



**RESEARCH**

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# **NYSE Goes All Electronic – What Does It Mean?**

May 2020



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## Executive Summary

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We are in unprecedented times. 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 sharp price declines – yet spikes in volumes – in equities markets, which closed the first quarter with their worst performance since the financial crisis. The ultimate symbol of these unprecedented times is the closing of the floor of the New York Stock Exchange (NYSE) on March 23, 2020. With the floor closure, market participants are wondering if the NYSE is losing trading market share of equity volumes.

Inside this note, we explore just that question. While market shares can fluctuate based on day, month or time period chosen, we analyze movements in market shares across parent exchange groups, individual exchange licenses and on versus off exchange trading volumes. Prior to the early Easter close week, there was an upward sloping trajectory for NYSE's aggregated market share from January to that week. Numbers worsened in April, but we do not view it as a significant degree, given: overall January 2 to April 29 share is down 1.6 pps, but the numbers fluctuate weekly throughout the time period and other exchanges also see periods of declines (and also swings) throughout the period. However, based on the downward trend at the end of the time period analyzed, we believe we must wait and see if there will be long-term impacts on NYSE's market share.

### Key highlights include:

- U.S. equity trading is not quite 100% electronic today
  - NYSE: 2 hybrid exchanges, 3 all electronic exchanges
  - Nasdaq: 3 exchanges, all electronic
  - Cboe Global Markets: 4 exchanges, all electronic
  - IEX: 1 exchange, all electronic
  - We estimate the application of human touch in equity trading is ~1%-2%.
- NYSE executes volumes through electronic order flow, DMMs and floor brokers on its hybrid exchanges, believing it enhances efficiencies and price transparency for the closing auction
- Market shares across exchanges (please see appendix for a complete table showing data for all exchanges)
  - 1Q20 market shares: NYSE 24.3%, Nasdaq 18.6%, Cboe 16.7% and IEX 2.6%
  - April 29 vs. January 2: NYSE -1.6 pps, NDAQ +0.9 pps, CBOE -0.8 pps and IEX -0.2 pps
  - February vs. January averages: NYSE +1.5 pps, NDAQ +0.6 pps, both CBOE and IEX flat
  - March vs. January averages: NYSE +0.9 pps, NDAQ +1.2 pps, CBOE +1.1 pps, IEX +0.2 pps
  - April vs. January averages: NYSE -1.4 pps, NDAQ -0.3 pps, CBOE +0.4 pps, IEX -0.5 pps
  - March 23 vs. March 20: NYSE fell 4.0 pps, NDAQ fell 0.8 pps, CBOE up 1.5 pps, IEX flat
  - March 23 vs. March 16: NYSE fell 1.9 pps, NDAQ up 0.3 pps, CBOE up 1.0 pps and IEX fell 0.8 pps
- Also in this note: details on the NYSE hybrid model; U.S. equity exchange landscape; an explanation of why exchanges run multiple licenses; and volume, volatility and index price charts

## What Happened?

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Charles Dickens wrote, “It was the best of times, it was the worst of times”. Well, we are in unprecedented times. 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 sharp price declines – yet spikes in volumes – in equities markets. U.S. equities closed the first quarter with their worst performance since the financial crisis: (Please see the appendix for charts on index prices, volumes and volatility.)

- **Index Prices:** The S&P 500 closed on March 31 at 2,584.59 (-21% from January 2), the DJIA at 21,917.16 (-24%), the Nasdaq at 7,700.10 (-15%) and the Russell 2000 at 1,153.10 (-31%)
- **Index Volumes:** Index volumes were up 137% (March 31 from January 2) for the S&P 500, 137% for the DJIA, 66% for the Nasdaq and 77% for the Russell 2000
- **Volatility:** CBOE Volatility Index (VIX<sup>1</sup>) jumped to 53.54 on March 31 from just 12.47 to start the year (+329%), peaking at 82.69 (+563%)
- **Consolidated ADV:** ADV ended the quarter on March 31 at 13.5 billion shares, +74% from January 2 (normally averages around 7 billion shares); peaking at 19.4 billion shares, +150%

The ultimate symbol of unprecedented times is the closing of the floor of the New York Stock Exchange (NYSE). On March 23, 2020, in order to protect the health of employees on the floor and not contribute to the strain on the New York City health care system, Intercontinental Exchange (ICE), the parent company of the NYSE, temporarily closed its equities and options trading floors and began electronic trading only.

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<sup>1</sup> A real-time market index that represents the market's expectation of 30-day forward-looking volatility, as derived from the price inputs of the S&P 500 index options. It measures market risk and investor sentiment (fear, stress) and is often called the fear index

## Isn't Everything Electronic Anyway?

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No, U.S. equity trading is not quite 100% electronic today. NYSE runs a hybrid model – electronic and human interaction, mainly at the open and close – in two of its exchanges. Its competitors are all electronic. Looking at published volumes, the total market share for NYSE's two hybrid exchanges was 13.1% (for 1Q20) of total equity volumes (NYSE 12.7%, American 0.4%). Now not all of this volume will be touched by humans – this is just the volume universe available for the hybrid model.

NYSE predominantly utilizes the hybrid process at the open and the close, with mostly electronic trading intraday on all of its exchanges. The closing auction blends technology and human judgment to provide price transparency and ensure smooth functioning of the close. NYSE indicates its closing auction trades around 223 million shares on average. Applying this to the 1Q20 ADV of 11.0 billion shares, it represents 2.0% of total equity volumes across all exchanges. NYSE further indicates its closing auction grew to nearly 7% of total NYSE-listed volume, which would represent 0.9% of total equity volumes.

Therefore, while the universe available to apply a hybrid model is ~13% of total volumes, it is more likely the actual application of human touch in U.S. equity trading is down in the single digit percentage range, around 1%-2%.

### Electronic or Hybrid Model

NYSE runs 5 of the 13 U.S. equities exchanges (scheduled to be 16 by the end of this year; please see Appendix for market landscape):

- **Equities, hybrid model** (2 out of 5): NYSE, American
- **Equities, all electronic** (3 out of 5): Arca, Chicago, National
- **Listings:** NYSE, mid- and large-cap stocks; American, small-cap stocks; Arca, ETPs

NYSE's competitors run all electronic models.

- **Nasdaq:** 3 equities exchanges, all electronic
- **Cboe Global Markets:** 4 equities exchanges, all electronic
- **IEX:** 1 equities exchange, all electronic

Please note, the structure is different in the U.S. listed options markets. Here, NYSE's competitors post a variety of structures, with some still running a hybrid model on at least one of their exchange licenses. NYSE runs 2 of the 16 listed options exchanges (American and Arca), and they both operate a hybrid model. Comparatively, Nasdaq has 6 options exchanges; only Nasdaq PHLX runs a hybrid model (temporarily closed on March 17). Cboe Global Markets has 4 options exchanges; only Cboe runs a hybrid model (temporarily closed March 16). MIAX has 3 options exchanges, all of which are electronic. BOX has 1 options exchange, which runs all electronic (it also opened an open outcry trading floor in August 2019; temporarily closed on March 20).

### Why Maintain a Hybrid Model?

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On the listed options side – and across futures and other options products – some exchanges utilize an open outcry trading floor 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. Open outcry is an organized auction process where participants have a chance to compete for orders. Once traders agree on terms, they settle a contract for that trade. The format enables price discovery and other efficiencies. It is still used today, mostly to trade complex orders and products.

For equities trading, NYSE runs a unique business model. It had specialists operating on the floor since 1872. A specialist was a member of a stock exchange acting as a market maker to facilitate trading of stock. They traded 5 to 10 stocks at a time, with one specialist per stock standing ready to step in and buy/sell as needed to ensure a fair and orderly market. A specialist stood on a particular spot on the floor of the exchange (his trading post), and floor traders acting on behalf of clients would come to the post for price discovery and to execute orders. (This is an open outcry auction system, just under a different name.)

While the specialists are gone, NYSE now uses the Designated Market Maker (DMM) model, which still enables the maintaining of fair and orderly markets for assigned securities. Today, DMMs operate manually and electronically – a hybrid model – to facilitate price discovery during market opens, closes and periods of trading imbalances or instability by maintaining depth of book in the securities they trade. NYSE also has floor brokers, acting in an agency-only<sup>2</sup> capacity.

#### Why does NYSE maintain this floor presence?

NYSE executes volumes through electronic order flow (EOF), DMMs and floor brokers. The majority of the intraday interaction is through EOF. Even the majority of the open/close is done through the electronic books of DMMs, who will then offset any liquidity imbalances manually. Given the importance of the closing auction – as stated above, around 223 million shares are traded during the close (and this is the number during benign market environments, unlike what was seen recently) – NYSE blends technology and human judgment to produce a key price point for investors, the closing price. An indication of the current value of a stock, it represents not just the last trade price of the day, but also the price used to set daily net asset values for mutual funds and ETF. Therefore, it is critical that this price reflect current market interest.

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<sup>2</sup> Agency brokers do not hold inventory of the securities they buy and sell, rather they only execute transactions on behalf of their clients. This differs from broker-dealers or market makers, who hold inventory of the securities they trade.

