.5%		-2.4%	3.6%	-0.1%	-1.2%	0.0%	0.0%
Mar ADV	9.4%	11.4%	7.3%	2.6%	0.2%	0.2%	31.2%		30.2%	36.7%	23.3%	8.4%	0.8%	0.6%
Mar/Jan	-4.1%	3.3%	-0.9%	-1.6%	-0.1%	0.0%	-3.5%		-8.8%	13.1%	-0.1%	-3.9%	-0.2%	0.0%
Apr ADV	10.2%	10.9%	9.9%	5.2%	0.3%	0.2%	36.7%		27.9%	29.6%	27.0%	14.2%	0.9%	0.5%
Apr/Jan	-3.3%	2.7%	1.8%	1.0%	0.0%	0.0%	2.0%		-11.2%	6.0%	3.5%	1.9%	-0.2%	-0.1%

Source: CBOE Global Markets, SIFMA estimates

⁵ Note: market shares can fluctuate based on day, month or time period chosen

Exchange Market Shares: Total Options Volumes



Source: Cboe Global Markets, SIFMA estimates

Looking Within the NYSE Complex

Looking at market share movements across the NYSE complex of exchanges⁶, we highlight the following trends in market shares as a percent of total market volumes and percent of total NYSE volumes:

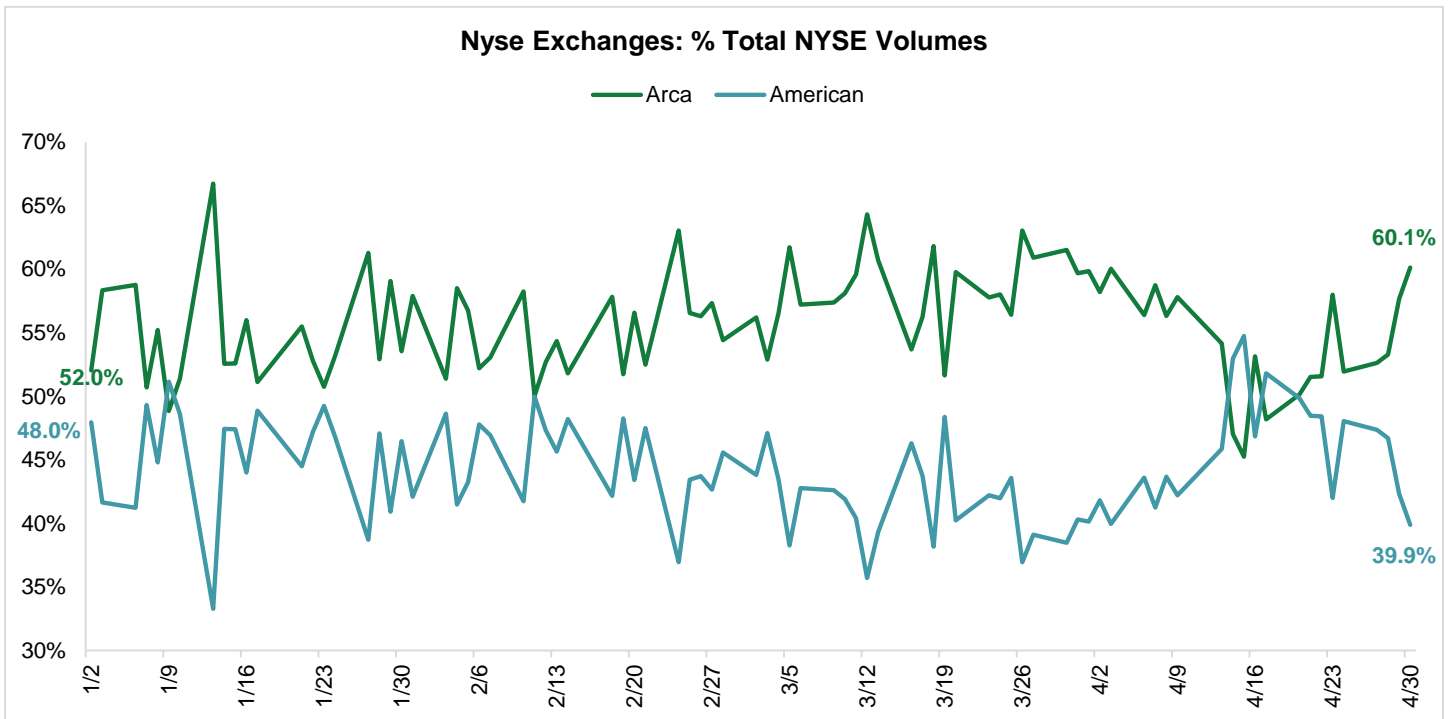
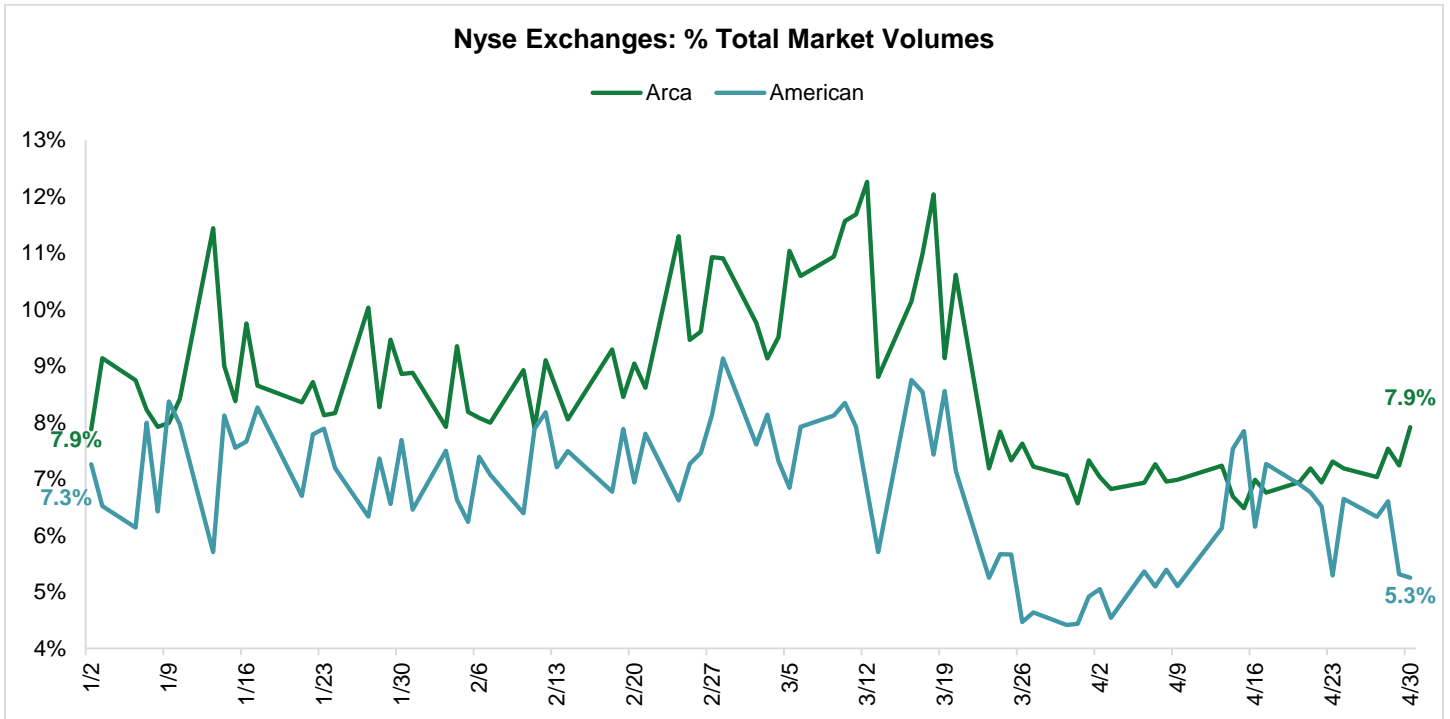
- Total NYSE volumes (right side of table): For 1Q20, Arca represented 56.4% of total NYSE volumes and American 43.6%
 - Arca and American both run a hybrid model
 - Arca lost share from April to January monthly ADV, -0.8 pps, and ended April up 8.1 pps from January 2
 - With only two exchanges in the group, American showed the opposite: +0.8 pps April to January ADV and -8.1 pps from end April to January 2
- Total market volumes (left side of table): For 1Q20, Arca represented 9.3% of total market volumes and American 7.2%
 - From end April to January 2, Arca market share was flat; versus American - 2.0 pps