As such, NYSE utilizes its hybrid model to offer investors several order types for the closing auction:

- **Market-on-Close (MOC)** – An unpriced order to buy or sell a security at the closing price, guaranteed to receive an execution in the closing auction
- **Limit-on-Close (LOC)** – Sets the maximum price an investor is willing to buy, or the minimum price to sell, in the closing auction; if priced better than the final closing auction price, it is guaranteed execution
- **D Orders** – NYSE floor brokers can enter customer orders verbally to DMMs or via an electronic order, a closing D Order; floor brokers act passively during intraday trading, then trade more actively at the close when contra-side liquidity is available

NYSE's model offers parity allocation of all trades, which enables multiple orders from DMMs, floor brokers and those at the top of the electronic book at the same price point to each participant in a trade (versus price-time priority basis which allocates trades to orders that arrive first in time at each price point). NYSE believes its hybrid structure and these order types result in lower volatility, deeper liquidity and price improvement, as well as enable flexibility for investors choosing to participate in the closing auction.

Again, the hybrid model is used predominantly at the open and close, or during periods of trading imbalance. Additionally, listings exchanges utilize the hybrid model to facilitate the auction for IPOs and secondary offerings, with manual treatment to match bids/offers and ensure an efficient opening trade.

### How Does Closing the Floor Effect the Closing Auction?

Naturally, EOF continues as normal, since it already was electronic. DMMs continue to have electronic responses to auctions. The prior manual DMM processes used an exchange execution process, range bound by price collars, to fill imbalance orders. Our understanding is that typically all imbalance orders were filled. With the floor closure and no manual DMM or floor broker processes, NYSE is using electronic exchange facilitated auctions, which also use price range boundaries. Our understanding is that there are now more market and limit-on-close orders left unfilled (unfilled orders get cancelled back to the buyer/seller). When the floor is open, floor brokers start disseminating imbalance information at 2:00 pm versus 3:50 pm in electronic mode. Also, in floor mode, the exchange can publish imbalances after 4:00 pm to bring liquidity in, which cannot happen today.

Floor brokers represent around 5% of intraday flow and 33% of open/close auctions. The D Orders, a unique selling point of NYSE's closing auction, are not available under the floor closure. Investors instead must use electronic MOCs/LOCs, which are offset with electronic imbalance orders. Floor brokers can still connect to NYSE electronically, but there is no open outcry at the close.

Structurally, operations have functioned well since the floor closure. Only time will tell if investors feel the difference in execution of their trades with or without the human interaction on the floor.



## Has The Close Shifted Exchange Market Shares?

While volatility has come down and index prices are starting to recover since the close of the first quarter, market participants are wondering if the close of the NYSE floor has caused the exchange to lose trading market share of equity volumes. In this section, we analyze market share movements across exchanges and across exchange parent groups' individual exchange licenses, as well as aggregate totals for on exchange versus off exchange trading volumes. We observe trends from the start of the year through April 29, with additional focus on the weeks around the close of the NYSE floor.

Before we begin, we note that market shares can fluctuate by a fraction of a percent or even a few percentage points (pps) on a monthly and certainly a daily basis. Therefore, this time period may be too short to be indicative of any long-term market share shifts.

### Volumes & Volatility

First, we analyze volumes and volatility from January 2 to April 29. Equity ADV began the year at a more normal level of 7.7 billion shares, while the VIX was at 12.47. Moving through the analysis time period, we highlight:

- Equity ADV peaked at 19.4 billion shares on February 28, +150% from the start of the year
- Equity ADV remains elevated at 13.1 billion shares (April 29), +70% 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 31.23, +150% from the start of the year

	Equity ADV	Options ADV	ETFs ADV	ETF % Equity	VIX
Jan 2	7.7	21.6	1.5	19.1%	12.47
Peak	19.4	47.3	5.6	29.8%	82.69
Peak/Jan 2	150%	119%	278%	55.8%	563%
Trough	6.7	18.7	1.1	15.6%	12.10
Apr 29	13.1	30.1	2.0	15.6%	31.23
Apr 29/Jan 2	70%	39%	38%	-18.7%	150%
Jan ADV	7.6	24.1	1.5	19.2%	13.94
Feb ADV	9.3	28.8	2.0	20.6%	19.63
Feb/Jan	21%	20%	38%	7.2%	41%
Mar ADV	15.6	29.6	4.2	26.4%	57.74
Mar/Jan	105%	23%	182%	37.5%	314%
Apr ADV	12.3	25.8	2.8	23.4%	41.82
Apr/Jan	61%	7%	91%	21.7%	200%

Source: Bloomberg, CBOE Global Markets, SIFMA estimates

**On vs. Off Exchange Trading**

Next, we look at volume trends for on versus off exchange trading. In general, during periods of high volatility, more volumes move onto exchange trading to participate in price discovery (improve transparency). In low volatility times, more volumes move off exchange.

Turning to the data, we highlight the following trends for on exchange market share:

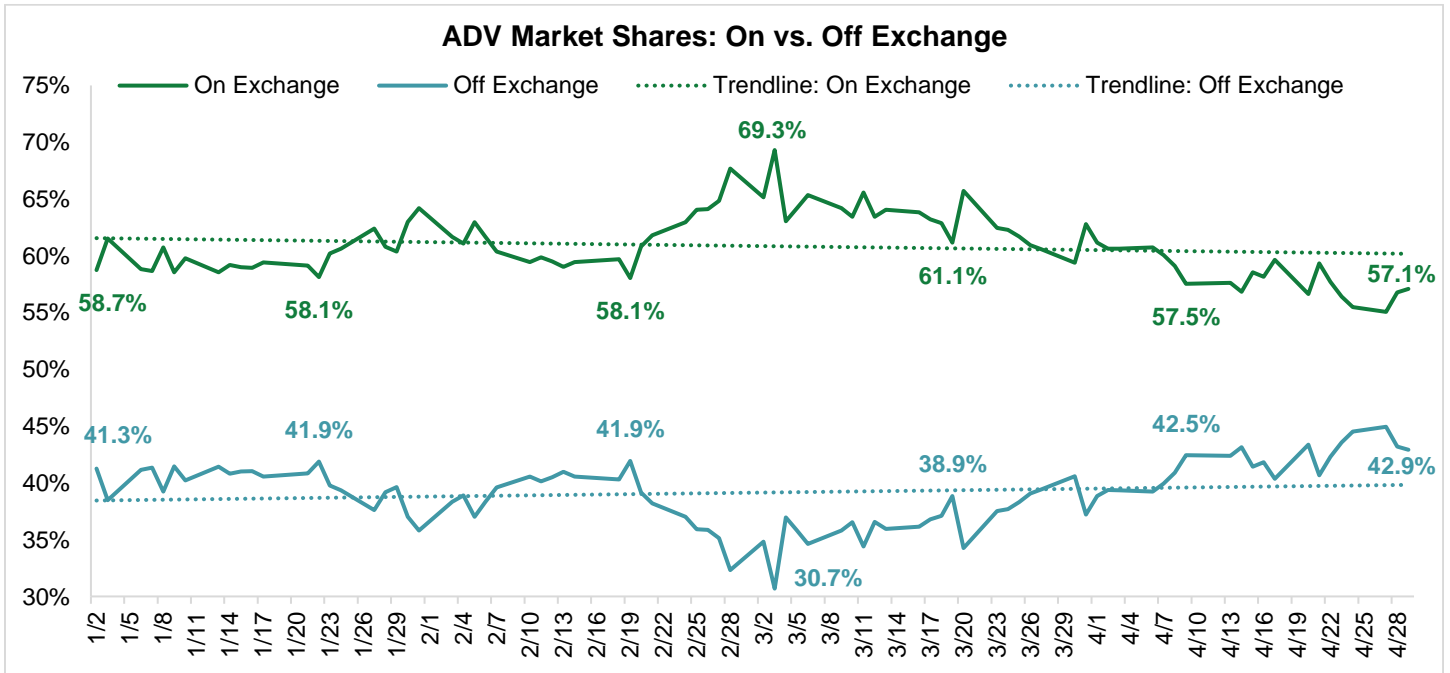
- March was elevated at 63.4% vs. 60.1% in January, +3.3 pps
- It peaked at 69.3% on March 3, +10.6 pps from the start of the year, averaging 62.4% for 1Q20
- Prior to the announcement of the close of the NYSE floor, it was at 63.8% on March 16
- This shot up to 65.7% on the Friday before the close (a triple witch Friday, volumes elevated in general)
- For the first several days of April, it returned to the average level seen in January
- By April 9 (day before a long weekend), it was below start of year levels at 57.5%; -1.2 pps from Jan 2, -2.6 pps from January average
- April ADV is 58.4% (through April 29), -1.7 pps from January
- More volumes moved on exchange as volatility spiked but has normalized as the VIX came down
- The trendline for on exchange trading is now downward sloping for the year, albeit with a modest slope (please see chart on the next page)