	% Total Market		& Total	Within NYSE	
	Arca	American		Arca	American
Jan 2	7.9%	7.3%	15.1%	52.0%	48.0%
Peak	12.3%	9.1%	20.0%	66.7%	54.7%
Peak/Jan 2	4.4%	1.9%	4.9%	14.7%	6.8%
Trough	6.5%	4.4%	11.0%	45.3%	33.3%
Average	8.6%	6.8%	15.4%	55.7%	44.3%
Avg/Jan 2	0.7%	-0.4%	0.3%	3.7%	-3.7%
Apr 30	7.9%	5.3%	13.2%	60.1%	39.9%
Apr 30/Jan 2	0.0%	-2.0%	-2.0%	8.1%	-8.1%
Jan ADV	8.8%	7.2%	16.0%	54.8%	45.2%
Feb ADV	9.3%	7.5%	16.7%	55.4%	44.6%
Feb/Jan	0.5%	0.2%	0.7%	0.6%	-0.6%
Mar ADV	9.7%	6.9%	16.6%	58.3%	41.7%
Mar/Jan	0.9%	-0.3%	0.6%	3.5%	-3.5%
Apr ADV	7.1%	6.0%	13.1%	54.1%	45.9%
Apr/Jan	-1.7%	-1.2%	-2.9%	-0.8%	0.8%

Source: CBOE Global Markets, SIFMA estimates

⁶ Note: market shares can fluctuate based on day, month or time period chosen

Exchange Market Shares: Total Options Volumes



Source: Cboe Global Markets, SIFMA estimates

Looking Within the MIAX Complex

Looking at market share movements across the MIAX complex of exchanges⁷, we highlight the following trends in market shares as a percent of total market volumes and percent of total MIAX volumes:

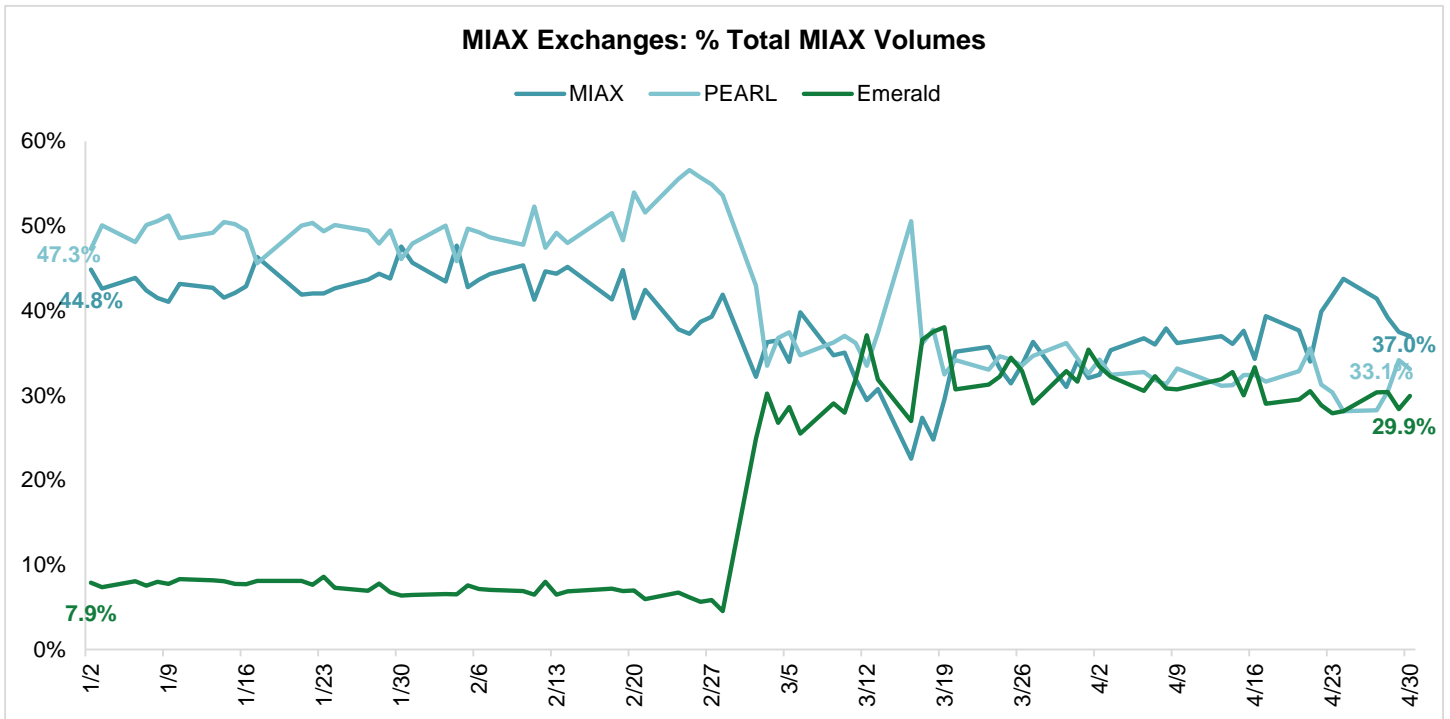
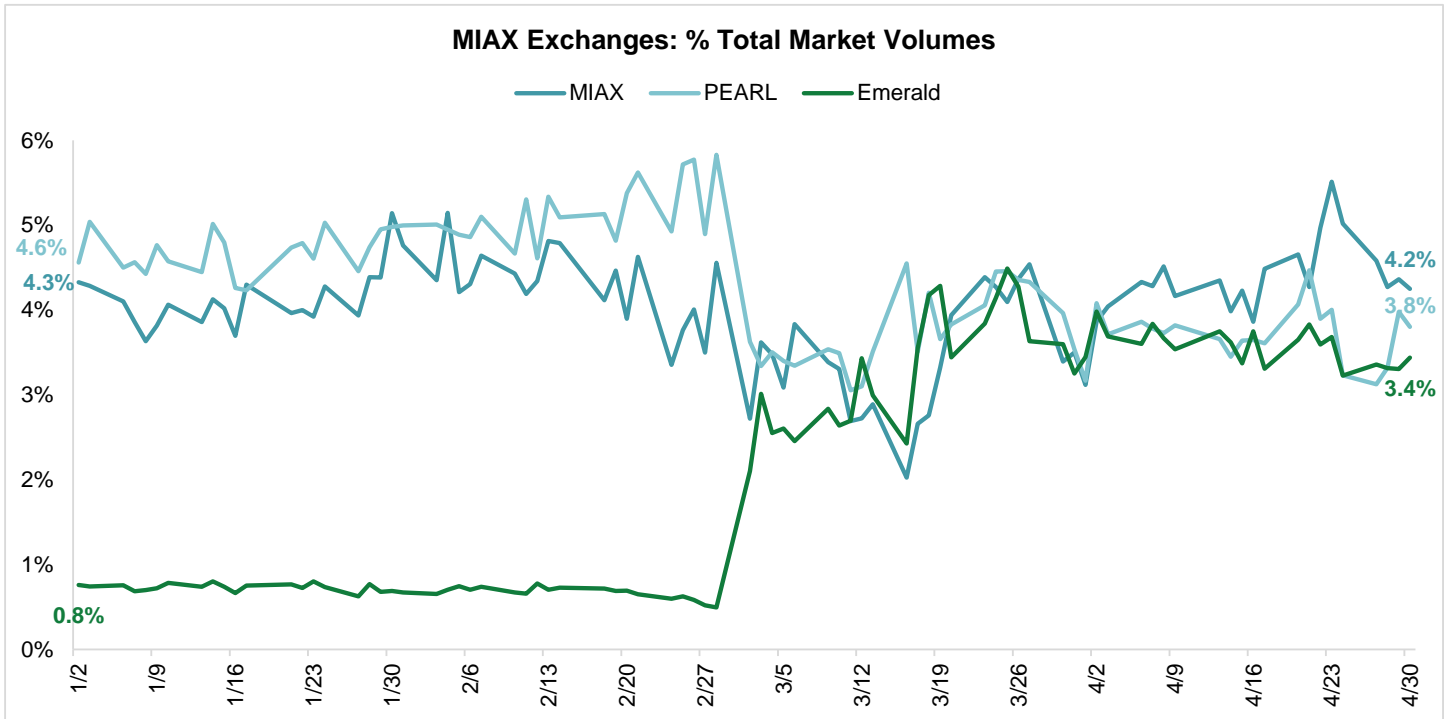
- **Total MIAX volumes** (right side of table): For 1Q20, PEARL represented 44.7% of total MIAX volumes; followed by MIAX 38.6% and Emerald 16.7%
 - All electronic exchanges (no hybrid models)
 - PEARL lost market share from April to January monthly ADV, -17.0 pps, and ended April -14.2 pps from January 2
 - MIAX lost share from April to January monthly ADV, -6.1 pps, & ended April -7.9 pps from January 2
 - Emerald gained share from April to January monthly ADV, +23.1 pps, and ended April up 22.1 pps from January 2; we note that Emerald had implemented pricing changes to attract flow prior to the Covid-19 crisis
- **Total market volumes** (left side of table): For 1Q20, PEARL represented 4.5% of total market volumes; followed by MIAX 3.9% and Emerald 1.7%
 - From end April to January 2, PEARL market share fell 0.8 pps; versus MIAX -0.1 pps and Emerald +2.7 pps