**% Total Market**

	On Exchange	Off Exchange
<b>General Stats</b>		
Jan 2	58.7%	41.3%
Peak	69.3%	44.9%
Peak/Jan2	10.6%	3.7%
Trough	55.1%	30.7%
Average	60.9%	39.1%
Avg/Jan2	2.1%	-2.1%
Apr 29	57.1%	42.9%
Apr29/Jan2	-1.7%	1.7%
<b>The Close</b>		
Mar 16	63.8%	36.2%
Mar 20	65.7%	34.3%
Mar 23	62.5%	37.5%
Mar23/Mar16	-1.4%	1.4%
Mar23/Mar20	-3.3%	3.3%
Apr 29	57.1%	42.9%
Apr29/Mar16	-6.7%	6.7%
<b>ADVs</b>		
Jan ADV	60.1%	39.9%
Feb ADV	62.3%	37.7%
Feb/Jan	2.2%	-2.2%
Mar ADV	63.4%	36.6%
Mar/Jan	3.3%	-3.3%
Apr ADV	58.4%	41.6%
Apr/Jan	-1.7%	1.7%

Source: CBOE Global Markets, SIFMA estimates

## Has The Close Shifted Exchange Market Shares?



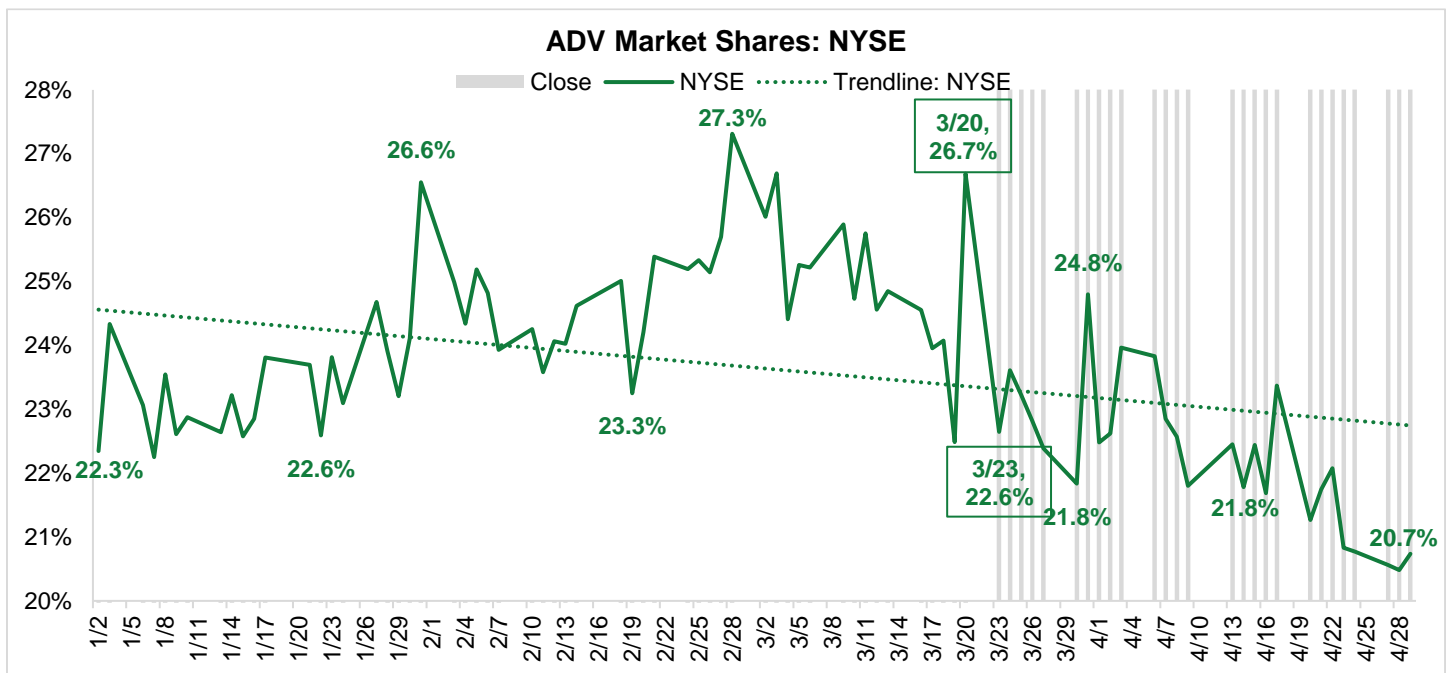
Source: Cboe Global Markets, SIFMA estimates

**NYSE Market Share**

Now that we know how on exchange volumes moved throughout the time period, we analyze how it shifted across exchange groups. We start with just NYSE market share movements, as some market participants have surmised that NYSE has lost market share since closing its trading floor. Similar to on exchange market share, NYSE looked like it had been gaining share from January to March, with an upward sloping trendline from the start of the year. Prior to the week of April 6, this trend looked like it was continuing. However, this trend had reversed prior to the Easter long weekend. The overall trendline is now downward sloping for the year.

We highlight the following trends for aggregate NYSE market share:

- March was elevated at 24.4% vs. 23.5% in January and 25.0% in February, +0.9 pps and -0.6 pps
- It peaked at 27.3% on February 28, +5.0 pps from the start of the year, averaging 24.3% in 1Q20
- It troughed at 21.8% on 3/30 (day before quarterly rebalancing; recovered to 24.8% on rebalance day)
- For the first several days of April, it returned to the average level seen in January
- By April 9 (day before a long weekend), it troughed again at 21.8%, below start of year levels at 22.3%; -0.5 pps from Jan 2, -1.7 pps from January average
- April ADV is 22.1% (through April 29), -1.4 pps from January
- While a lower market share, it is not greater than the share lost by total on exchange trading (-1.7 pps)



Source: Cboe Global Markets, SIFMA estimates

## Has The Close Shifted Exchange Market Shares?

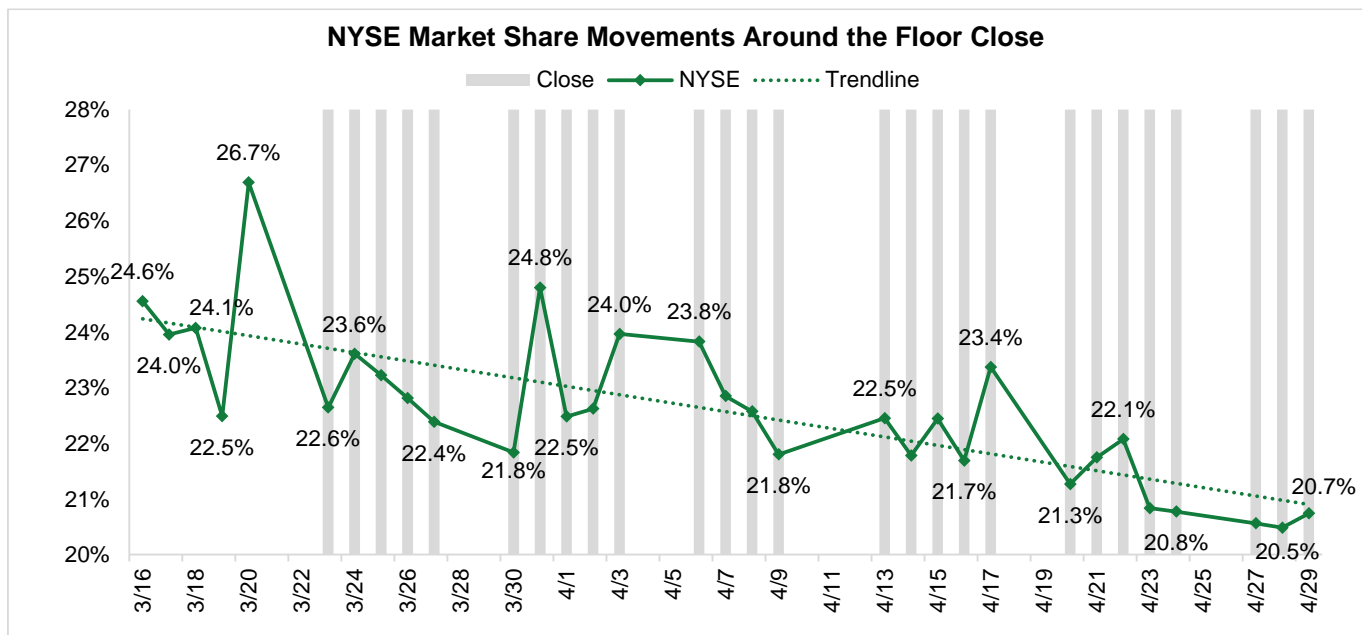
Looking closer at the time period around the floor closure, we assess how NYSE market share held up. We choose the starting point of this assessment as March 16, the Monday of the last week the floor was opened. It is also before the closure was publicly announced (March 18), to avoid any noise from the announcement.