	% Total Market			& Within MIAX				
	PEARL	MIAX	Emerald	Total		PEARL	MIAX	Emerald
Jan 2	4.6%	4.3%	0.8%	9.6%		47.3%	44.8%	7.9%
Peak	5.8%	5.5%	4.5%	13.2%		56.6%	47.7%	38.0%
Peak/Jan 2	1.3%	1.2%	3.7%	3.5%		9.3%	2.8%	30.1%
Trough	3.1%	2.0%	0.5%	8.4%		28.1%	22.5%	4.5%
Average	4.3%	4.0%	2.1%	10.4%		41.8%	38.7%	19.5%
Avg/Jan 2	-0.3%	-0.3%	1.4%	0.8%		-5.5%	-6.2%	11.6%
Apr 30	3.8%	4.2%	3.4%	11.5%		33.1%	37.0%	29.9%
Apr 30/Jan 2	-0.8%	-0.1%	2.7%	1.8%		-14.2%	-7.9%	22.1%
Jan ADV	4.7%	4.1%	0.7%	9.6%		49.0%	43.4%	7.6%
Feb ADV	5.2%	4.2%	0.6%	10.1%		51.6%	41.9%	6.4%
Feb/Jan	0.5%	0.1%	-0.1%	0.5%		2.6%	-1.4%	-1.2%
Mar ADV	3.7%	3.4%	3.3%	10.4%		36.0%	32.5%	31.5%
Mar/Jan	-1.0%	-0.8%	2.5%	0.8%		-13.0%	-10.9%	23.9%
Apr ADV	3.7%	4.3%	3.6%	11.6%		32.0%	37.3%	30.7%
Apr/Jan	-1.0%	0.2%	2.8%	2.1%		-17.0%	-6.1%	23.1%

Source: CBOE Global Markets, SIFMA estimates

⁷ Note: market shares can fluctuate based on day, month or time period chosen

Exchange Market Shares: Total Options Volumes



Source: Cboe Global Markets, SIFMA estimates

Exchange Market Shares: Index Options Volumes

All Exchange Comparison

In this section, we analyze market share movements across exchange groups⁸, for index options volumes only, highlighting the following trends:

- Given its suite of heavily traded proprietary index option products, Cboe dominates market share
- During this time period, some exchanges traded no index options: BOX; Nasdaq NOM, MRX and BX; MIAX PEARL and Emerald
- For 1Q20, Cboe held the highest market share at 99.224%; followed by Nasdaq 0.610%, MIAX 0.163% and NYSE 0.004% (0% at BOX)
- February versus January averages: Cboe, NDAQ, MIAX and NYSE flat
- March versus January averages: Cboe market share was +0.4 pps, with NDAQ -0.2 pps, MIAX -0.2 pps and NYSE flat
- April versus January averages: Cboe market share was +0.4 pps, with NDAQ -0.1 pps, MIAX -0.3 pps and NYSE flat
- At the end of the time series (April 30): Cboe market share was +0.1 pps, with NDAQ -0.1 pps and both MIAX and NYSE flat

% Index Options Market

	CBOE	NDAQ	MIAX	NYSE
Jan 2	99.3%	0.7%	0.0%	0.0%
Peak	99.8%	1.1%	4.9%	0.1%
Peak/Jan 2	0.5%	0.4%	4.9%	0.1%
Trough	94.5%	0.2%	0.0%	0.0%
Average	99.2%	0.6%	0.1%	0.0%
Avg/Jan 2	-0.1%	0.0%	0.1%	0.0%
Apr 30	99.5%	0.5%	0.0%	0.0%
Apr 30/Jan 2	0.1%	-0.1%	0.0%	0.0%
Jan ADV	99.0%	0.7%	0.3%	0.0%
Feb ADV	99.0%	0.7%	0.3%	0.0%
Feb/Jan	0.0%	0.0%	0.0%	0.0%
Mar ADV	99.5%	0.5%	0.0%	0.0%
Mar/Jan	0.4%	-0.2%	-0.2%	0.0%
Apr ADV	99.4%	0.6%	0.0%	0.0%
Apr/Jan	0.4%	-0.1%	-0.3%	0.0%