	Market Share	vs. Jan 2 22.3%	vs. Jan Avg 23.5%
Jan 2	22.3%	0.0%	-1.1%
Mar 16	24.6%	2.2%	1.1%
Mar 20	26.7%	4.3%	3.2%
Mar 23	22.6%	0.3%	-0.8%
W1: Mar 23-27	22.9%	0.6%	-0.5%
W2: Mar 30-Apr 3	23.1%	0.8%	-0.3%
W3: Apr 6-9	22.8%	0.4%	-0.7%
W4: Apr 13-17	22.3%	0.0%	-1.1%
W5: Apr 20-24	21.3%	-1.0%	-2.1%
Apr 29	20.7%	-1.6%	-2.7%
Mar ADV	24.4%	2.1%	0.9%
Apr ADV	22.1%	-0.2%	-1.4%

Source: CBOE Global Markets, SIFMA estimates

- NYSE had been gaining share prior to the close versus the start of the year
- Its share held up for the first few weeks of the close, but this trend had reversed prior to the Easter long weekend
- The first four weeks of April were in line with January levels
- Week 5 levels dropped 1 pps W/W, but April ADV is still in line with January (through April 29)
- Note: March 20 was a triple witch Friday, where volumes are elevated in general; April 9 was the day before a long weekend, where investors reposition portfolios (elevating volumes)

However, as we noted at the start of this section, NYSE market share moved around quite a bit during this period, as exchange market shares do on a day-to-day, week-to-week, etc. basis. Prior to the early close week, we would have concluded the floor closure had not significantly impacted NYSE's market share. Now, based on the downward turn at the end of this time series, we must wait and see if there will be long-term impacts on NYSE's market share.



Source: Cboe Global Markets, SIFMA estimates

### NYSE vs. Other Exchanges

In this section, we analyze market share movements across exchange groups. (We again warn that market shares can fluctuate based on day, month or time period chosen.) We note the following trends in market shares across exchanges:

- In 1Q20, NYSE held the highest market share, 24.3%; followed by Nasdaq 18.6%, Cboe 16.7% & IEX 2.6%
- February versus January averages: NYSE market share was up 1.5 pps, with NDAQ up 0.6 pps and both CBOE and IEX flat
- March versus January averages: NYSE market share was up 0.9 pps, with NDAQ up 1.2 pps, CBOE up 1.1 pps and IEX essentially flat (+0.2%)
- April versus January averages: NYSE market share was down 1.4 pps, with NDAQ -0.3 pps, CBOE +0.4 pps and IEX -0.5 pps vs. on exchange trading in total -1.7 pps
- Exchange market shares during the NYSE floor closure
  - March 23 versus March 20: NYSE market share fell 4.0 pps on the first day the floor was closed, while NDAQ fell 0.8 pps, CBOE increased 1.5 pps and IEX was essentially flat (+0.1%) vs. on exchange trading -3.3 pps
  - March 23 versus March 16: NYSE market share fell 1.9 pps while NDAQ increased 0.3 pps, CBOE increased 1.0 pps and IEX fell 0.8 pps vs. on exchange trading -1.4 pps
- At the end of the time series (April 29), on exchange trading was down 1.7 pps from January 2, with NYSE -1.6 pps (NDAQ +0.9 pps, CBOE -0.8 pps, IEX -0.2 pps)

The decline is logical given NYSE is the only exchange group running a hybrid model, but, given the fluctuations across the time period, it does not appear that any other particular parent exchange group is out-and-out winning. It is also not a significant enough loss of share to declare that this will be a permanent shift. (Please see table on the following page.)

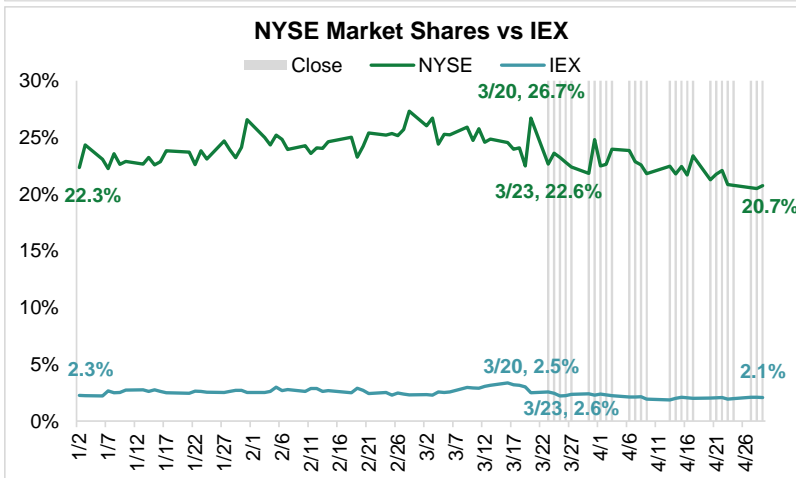
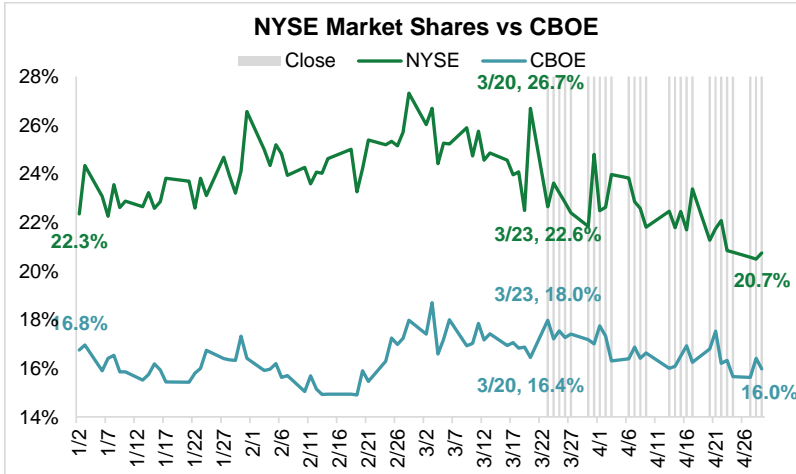
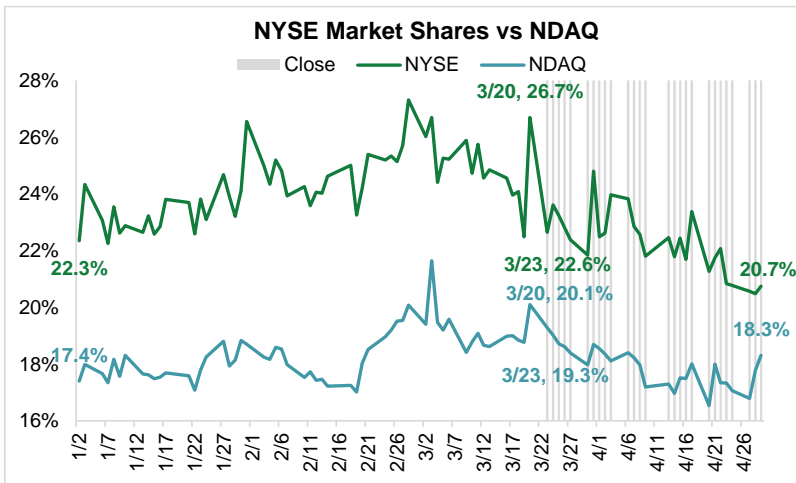
## Has The Close Shifted Exchange Market Shares?

### % Total Market

	NYSE	NDAQ	CBOE	IEX	On Exchange	Off Exchange
<b>General Stats</b>						
Jan 2	22.3%	17.4%	16.8%	2.3%	58.7%	41.3%
Peak	27.3%	21.6%	18.7%	3.4%	69.3%	44.9%
Peak/Jan2	5.0%	4.2%	1.9%	1.1%	10.6%	3.7%
Trough	20.5%	16.5%	14.9%	1.9%	55.1%	30.7%
Average	23.7%	18.2%	16.5%	2.5%	60.9%	39.1%
Avg/Jan2	1.3%	0.8%	-0.3%	0.2%	2.1%	-2.1%
Apr 29	20.7%	18.3%	16.0%	2.1%	57.1%	42.9%
Apr29/Jan2	-1.6%	0.9%	-0.8%	-0.2%	-1.7%	1.7%
<b>The Close</b>						
Mar 16	24.6%	19.0%	16.9%	3.4%	63.8%	36.2%
Mar 20	26.7%	20.1%	16.4%	2.5%	65.7%	34.3%
Mar 23	22.6%	19.3%	18.0%	2.6%	62.5%	37.5%
Mar23/Mar16	-1.9%	0.3%	1.0%	-0.8%	-1.4%	1.4%
Mar23/Mar20	-4.0%	-0.8%	1.5%	0.1%	-3.3%	3.3%
Apr 29	20.7%	18.3%	16.0%	2.1%	57.1%	42.9%
Apr29/Mar16	-3.8%	-0.7%	-1.0%	-1.3%	-6.7%	6.7%
<b>ADVs</b>						
Jan ADV	23.5%	17.9%	16.2%	2.5%	60.1%	39.9%
Feb ADV	25.0%	18.5%	16.2%	2.6%	62.3%	37.7%
Feb/Jan	1.5%	0.6%	0.0%	0.0%	2.2%	-2.2%
Mar ADV	24.4%	19.1%	17.3%	2.7%	63.4%	36.6%
Mar/Jan	0.9%	1.2%	1.1%	0.2%	3.3%	-3.3%
Apr ADV	22.1%	17.6%	16.5%	2.1%	58.4%	41.6%
Apr/Jan	-1.4%	-0.3%	0.4%	-0.5%	-1.7%	1.7%

Source: CBOE Global Markets, SIFMA estimates

## Has The Close Shifted Exchange Market Shares?



Source: Cboe Global Markets, SIFMA estimates

If you map out trend lines for each of the exchanges from January 2 to April 29, NYSE and IEX are slightly downward sloping. NDAQ and CBOE are slightly upward sloping. However, the slope factors (“m” in  $y = mx + b$ ) for all are all well below 1, meaning the slopes are very, very modest:

- NYSE:  $y = -0.0002x - 6.974$
- NDAQ:  $y = 0.000007x - 0.1124$
- CBOE:  $y = 0.00007x - 3.1213$
- IEX:  $y = -0.00005x + 1.9866$

In other words, there is no clear winner or loser at this point in time.

Now, trend lines account for heightened volumes during a time period. Looking just at the straight market shares on January 2 versus April 29, the majority of exchanges are down: (i.e. a shift to off exchange trading)

- NYSE -1.6%
- NDAQ +0.9%
- CBOE -0.8%
- IEX -0.2%

Looking at the charts for the time period just around the close, NDAQ shows a similar pattern to NYSE’s decline, with an upward shift at the end of the time period. CBOE showed a pop from the Friday before the close to the first closure day, but this levelled off. IEX is essentially flat.

Based on these trends, we do not see a significant effect on NYSE’s market share. again, based on the slightly lower (versus January) levels at the end of this time series, we must wait and see if there will be long-term impacts.



### Looking Within the NYSE Complex

Next, we analyze market share movements across the NYSE complex of exchanges (note: market shares can fluctuate based on day, month or time period chosen.) We note the following trends in market shares across NYSE exchanges as a percent of total market volumes and percent of total NYSE volumes:

(Please see the table and charts on the following pages.)

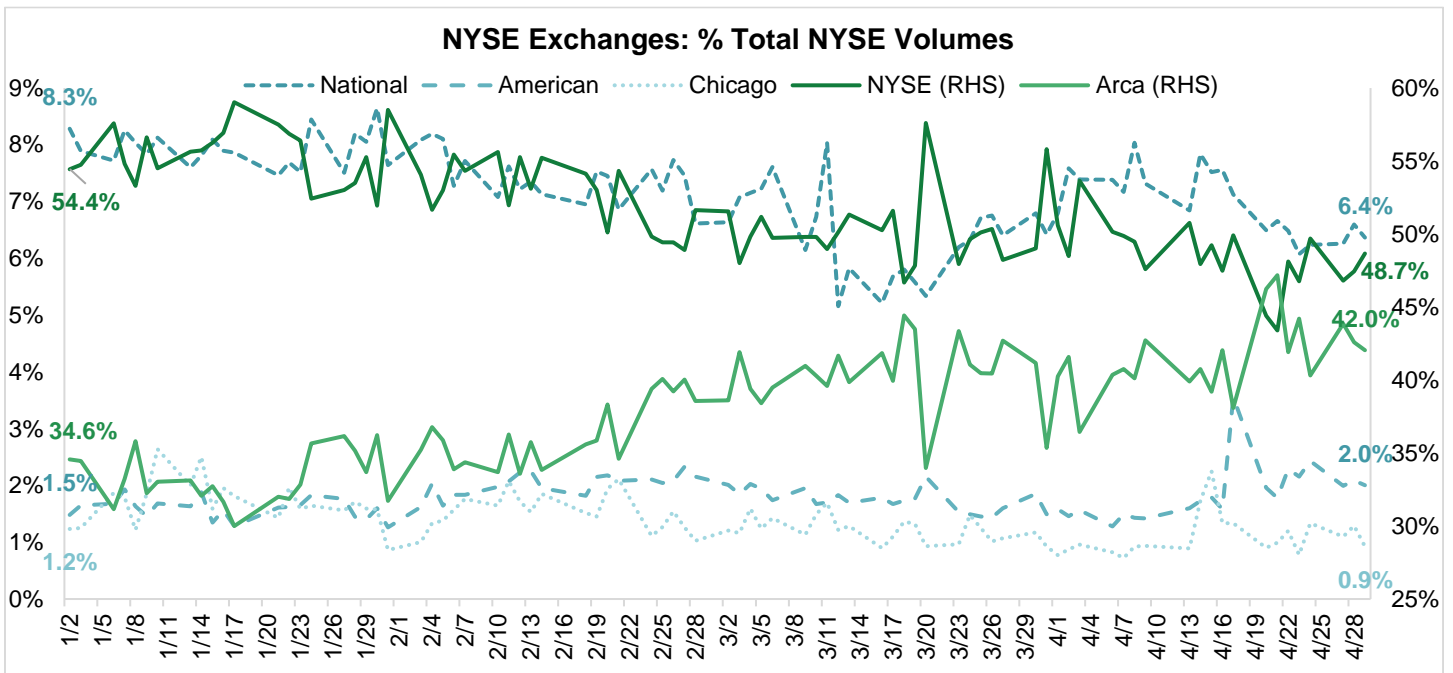
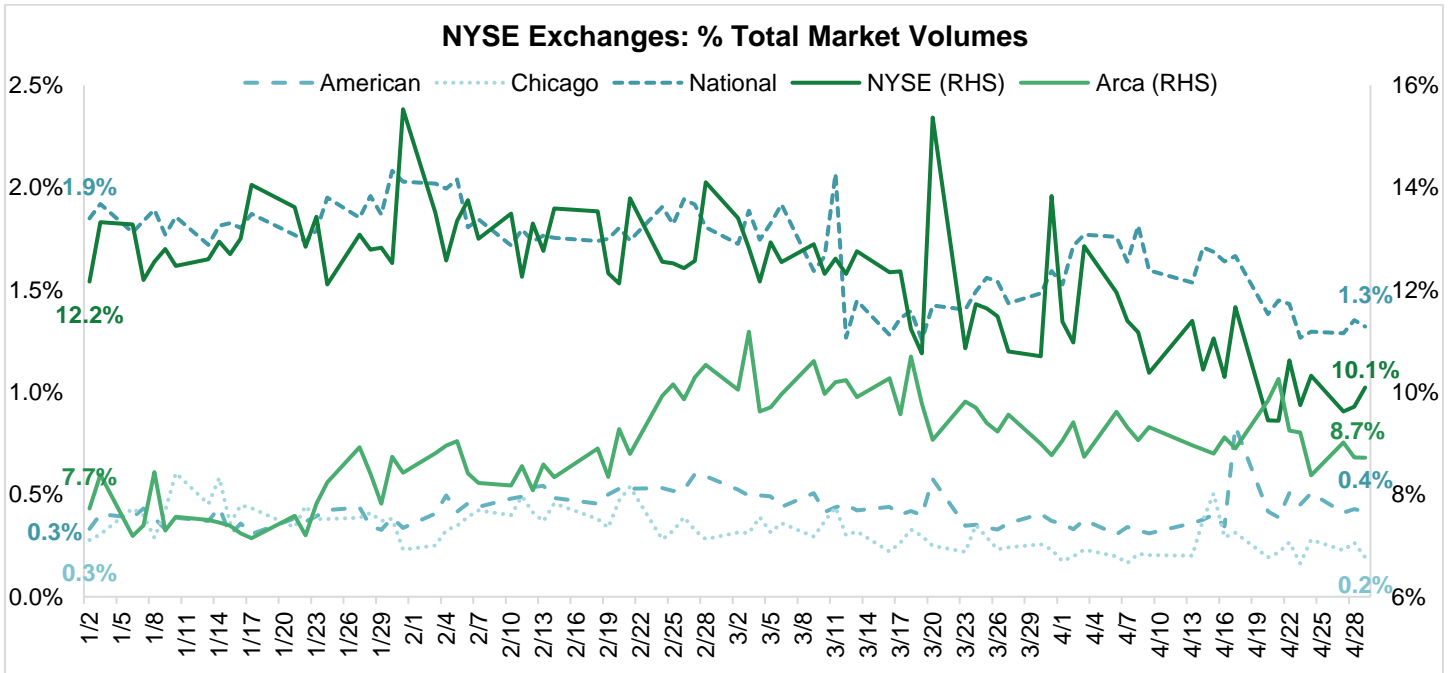
- Total NYSE volumes (right side of table): ~90% on the NYSE and Arca exchanges, averaging 52.0% and 37.9% for 1Q20; National, American and Chicago represented 7.0%, 1.8% and 1.4%
  - As expected given the floor closure, the hybrid NYSE average market share dropped in April to 48.6%, -6.9 pps from January; NYSE share also declined in February and March (-3.4 & -5.2 pps)
  - All electronic Arca was the gainer, with an April average of 41.4%, +8.1 pps since January (+3.7 pps in February and +7.0 pps in March)
  - National, American & Chicago: April 7.1% (-0.9 pps from Jan.), 1.8% (+0.2 pps) & 1.1% (-0.6 pps)
- Total market volumes (left side of table): NYSE and Arca represented 12.7% and 9.2% in 1Q20; National, American and Chicago represented 1.7%, 0.4% and 0.3%
  - NYSE April share fell 2.3 pps from January; versus +1.3 pps at Arca, -0.3 pps at National, flat at American and -0.1 pps at Chicago