Source: CBOE Global Markets, SIFMA estimates

⁸ Note: market shares can fluctuate based on day, month or time period chosen

Looking Within the Cboe Complex, Part II

Just as Cboe as a group dominates index market volumes, the Cboe exchange dominates within the Cboe complex, 99.5% of total as of April 30. We highlight the following trends:⁹

- Total Cboe index volumes (right side of table): For 1Q20, Cboe represented 99.5% of total Cboe volumes; followed by C2 0.2%, EDGX 0.2% and BZX 0.1%
 - Only Cboe runs a hybrid model
 - Cboe lost market share from April to January monthly ADV, -0.3 pps, and ended April -0.1 pps from January 2
 - EDGX and C2 took in the April to January monthly ADV gains, +0.2 pps and +0.1 pps respectively, while C2 picked up the end April gain (+0.1 pps)
- Total market index volumes (left side of table): For 1Q20, Cboe represented 98.8% of total market volumes; followed by C2 0.2%, EDGX 0.2% and BZX 0.1%
 - From end April to January 2, there have not been significant changes, with C2 +0.1 pps and all other exchanges essentially flat

	% Index Options Market				&		Within Cboe			
	Cboe	BZX	EDGX	C2	Total		Cboe	BZX	EDGX	C2
Jan 2	99.0%	0.1%	0.1%	0.2%	99.3%		99.6%	0.1%	0.1%	0.2%
Peak	99.5%	0.3%	1.5%	0.5%	99.8%		99.8%	0.3%	1.5%	0.5%
Peak/Jan 2	0.5%	0.2%	1.4%	0.3%	0.5%		0.2%	0.2%	1.4%	0.3%
Trough	94.1%	0.0%	0.0%	0.1%	94.5%		98.3%	0.0%	0.0%	0.1%
Average	98.7%	0.1%	0.2%	0.2%	99.2%		99.5%	0.1%	0.2%	0.3%
Avg/Jan 2	-0.2%	0.0%	0.1%	0.1%	-0.1%		-0.1%	0.0%	0.1%	0.1%
Apr 30	98.9%	0.1%	0.1%	0.3%	99.5%		99.5%	0.1%	0.1%	0.3%
Apr 30/Jan 2	0.0%	0.0%	0.0%	0.1%	0.1%		-0.1%	0.0%	0.0%	0.1%
Jan ADV	98.7%	0.1%	0.1%	0.2%	99.0%		99.7%	0.1%	0.1%	0.2%
Feb ADV	98.6%	0.1%	0.1%	0.3%	99.0%		99.5%	0.1%	0.1%	0.3%
Feb/Jan	-0.2%	0.0%	0.0%	0.1%	0.0%		-0.1%	0.0%	0.0%	0.1%
Mar ADV	98.9%	0.1%	0.3%	0.2%	99.5%		99.5%	0.1%	0.3%	0.2%
Mar/Jan	0.2%	0.0%	0.2%	0.0%	0.4%		-0.2%	0.0%	0.2%	0.0%
Apr ADV	98.8%	0.1%	0.2%	0.3%	99.4%		99.4%	0.1%	0.2%	0.3%
Apr/Jan	0.1%	0.0%	0.2%	0.1%	0.4%		-0.3%	0.0%	0.2%	0.1%

Source: CBOE Global Markets, SIFMA estimates

⁹ Note: market shares can fluctuate based on day, month or time period chosen

Looking Within the Nasdaq Complex, Part II

Looking at market share movements across the Nasdaq complex of exchanges¹⁰, we highlight the following trends:

- Total Nasdaq index volumes (right side of table): For 1Q20, ISE represented 50.6% of total Nasdaq volumes; followed by PHLX 46.2% and GEMX 3.3%
 - Only PHLX runs a hybrid model
 - ISE gained market share from April to January monthly ADV, +1.7 pps, and ended April +2.9 pps from January 2
 - PHLX lost market share from April to January monthly ADV, -2.4 pps, and ended April -0.4 pps
 - GEMX gained market share from April to January monthly ADV, +0.7 pps, and ended April -2.4 pps
- Total market index volumes (left side of table): For 1Q20, ISE represented 0.3% of total market volumes; followed by PHLX 0.3% and GEMX 0.2%
 - From end April to January 2, there have not been significant changes, with ISE -0.1 pps and all other exchanges flat

	% Index Options Market			&		Within Nasdaq		
	ISE	PHLX	GEMX	NDAQ		ISE	PHLX	GEMX
Jan 2	0.5%	0.2%	0.0%	0.7%		69.6%	27.2%	3.2%
Peak	0.8%	0.8%	0.1%	1.1%		76.4%	82.2%	19.4%
Peak/Jan 2	0.3%	0.7%	0.1%	0.4%		6.8%	55.0%	16.2%
Trough	0.1%	0.1%	0.0%	0.2%		15.3%	20.3%	0.6%
Average	0.4%	0.3%	0.0%	0.6%		56.8%	39.5%	3.7%
Avg/Jan 2	-0.1%	0.1%	0.0%	0.0%		-12.8%	12.3%	0.5%
Apr 30	0.4%	0.1%	0.0%	0.5%		72.5%	26.8%	0.7%
Apr 30/Jan 2	-0.1%	0.0%	0.0%	-0.1%		2.9%	-0.4%	-2.4%
Jan ADV	0.4%	0.3%	0.0%	0.7%		60.4%	36.4%	3.1%
Feb ADV	0.4%	0.3%	0.0%	0.7%		57.0%	39.8%	3.3%
Feb/Jan	0.0%	0.0%	0.0%	0.0%		-3.4%	3.3%	0.1%
Mar ADV	0.2%	0.3%	0.0%	0.5%		36.1%	60.6%	3.4%
Mar/Jan	-0.2%	0.0%	0.0%	-0.2%		-24.4%	24.1%	0.2%
Apr ADV	0.4%	0.2%	0.0%	0.6%		62.1%	34.1%	3.8%
Apr/Jan	-0.1%	-0.1%	0.0%	-0.1%		1.7%	-2.4%	0.7%

Source: CBOE Global Markets, SIFMA estimates

¹⁰ Note: market shares can fluctuate based on day, month or time period chosen

Looking Within the NYSE Complex, Part II

Looking at market share movements across the NYSE complex of exchanges¹¹, we highlight the following trends:

- Total NYSE index volumes (right side of table): For 1Q20, American represented 73.3% of total NYSE volumes, followed by Arca 26.7%
 - Arca and American both run a hybrid model
 - American lost market share from April to January monthly ADV, while Arca gained, -/+13.7 pps
 - Both American and Arca were flat to end April
- Total market index volumes (left side of table): For 1Q20, American represented 0.003% of total market volumes, followed by Arca 0.001%
 - From end April to January 2, there have not been significant changes (i.e. flat)

	% Index Options Market			&	Within NYSE	
	American	Arca	NYSE		American	Arca
Jan 2	0.0%	0.0%	0.0%		0.0%	0.0%
Peak	0.09%	0.03%	0.11%		100.0%	100.0%
Peak/Jan 2	0.0900%	0.0285%	0.1121%		100.0%	100.0%
Trough	0.0%	0.0%	0.0%		0.0%	0.0%
Average	0.0022%	0.0009%	0.0031%		55.3%	44.7%
Avg/Jan 2	0.0022%	0.0009%	0.0031%		55.3%	44.7%
Apr 30	0.0%	0.0%	0.0%		0.0%	0.0%
Apr 30/Jan 2	0.0%	0.0%	0.0%		0.0%	0.0%
Jan ADV	0.005%	0.001%	0.006%		80.3%	19.7%
Feb ADV	0.005%	0.001%	0.006%		80.6%	19.4%
Feb/Jan	-0.0003%	-0.0001%	-0.0004%		0.3%	-0.3%
Mar ADV	0.00004%	0.0007%	0.0008%		4.8%	95.2%
Mar/Jan	-0.0048%	-0.0004%	-0.0052%		-75.5%	75.5%
Apr ADV	0.0001%	0.00004%	0.0001%		66.7%	33.3%
Apr/Jan	-0.005%	-0.001%	-0.006%		-13.7%	13.7%