## Has The Close Shifted Exchange Market Shares?

	% Total Market					&	Within NYSE				
	NYSE	Arca	National	American	Chicago		Total	NYSE	Arca	National	American
<b>General Stats</b>											
Jan 2	12.2%	7.7%	1.9%	0.3%	0.3%	22.3%	54.4%	34.6%	8.3%	1.5%	1.2%
Peak	15.5%	11.2%	2.1%	0.8%	0.6%	27.3%	59.0%	47.2%	8.6%	3.6%	2.6%
Peak/Jan2	3.4%	3.5%	0.2%	0.5%	0.3%	5.0%	4.6%	12.6%	0.4%	2.1%	1.4%
Trough	9.4%	7.1%	1.3%	0.3%	0.2%	20.5%	43.4%	30.0%	5.2%	1.3%	0.7%
Average	12.3%	9.0%	1.7%	0.4%	0.3%	23.7%	51.8%	37.9%	7.2%	1.8%	1.4%
Avg/Jan2	0.1%	1.2%	-0.1%	0.1%	0.1%	1.3%	-2.7%	3.3%	-1.1%	0.3%	0.2%
Apr 29	10.1%	8.7%	1.3%	0.4%	0.2%	20.7%	48.7%	42.0%	6.4%	2.0%	0.9%
Apr29/Jan2	-2.1%	1.0%	-0.5%	0.1%	-0.1%	-1.6%	-5.8%	7.5%	-1.9%	0.5%	-0.3%
<b>The Close</b>											
Mar 16	12.3%	10.3%	1.3%	0.4%	0.2%	24.6%	50.3%	41.8%	5.2%	1.8%	0.9%
Mar 20	15.4%	9.1%	1.4%	0.6%	0.2%	26.7%	57.6%	34.0%	5.3%	2.2%	0.9%
Mar 23	10.9%	9.8%	1.4%	0.3%	0.2%	22.6%	48.0%	43.4%	6.2%	1.5%	1.0%
Mar23/Mar16	-1.5%	-0.5%	0.1%	-0.1%	0.0%	-1.9%	-2.3%	1.5%	1.0%	-0.3%	0.1%
Mar23/Mar20	-4.5%	0.7%	0.0%	-0.2%	0.0%	-4.0%	-9.7%	9.4%	0.9%	-0.6%	0.0%
Apr 29	10.1%	8.7%	1.3%	0.4%	0.2%	20.7%	48.7%	42.0%	6.4%	2.0%	0.9%
Apr29/Mar16	-2.2%	-1.6%	0.0%	0.0%	0.0%	-3.8%	-1.6%	0.2%	1.2%	0.2%	0.0%
<b>ADVs</b>											
Jan ADV	13.0%	7.8%	1.9%	0.4%	0.4%	23.5%	55.5%	33.3%	7.9%	1.6%	1.7%
Feb ADV	13.0%	9.3%	1.8%	0.5%	0.4%	25.0%	52.1%	37.0%	7.4%	2.0%	1.5%
Feb/Jan	0.0%	1.4%	0.0%	0.1%	0.0%	1.5%	-3.4%	3.7%	-0.5%	0.5%	-0.2%
Mar ADV	12.3%	9.9%	1.5%	0.4%	0.3%	24.4%	50.3%	40.4%	6.3%	1.8%	1.2%
Mar/Jan	-0.7%	2.0%	-0.3%	0.1%	-0.1%	0.9%	-5.2%	7.0%	-1.6%	0.2%	-0.4%
Apr ADV	10.7%	9.2%	1.6%	0.4%	0.2%	22.1%	48.6%	41.4%	7.1%	1.8%	1.1%
Apr/Jan	-2.3%	1.3%	-0.3%	0.0%	-0.1%	-1.4%	-6.9%	8.1%	-0.9%	0.2%	-0.6%

Source: CBOE Global Markets, SIFMA estimates

## Has The Close Shifted Exchange Market Shares?



Source: Cboe Global Markets, SIFMA estimates

### Looking Within the Nasdaq Complex

Next, we analyze market share movements across the Nasdaq complex of exchanges (note: market shares can fluctuate based on day, month or time period chosen.) We note the following trends in market shares across Nasdaq exchanges as a percent of total market volumes and percent of total Nasdaq volumes:

(Please see the table and charts on the following pages.)

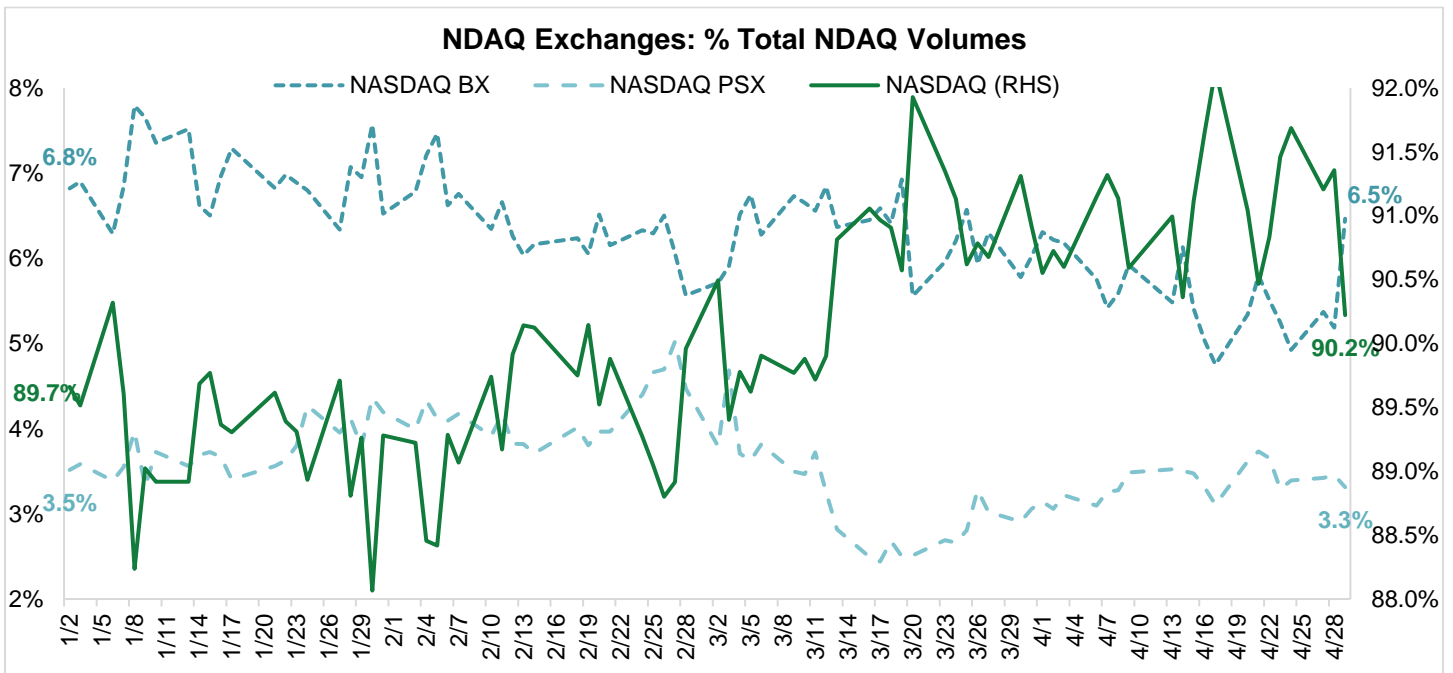
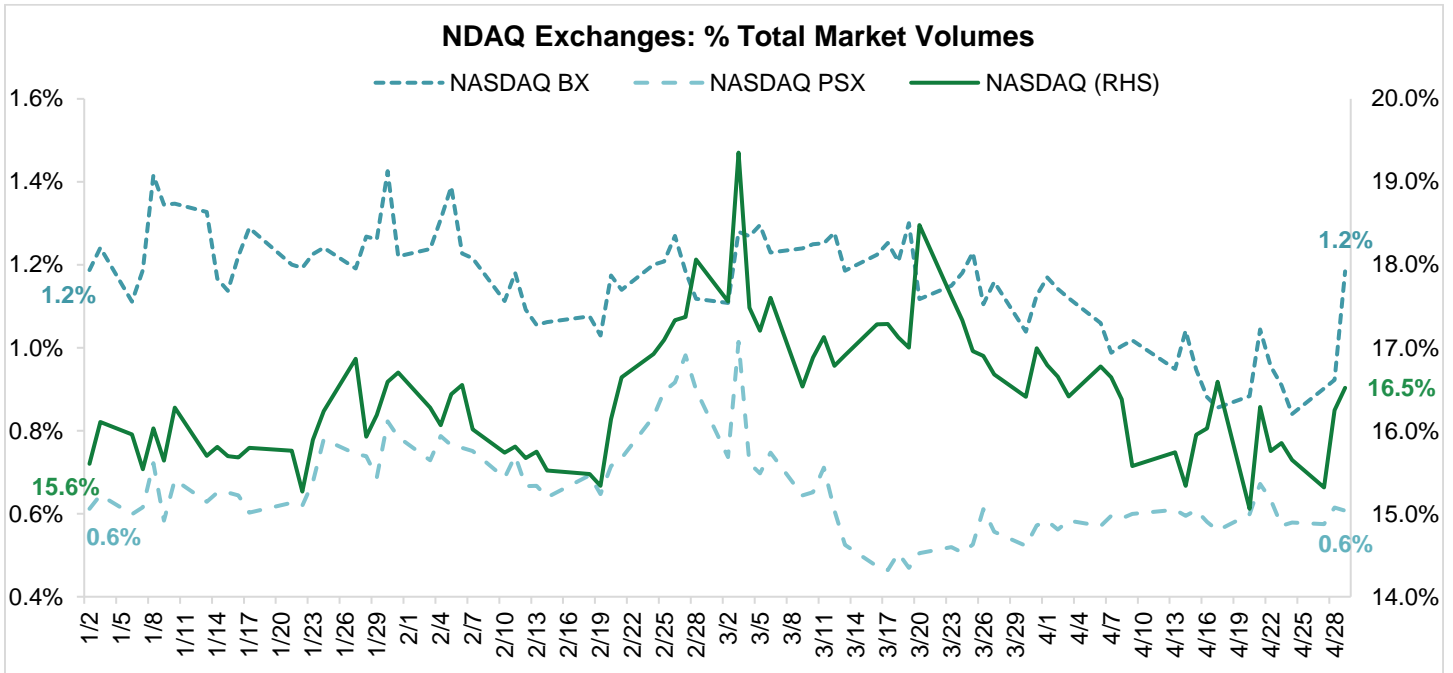
- Total Nasdaq volumes (right side of table): 90% are on the Nasdaq exchange for 1Q20; BX and PSX represented 6.5% and 3.6%
  - Nasdaq average market share increased in April to 91.1%, +1.8 pps from January; Nasdaq share was essentially flat in February (+0.1 pps) but up in March (+1.3 pps)
  - BX and PSX: April 5.6% (-1.4 pps from Jan.) and 3.4% (-0.4 pps)
- Total market volumes (left side of table): Nasdaq represented 16.8% in 1Q20; BX and PSX represented 1.2% and 0.7%
  - Nasdaq April share is essentially flat from January (+0.1 pps); -0.3 pp at BX and -0.1 pps at PSX

## Has The Close Shifted Exchange Market Shares?

	% Total Market			&	Within Nasdaq		
	Nasdaq	BX	PSX		Total	Nasdaq	BX
<b>General Stats</b>							
Jan 2	15.6%	1.2%	0.6%	17.4%	89.7%	6.8%	3.5%
Peak	19.3%	1.4%	1.0%	21.6%	92.1%	7.8%	5.0%
Peak/Jan2	3.8%	0.2%	0.4%	4.2%	2.5%	1.0%	1.5%
Trough	15.1%	0.8%	0.5%	16.5%	88.1%	4.8%	2.4%
Average	16.4%	1.2%	0.7%	18.2%	90.1%	6.3%	3.6%
Avg/Jan2	0.8%	0.0%	0.0%	0.8%	0.4%	-0.5%	0.1%
Apr 29	16.5%	1.2%	0.6%	18.3%	90.2%	6.5%	3.3%
Apr29/Jan2	0.9%	0.0%	0.0%	0.9%	0.6%	-0.4%	-0.2%
<b>The Close</b>							
Mar 16	17.3%	1.2%	0.5%	19.0%	91.1%	6.4%	2.5%
Mar 20	18.5%	1.1%	0.5%	20.1%	91.9%	5.6%	2.5%
Mar 23	17.6%	1.1%	0.5%	19.3%	91.3%	6.0%	2.7%
Mar23/Mar16	0.3%	-0.1%	0.0%	0.3%	0.3%	-0.5%	0.2%
Mar23/Mar20	-0.9%	0.0%	0.0%	-0.8%	-0.6%	0.4%	0.2%
Apr 29	16.5%	1.2%	0.6%	18.3%	90.2%	6.5%	3.3%
Apr29/Mar16	-0.8%	0.0%	0.1%	-0.7%	-0.8%	0.0%	0.8%
<b>ADVs</b>							
Jan ADV	16.0%	1.2%	0.7%	17.9%	89.3%	7.0%	3.8%
Feb ADV	16.6%	1.2%	0.8%	18.5%	89.4%	6.3%	4.3%
Feb/Jan	0.6%	-0.1%	0.1%	0.6%	0.1%	-0.6%	0.5%
Mar ADV	17.2%	1.2%	0.6%	19.1%	90.5%	6.3%	3.1%
Mar/Jan	1.3%	0.0%	-0.1%	1.2%	1.3%	-0.6%	-0.6%
Apr ADV	16.1%	1.0%	0.6%	17.6%	91.1%	5.6%	3.4%
Apr/Jan	0.1%	-0.3%	-0.1%	-0.3%	1.8%	-1.4%	-0.4%

Source: CBOE Global Markets, SIFMA estimates

## Has The Close Shifted Exchange Market Shares?



Source: Cboe Global Markets, SIFMA estimates

### Looking Within the Cboe Complex

Next, we analyze market share movements across the Cboe complex of exchanges (note: market shares can fluctuate based on day, month or time period chosen.) We note the following trends in market shares across Nasdaq exchanges as a percent of total market volumes and percent of total Cboe volumes:

(Please see the table and charts on the following pages.)

- Total Cboe volumes (right side of table): ~74% are on the BZX and EDGX exchanges, representing 41.2% and 32.5% for 1Q20; BYX and EDGA represented 13.6% and 12.8%
  - BZX average market share increased in April to 41.0%, +5.4 pps from January (but down from a 44.5% share in March), and EDGX share grew to 36.4%, +1.1 pps (up from a 31.4% share in March)
  - BYX and EDGA: April 12.2% (-3.4 pps from January) and 10.5% (-3.1 pps)
- Total market volumes (left side of table): BZX and EDGX represented 6.9% and 5.4% in 1Q20; BYX and EDGA represented 2.3% and 2.1%
  - BZX April share grew 1.0 pps from January; versus +0.3 pps at EDGX and -0.5 pps at both BYX and EDGA