Source: CBOE Global Markets, SIFMA estimates

¹¹ Note: market shares can fluctuate based on day, month or time period chosen

Exchange Market Shares: SPY Options Volumes

All Exchange Comparison

In this section, we analyze market share movements across exchange groups¹², for SPY options volumes only, highlighting the following trends:

- As this is a non-proprietary product, market shares are much more spread out across exchange groups
- For 1Q20, Cboe held the highest market share at 34.3%; followed closely by Nasdaq 30.4% and then NYSE 19.1%, MIAX 14.9% and BOX 1.3%
- February versus January averages: Cboe was flat, NDAQ -0.6 pps, NYSE -0.8 pps, MIAX +1.1 pps and BOX +0.3 pps
- March versus January averages: Cboe +1.4 pps, with NDAQ +0.3 pps, NYSE -4.0 pps, MIAX +1.5 pps and BOX +0.7 pps
- April versus January averages: Cboe +0.5 pps, with NDAQ -1.1 pps, NYSE -3.1 pps, MIAX +3.4 pps and BOX +0.4 pps
- At the end of the time series (April 30): Cboe market share was +0.9 pps, with NDAQ -2.5 pps, NYSE -4.3 pps, MIAX +5.3 pps and BOX +0.5 pps

% SPY Options Market

	CBOE	NDAQ	NYSE	MIAX	BOX
Jan 2	32.8%	30.8%	22.2%	13.5%	0.6%
Peak	42.1%	37.2%	26.6%	22.2%	2.8%
Peak/Jan 2	9.3%	6.4%	4.4%	8.7%	2.1%
Trough	29.7%	26.3%	13.9%	11.6%	0.5%
Average	34.1%	30.1%	19.3%	15.3%	1.2%
Avg/Jan 2	1.2%	-0.7%	-2.9%	1.8%	0.6%
Apr 30	33.8%	28.4%	17.9%	18.8%	1.2%
Apr 30/Jan 2	0.9%	-2.5%	-4.3%	5.3%	0.5%
Jan ADV	33.6%	30.4%	21.3%	13.8%	0.9%
Feb ADV	33.6%	29.9%	20.5%	14.9%	1.2%
Feb/Jan	0.0%	-0.6%	-0.8%	1.1%	0.3%
Mar ADV	35.0%	30.7%	17.3%	15.4%	1.6%
Mar/Jan	1.4%	0.3%	-4.0%	1.5%	0.7%
Apr ADV	34.1%	29.3%	18.2%	17.2%	1.2%
Apr/Jan	0.5%	-1.1%	-3.1%	3.4%	0.4%

Source: OCC, SIFMA estimates

¹² Note: market shares can fluctuate based on day, month or time period chosen

Looking Within the Cboe Complex, Part III

Looking at market share movements across the Cboe complex of exchanges, we highlight the following trends:¹³

- Total Cboe SPY volumes (right side of table): For 1Q20, BZX represented 35.8% of total Cboe volumes, followed by Cboe 35.6%, C2 17.0% and EDGX 11.6%
 - Only Cboe runs a hybrid model
 - April versus January averages: Cboe +1.3 pps, with BZX +6.8 pps, C2 -8.2 pps and EDGX +0.1 pps
 - At the end of the time series (April 30): Cboe -5.7 pps, with BZX +10.3 pps, C2 -0.4 pps and EDGX -4.3 pps
- Total market SPY volumes (left side of table): For 1Q20, BZX represented 12.3% of total SPY volumes, followed by Cboe 12.2%, C2 5.8% and EDGX 4.0%
 - April versus January averages: Cboe +0.6 pps, with BZX +2.4 pps, C2 -2.7 pps and EDGX +0.1 pps
 - At the end of the time series (April 30): Cboe -1.5 pps, with BZX +3.7 pps, C2 +0.1 pps and EDGX -1.3 pps

	% SPY Options Market					&	Within Cboe			
	Cboe	BZX	C2	EDGX	Total		Cboe	BZX	C2	EDGX
Jan 2	14.2%	7.6%	6.4%	4.6%	32.8%		43.4%	23.1%	19.5%	14.0%
Peak	17.0%	19.3%	9.8%	5.7%	42.1%		47.2%	50.0%	29.1%	16.0%
Peak/Jan 2	2.8%	11.8%	3.4%	1.0%	9.3%		3.8%	26.9%	9.6%	2.0%
Trough	9.6%	6.5%	3.0%	1.4%	29.7%		28.8%	20.5%	8.4%	4.3%
Average	12.7%	11.4%	6.0%	4.1%	34.1%		37.2%	33.2%	17.6%	12.0%
Avg/Jan 2	-1.6%	3.8%	-0.4%	-0.5%	1.2%		-6.2%	10.1%	-1.9%	-2.0%
Apr 30	12.7%	11.3%	6.5%	3.3%	33.8%		37.7%	33.4%	19.2%	9.8%
Apr 30/Jan 2	-1.5%	3.7%	0.1%	-1.3%	0.9%		-5.7%	10.3%	-0.4%	-4.3%
Jan ADV	12.8%	9.2%	7.4%	4.2%	33.6%		38.1%	27.3%	22.1%	12.5%
Feb ADV	12.4%	10.3%	7.1%	3.8%	33.6%		36.9%	30.7%	21.0%	11.4%
Feb/Jan	-0.4%	1.1%	-0.4%	-0.4%	0.0%		-1.1%	3.3%	-1.1%	-1.1%
Mar ADV	11.8%	14.8%	4.4%	3.9%	35.0%		33.8%	42.4%	12.6%	11.3%
Mar/Jan	-1.0%	5.7%	-3.0%	-0.3%	1.4%		-4.3%	15.1%	-9.5%	-1.3%
Apr ADV	13.4%	11.6%	4.7%	4.3%	34.1%		39.4%	34.1%	13.9%	12.6%
Apr/Jan	0.6%	2.4%	-2.7%	0.1%	0.5%		1.3%	6.8%	-8.2%	0.1%

Source: OCC, SIFMA estimates

¹³ Note: market shares can fluctuate based on day, month or time period chosen

Looking Within the Nasdaq Complex, Part III

Looking at market share movements across the Nasdaq complex of exchanges, we highlight the following trends:¹⁴

- **Total Nasdaq SPY volumes** (right side of table): For 1Q20, ISE represented 36.7% of total Nasdaq volumes, followed by NOM 31.1%, PHLX 23.4%, GEMX 8.3%, MRX 0.3% and BX 0.3%
 - Only PHLX runs a hybrid model
 - April versus January averages: ISE -12.7 pps, NOM +18.8 pps, PHLX -5.0 pps, GEMX -1.1 pps, MRX +0.1 pps and BX -0.1 pps
 - At the end of the time series (April 30): ISE -14.3 pps, NOM +15.1 pps, PHLX +2.6 pps, GEMX -4.7 pps, MRX +1.5 pps and BX -0.1 pps
- **Total market SPY volumes** (left side of table): For 1Q20, ISE represented 11.2% of total SPY volumes, followed by NOM 9.5%, PHLX 7.1%, GEMX 2.5%, MRX 0.1% and BX 0.1%
 - April versus January averages: ISE -4.2 pps, NOM +5.3 pps, PHLX -1.7 pps, GEMX -0.5 pps and both MRX and BX flat
 - At the end of the time series (April 30): ISE -5.2 pps, NOM +3.8 pps, PHLX +0.2 pps, GEMX -1.6 pps, MRX +0.4 pps and BX flat

	% SPY Options Market						&		Within Nasdaq					
	ISE	NOM	PHLX	GEMX	MRX	BX	NDAQ		ISE	NOM	PHLX	GEMX	MRX	BX
Jan 2	13.9%	6.0%	7.3%	3.6%	0.1%	0.1%	30.8%		45.0%	19.4%	23.6%	11.7%	0.2%	0.2%
Peak	17.9%	16.1%	14.8%	4.9%	0.5%	0.9%	37.2%		53.1%	54.7%	39.9%	15.9%	1.7%	2.8%
Peak/Jan 2	4.0%	10.1%	7.6%	1.3%	0.4%	0.8%	6.4%		8.1%	35.3%	16.3%	4.3%	1.5%	2.7%
Trough	5.9%	4.0%	3.6%	0.6%	0.0%	0.0%	26.3%		19.2%	11.8%	12.3%	2.1%	0.0%	0.0%
Average	11.3%	8.7%	6.9%	3.0%	0.1%	0.1%	30.1%		37.6%	29.1%	22.8%	10.0%	0.3%	0.2%
Avg/Jan 2	-2.6%	2.8%	-0.3%	-0.6%	0.0%	0.0%	-0.7%		-7.5%	9.7%	-0.7%	-1.6%	0.1%	0.0%
Apr 30	8.7%	9.8%	7.4%	2.0%	0.5%	0.0%	28.4%		30.7%	34.4%	26.2%	7.0%	1.7%	0.1%
Apr 30/Jan 2	-5.2%	3.8%	0.2%	-1.6%	0.4%	0.0%	-2.5%		-14.3%	15.1%	2.6%	-4.7%	1.5%	-0.1%
Jan ADV	13.9%	5.1%	7.5%	3.7%	0.1%	0.0%	30.4%		45.8%	16.9%	24.7%	12.3%	0.2%	0.1%
Feb ADV	12.7%	7.2%	7.2%	2.6%	0.1%	0.1%	29.9%		42.7%	24.0%	24.2%	8.7%	0.3%	0.2%
Feb/Jan	-1.2%	2.0%	-0.3%	-1.1%	0.0%	0.0%	-0.6%		-3.2%	7.0%	-0.4%	-3.5%	0.0%	0.0%
Mar ADV	9.0%	12.8%	6.9%	1.9%	0.1%	0.2%	30.7%		29.1%	41.6%	22.3%	6.1%	0.3%	0.5%
Mar/Jan	-5.0%	7.7%	-0.6%	-1.8%	0.0%	0.1%	0.3%		-16.7%	24.7%	-2.4%	-6.1%	0.1%	0.3%
Apr ADV	9.7%	10.5%	5.8%	3.3%	0.1%	0.0%	29.3%		33.1%	35.7%	19.6%	11.2%	0.3%	0.1%
Apr/Jan	-4.2%	5.3%	-1.7%	-0.5%	0.0%	0.0%	-1.1%		-12.7%	18.8%	-5.0%	-1.1%	0.1%	-0.1%

Source: OCC, SIFMA estimates

¹⁴ Note: market shares can fluctuate based on day, month or time period chosen

Looking Within the NYSE Complex, Part III

Looking at market share movements across the NYSE complex of exchanges, we highlight the following trends:¹⁵

- Total NYSE SPY volumes (right side of table): For 1Q20, American represented 55.0% of total NYSE volumes, with Arca 45.0%
 - Both exchanges run a hybrid model
 - April versus January averages: American +6.8 pps and Arca -6.8 pps
 - At the end of the time series (April 30): American +0.2 pps and Arca -0.2 pps
- Total market SPY volumes (left side of table): For 1Q20, American represented 10.5% of total SPY volumes, with Arca 8.6%
 - April versus January averages: American -0.6 pps and Arca -2.6 pps
 - At the end of the time series (April 30): American -2.4 pps and Arca -1.9 pps

	% SPY Options Market			&	Within NYSE	
	American	Arca	NYSE		American	Arca
Jan 2	12.4%	9.8%	22.2%		56.0%	44.0%
Peak	20.1%	14.3%	26.6%		75.4%	57.6%
Peak/Jan 2	7.6%	4.5%	4.4%		19.4%	13.6%
Trough	6.8%	5.8%	13.9%		42.4%	24.6%
Average	11.3%	8.1%	19.3%		58.1%	41.9%
Avg/Jan 2	-1.1%	-1.7%	-2.9%		2.1%	-2.1%
Apr 30	10.0%	7.8%	17.9%		56.2%	43.8%
Apr 30/Jan 2	-2.4%	-1.9%	-4.3%		0.2%	-0.2%
Jan ADV	12.3%	9.0%	21.3%		57.7%	42.3%
Feb ADV	11.7%	8.8%	20.5%		57.0%	43.0%
Feb/Jan	-0.6%	-0.2%	-0.8%		-0.6%	0.6%
Mar ADV	9.0%	8.3%	17.3%		52.0%	48.0%
Mar/Jan	-3.3%	-0.7%	-4.0%		-5.7%	5.7%
Apr ADV	11.7%	6.5%	18.2%		64.5%	35.5%
Apr/Jan	-0.6%	-2.6%	-3.1%		6.8%	-6.8%

Source: OCC, SIFMA estimates

¹⁵ Note: market shares can fluctuate based on day, month or time period chosen

Looking Within the MIAX Complex, Part III

Looking at market share movements across the MIAX complex of exchanges, we highlight the following trends: ¹⁶

- Total MIAX SPY volumes (right side of table): For 1Q20, PEARL represented 58.4% of total MIAX volumes, followed by MIAX 31.6% and Emerald 10.0%
 - All electronic exchanges
 - April versus January averages: PEARL -15.0 pps, MIAX +14.2 pps and Emerald +0.8 pps
 - At the end of the time series (April 30): PEARL -18.4 pps, MIAX +21.2 pps and Emerald -2.8 pps
- Total market SPY volumes (left side of table): For 1Q20, PEARL represented 8.7% of total SPY volumes, followed by MIAX 4.7% and Emerald 1.5%
 - April versus January averages: PEARL -0.6 pps, MIAX +3.4 pps and Emerald +0.5 pps
 - At the end of the time series (April 30): PEARL -0.1 pps, MIAX +5.3 pps and Emerald +0.2 pps

	% SPY Options Market			&	Within MIAX		
	PEARL	MIAX	Emerald	MIAX	PEARL	MIAX	Emerald
Jan 2	8.6%	3.2%	1.7%	13.5%	63.4%	23.8%	12.9%
Peak	11.0%	11.1%	3.3%	22.2%	70.2%	49.9%	21.6%
Peak/Jan 2	2.4%	7.9%	1.6%	8.7%	6.8%	26.2%	8.7%
Trough	6.2%	2.7%	0.6%	11.6%	39.2%	21.3%	4.1%
Average	8.4%	5.3%	1.5%	15.3%	55.7%	34.1%	10.1%
Avg/Jan 2	-0.1%	2.1%	-0.2%	1.8%	-7.6%	10.4%	-2.8%
Apr 30	8.5%	8.5%	1.9%	18.8%	44.9%	45.0%	10.1%
Apr 30/Jan 2	-0.1%	5.3%	0.2%	5.3%	-18.4%	21.2%	-2.8%
Jan ADV	8.4%	4.1%	1.4%	13.8%	60.5%	29.4%	10.1%
Feb ADV	9.2%	4.8%	0.9%	14.9%	62.0%	32.1%	5.9%
Feb/Jan	0.9%	0.7%	-0.5%	1.1%	1.5%	2.7%	-4.1%
Mar ADV	8.5%	4.9%	1.9%	15.4%	55.5%	32.2%	12.3%
Mar/Jan	0.2%	0.9%	0.5%	1.5%	-5.0%	2.8%	2.2%
Apr ADV	7.8%	7.5%	1.9%	17.2%	45.5%	43.7%	10.9%
Apr/Jan	-0.6%	3.4%	0.5%	3.4%	-15.0%	14.2%	0.8%

Source: OCC, SIFMA estimates

¹⁶ Note: market shares can fluctuate based on day, month or time period chosen

Appendix: Market Share Movements Overview

% Total Options Market

	Cboe	BZX	EDGX	C2	Total Cboe	PHLX	NOM	ISE	GEMX	MRX	BX	Total Nasdaq	Arca	American	Total NYSE	PEARL	MIAX	Emerald	Total MIAX
Jan 2	20.4%	8.0%	3.3%	4.0%	35.8%	15.6%	8.3%	7.9%	4.3%	0.4%	0.2%	36.8%	7.9%	7.3%	15.1%	4.6%	4.3%	0.8%	9.6%
Peak	25.5%	15.0%	4.6%	4.6%	43.3%	18.7%	13.3%	11.7%	6.2%	0.4%	0.3%	38.9%	12.3%	9.1%	20.0%	5.8%	5.5%	4.5%	13.2%
Peak/Jan 2	5.0%	7.0%	1.3%	0.6%	7.6%	3.1%	4.9%	3.7%	1.9%	0.1%	0.1%	2.2%	4.4%	1.9%	4.9%	1.3%	1.2%	3.7%	3.5%
Trough	15.9%	7.7%	2.2%	1.8%	34.0%	6.4%	7.4%	5.3%	1.0%	0.2%	0.1%	26.9%	6.5%	4.4%	11.0%	3.1%	2.0%	0.5%	8.4%
Average	21.1%	10.0%	3.5%	3.1%	37.8%	11.3%	9.9%	8.3%	4.0%	0.3%	0.2%	34.0%	8.6%	6.8%	15.4%	4.3%	4.0%	2.1%	10.4%
Avg/Jan 2	0.7%	1.9%	0.3%	-0.9%	2.0%	-4.3%	1.5%	0.3%	-0.3%	-0.1%	0.0%	-2.7%	0.7%	-0.4%	0.3%	-0.3%	-0.3%	1.4%	0.8%
Apr 30	19.6%	11.2%	3.5%	2.8%	37.2%	11.8%	10.5%	9.3%	3.5%	0.4%	0.2%	35.8%	7.9%	5.3%	13.2%	3.8%	4.2%	3.4%	11.5%
Apr 30/Jan 2	-0.8%	3.2%	0.3%	-1.2%	1.4%	-3.8%	2.1%	1.4%	-0.8%	0.1%	0.0%	-1.0%	0.0%	-2.0%	-2.0%	-0.8%	-0.1%	2.7%	1.8%
Jan ADV	21.6%	8.5%	3.3%	3.8%	37.2%	13.5%	8.2%	8.1%	4.3%	0.4%	0.2%	34.7%	8.8%	7.2%	16.0%	4.7%	4.1%	0.7%	9.6%
Feb ADV	21.7%	8.8%	3.4%	3.5%	37.4%	12.2%	9.0%	7.8%	3.7%	0.4%	0.2%	33.2%	9.3%	7.5%	16.7%	5.2%	4.2%	0.6%	10.1%
Feb/Jan	0.2%	0.3%	0.1%	-0.3%	0.2%	-1.4%	0.9%	-0.4%	-0.6%	0.0%	0.0%	-1.5%	0.5%	0.2%	0.7%	0.5%	0.1%	-0.1%	0.5%
Mar ADV	22.5%	11.7%	3.3%	2.3%	39.8%	9.4%	11.4%	7.3%	2.6%	0.2%	0.2%	31.2%	9.7%	6.9%	16.6%	3.7%	3.4%	3.3%	10.4%
Mar/Jan	0.9%	3.2%	0.0%	-1.5%	2.6%	-4.1%	3.3%	-0.9%	-1.6%	-0.1%	0.0%	-3.5%	0.9%	-0.3%	0.6%	-1.0%	-0.8%	2.5%	0.8%
Apr ADV	19.0%	10.6%	4.0%	2.9%	36.4%	10.2%	10.9%	9.9%	5.2%	0.3%	0.2%	36.7%	7.1%	6.0%	13.1%	3.7%	4.3%	3.6%	11.6%
Apr/Jan	-2.6%	2.1%	0.7%	-1.0%	-0.7%	-3.3%	2.7%	1.8%	1.0%	0.0%	0.0%	2.0%	-1.7%	-1.2%	-2.9%	-1.0%	0.2%	2.8%	2.1%

Source: CBOE Global Markets, SIFMA estimates

Appendix: Market Landscape

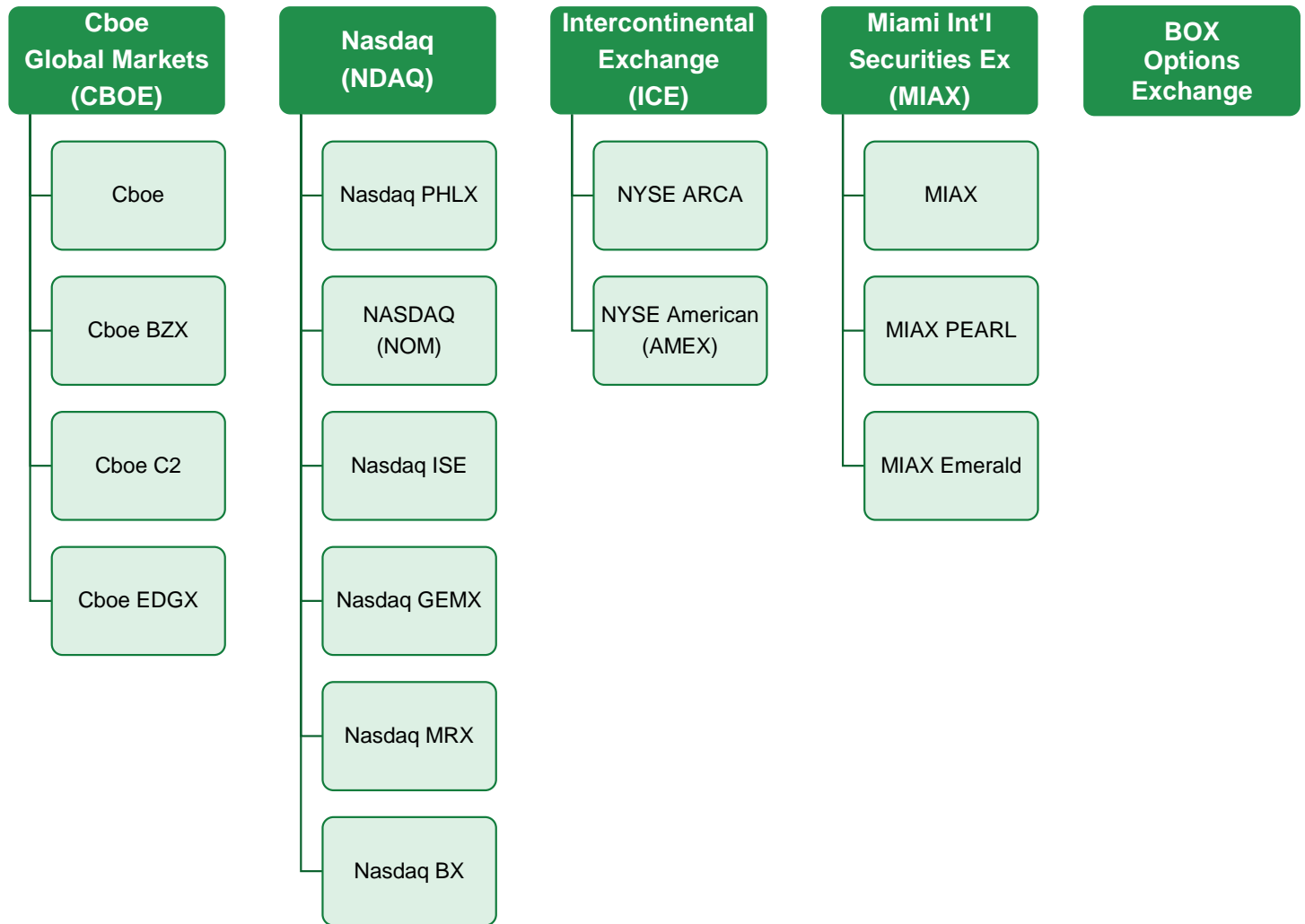
Exchange parent groups often hold multiple exchange licenses (each individual exchange must be approved by and registered with the SEC). Different exchanges are set up to serve the various needs of end users, mainly based on pricing models, as well as matching methodologies or different order types to serve customer needs (investment strategies, comply with regulation, execute a range of trading strategies, etc.).

Some exchanges utilize an open outcry trading floor and electronic systems, a hybrid model. In open outcry trading, verbal and hand signals convey trading information (volume, price, intentions, acceptance) in the trading pits, or a set area on the trading floor designated to trade a certain product or market. It is an organized auction process where participants compete for orders. Once traders agree on terms, they settle a contract for that trade. The format enables price discovery and other efficiencies and is used mostly to trade complex orders and products.

US Listed Options Exchange Models

- 16 total exchanges
- **NYSE**, 2 exchanges (owned by Intercontinental Exchange; floors temporarily closed March 20, Arca's San Francisco floor reopened May 4, American scheduled to partially reopen May 26)
 - NYSE Arca – hybrid model; maker/taker (rebates for posting, fees for removing liquidity), price-time priority allocation
 - NYSE American – hybrid model; blends customer priority and size pro-rata allocation
- **Nasdaq**, 6 exchanges (PHLX floor temporarily closed March 17)
 - Nasdaq PHLX – hybrid model; customer priority, pro rata allocation; classic/traditional pricing model (customers trade with no fees, non-customers pay fees)
 - NASDAQ (NOM) – all-electronic; maker/taker; price/time priority allocation
 - Nasdaq BX – all electronic; taker/maker; with customer priority utilizing either a price/time priority or pro rata allocation algorithm (geared to retail order flow)
 - Nasdaq ISE – all electronic; modified maker/taker (rebates/ fees based on product, client type and order category); pro-rata allocation
 - Nasdaq GEMX – all electronic; maker/taker; market makers, preferenced orders and pro-rata allocation
 - Nasdaq MRX – all electronic; simple customer priority, pro-rata allocation with traditional pricing or price-time complex market with pricing similar to ISE
- **Cboe**, 4 exchanges (Cboe floor temporarily closed March 16)
 - Cboe – hybrid model; classic pricing model
 - Cboe C2 – all electronic; pro-rata, maker-taker model
 - Cboe BZX – all electronic; price-time, maker-taker model
 - Cboe EDGX – all electronic; pro-rata/customer priority/DMM model
- **MIAX**, 3 exchanges
 - MIAX – all electronic; classic pricing model; pro-rata trade allocation
 - MIAX PEARL – all electronic; maker/taker; price-time trade allocation
 - MIAX Emerald – all electronic; maker/taker; pro-rata trade allocation
- **BOX**, 1 exchange
 - BOX – all electronic; no payment for order flow; price/time priority matching
 - Opened an open outcry trading floor in August 2019 (floor closed March 20, reopened May 4)

Exchange Landscape



Appendix: Terms to Know

FINRA	Financial Industry Regulatory Authority
SEC	Securities and Exchange Commission
SRO	Self-Regulatory Organization
ADV	Average Daily Trading Volume
ATS	Alternative Trading System
Best Ex	Best Execution
CAT	Consolidated Audit Trail
Dark Pool	Private trading venues, not accessible by the public
ETF	Exchange-Traded Fund
MM	Market Maker
OPRA	Options Price Reporting Authority
Call	The right to buy the underlying security, on or before expiration
Put	The right to sell the underlying security, on or before expiration
Holder	The buyer of the contract
Writer	The seller of the contract
American	Option may be exercised on any trading day on or before expiration
European	Option may only be exercised on expiration
Exercise	To put into effect the right specified in a contract
Underlying	The instrument on which the options contract is based; the asset/security being bought or sold upon exercise notification
Expiration	The set date at which the options contract ends, or ceases to exist, or the last day it can be traded
Stock Price	The price at which the underlying stock is trading, fluctuates continuously
Strike Price	The set price at which the options contract is exercised, or acted upon
Premium	The price the option contract trades at, or the purchase price, which fluctuates constantly
Time Decay	The time value portion of an option's premium decreases as time passes; the longer the option's life, the greater the probability the option will move in the money
Intrinsic Value	The in-the-money portion of an option's premium
Time Value	(Extrinsic value) The option premium (price) of the option minus intrinsic value; assigned by external factors (passage of time, volatility, interest rates, dividends, etc.)
In-the-Money	For a call option, when the stock price is greater than the strike price; reversed for put options
At-the Money	Stock price is identical to the strike price; the option has no intrinsic value
Out-of-the-Money	For a call option, when the stock price is less than the strike price; reversed for put options

Appendix: SIFMA Insights Research Reports

SIFMA Insights Market Structure Primers: www.sifma.org/primers

- Global Capital Markets & Financial Institutions
- Electronic Trading
- US Capital Formation & Listings Exchanges
- US Equity
- US Multi-Listed Options
- US ETF
- US Fixed Income
- SOFR: The Transition from LIBOR

SIFMA Insights: www.sifma.org/insights

- NYSE Goes All Electronic – What Does It Mean?
- Spotlight: The VIX's Wild Ride
- Market Structure Week Debrief, 2019
- The Evolution of the Fintech Narrative

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SIFMA Insights

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