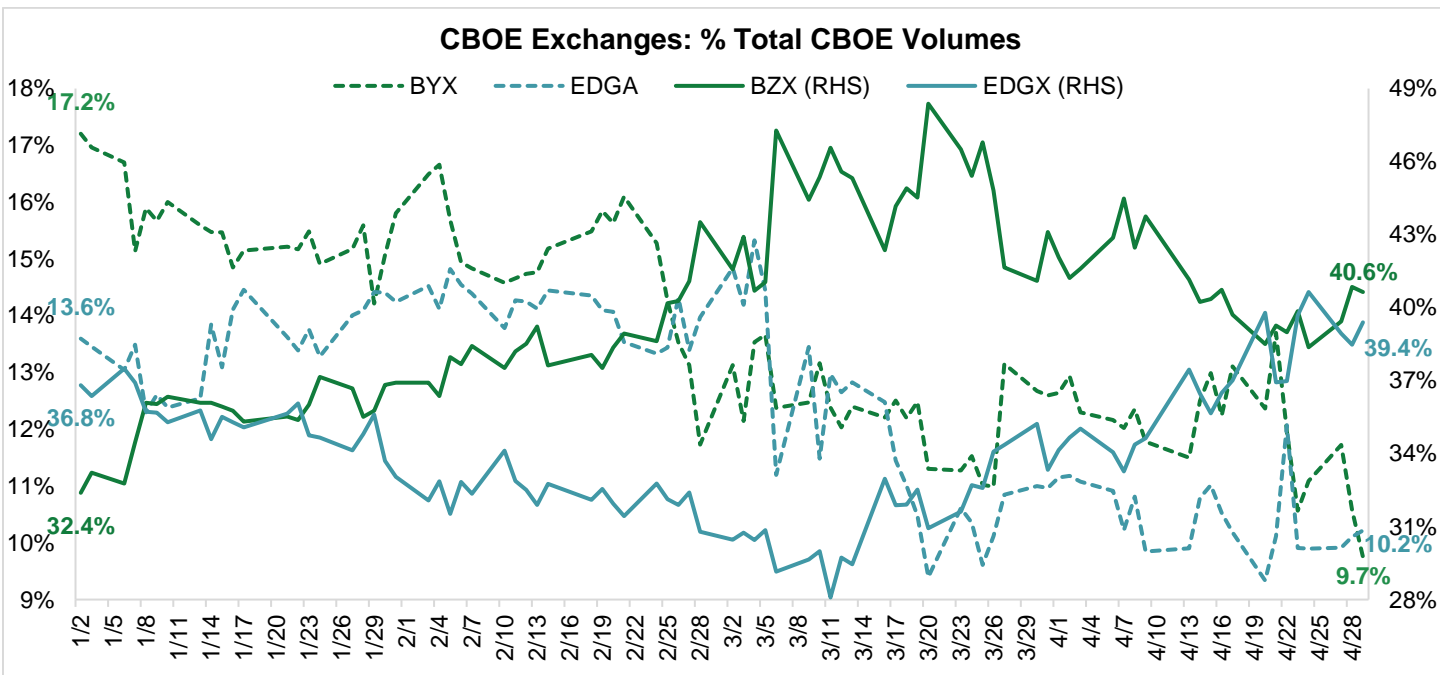
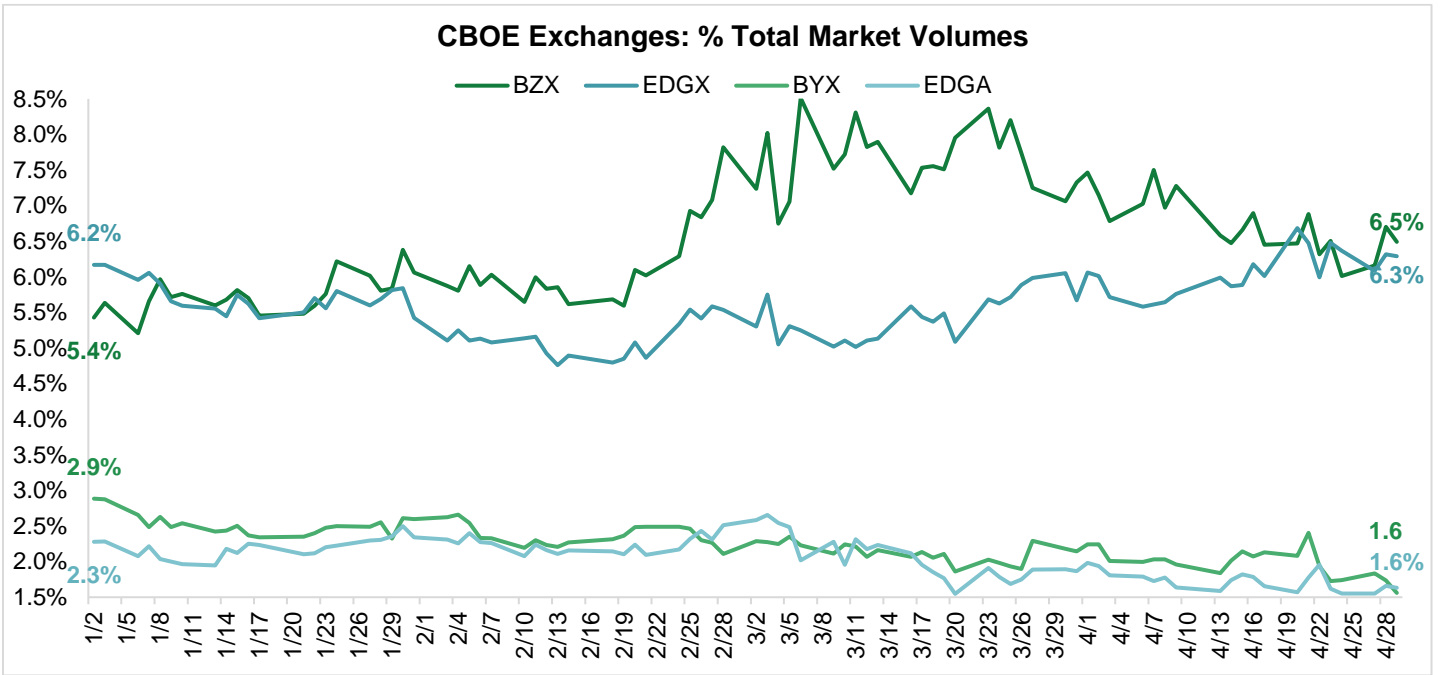
## Has The Close Shifted Exchange Market Shares?

	% Total Market				Total	&	Within Cboe			
	BZX	EDGX	BYX	EDGA			BZX	EDGX	BYX	EDGA
<b>General Stats</b>										
Jan 2	5.4%	6.2%	2.9%	2.3%	16.8%		32.4%	36.8%	17.2%	13.6%
Peak	8.5%	6.7%	2.9%	2.7%	18.7%		48.4%	40.6%	17.2%	15.3%
Peak/Jan2	3.1%	0.5%	0.0%	0.4%	1.9%		16.0%	3.8%	0.0%	1.7%
Trough	5.2%	4.8%	1.7%	1.5%	14.9%		32.4%	28.1%	10.6%	9.3%
Average	6.6%	5.6%	2.3%	2.1%	16.5%		39.9%	33.9%	13.7%	12.5%
Avg/Jan2	1.2%	-0.6%	-0.6%	-0.2%	-0.3%		7.5%	-2.9%	-3.5%	-1.1%
Apr 29	6.5%	6.3%	1.6%	1.6%	16.0%		40.6%	39.4%	9.7%	10.2%
Apr29/Jan2	1.1%	0.1%	-1.3%	-0.6%	-0.8%		8.2%	2.6%	-7.5%	-3.4%
<b>The Close</b>										
Mar 16	7.2%	5.6%	2.1%	2.1%	16.9%		42.3%	33.0%	12.2%	12.5%
Mar 20	8.0%	5.1%	1.9%	1.5%	16.4%		48.4%	30.9%	11.3%	9.4%
Mar 23	8.4%	5.7%	2.0%	1.9%	18.0%		46.5%	31.6%	11.3%	10.6%
Mar23/Mar16	1.2%	0.1%	0.0%	-0.2%	1.0%		4.2%	-1.4%	-0.9%	-1.9%
Mar23/Mar20	0.4%	0.6%	0.2%	0.4%	1.5%		-1.9%	0.7%	0.0%	1.2%
Apr 29	6.5%	6.3%	1.6%	1.6%	16.0%		40.6%	39.4%	9.7%	10.2%
Apr29/Mar16	-0.7%	0.7%	-0.5%	-0.5%	-1.0%		-1.7%	6.4%	-2.5%	-2.3%
<b>ADVs</b>										
Jan ADV	5.8%	5.7%	2.5%	2.2%	16.2%		35.5%	35.3%	15.6%	13.5%
Feb ADV	6.4%	5.2%	2.4%	2.3%	16.2%		39.3%	32.2%	14.5%	14.0%
Feb/Jan	0.6%	-0.5%	-0.2%	0.1%	0.0%		3.7%	-3.2%	-1.0%	0.5%
Mar ADV	7.7%	5.4%	2.1%	2.0%	17.3%		44.5%	31.4%	12.3%	11.8%
Mar/Jan	1.9%	-0.3%	-0.4%	-0.2%	1.1%		8.9%	-3.9%	-3.3%	-1.7%
Apr ADV	6.8%	6.0%	2.0%	1.7%	16.5%		41.0%	36.4%	12.2%	10.5%
Apr/Jan	1.0%	0.3%	-0.5%	-0.5%	0.4%		5.4%	1.1%	-3.4%	-3.1%

Source: CBOE Global Markets, SIFMA estimates



## Has The Close Shifted Exchange Market Shares?



Source: Cboe Global Markets, SIFMA estimates

### Why Do Exchange Parent Companies Run Multiple Exchange Licenses?

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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.).

#### Behind the Market Structure

##### Exchange Pricing Models

Exchange pricing models are often based on the provision or usage of liquidity. The maker-taker models pay a transaction rebate to market makers providing liquidity (makers) and charge a transaction fee to market participants taking out liquidity (takers). Makers post buy and sell offers and are paid a fee, around \$0.20-\$0.30 for every 100 shares traded. Takers are charged a fee. The taker-maker models, which comprise at least 5% of U.S. market share, may not be as popular as maker-taker venues but do offer another flavor of market structure.

Exchanges may also pay market participants rebates, or compensation to route customer order flow to an exchange.

##### Order Matching Methodologies

Matching orders is the process of pairing opposite buy (bid)/sell (ask) requests for a security which are submitted in close proximity of price and time. If one investor wants to buy a quantity of stock and another wants to sell the same quantity at the same price – the maximum price of the buy order matches or exceeds the minimum price of the sell order – their orders match and a transaction is made. Processes to match orders predominantly use electronic algorithms, with hybrid exchange models involving human interaction at the open, close or imbalance trading sessions. Exchanges use their own specific algorithm to match orders, mainly falling under two types: (a) price-time priority (or first-in-first-out/FIFO) and (2) pro-rata.

Most exchanges match orders on a price-time priority basis. The earliest and best active buy order (highest price) is matched with the best sell order (lowest price). If the prices quoted are the same and both the orders are the same type (buy/sell), then whoever placed the order earlier will have the higher priority when the orders are filled, i.e. price-time priority (in the rare cases where time and price are the same, exchanges will often prioritize larger orders). Ex: An active buy order for 250 shares of stock at \$85 per share precedes (is placed before) an order for 50 shares of the same stock at the same price; the system matches the entire 250 share order before matching any part of the 50 share order.

Or, if all transaction conditions are same, exchanges can match active orders on a pro rata basis, i.e. the shares are split among the orders proportional to the relative size of each order. Here, an order may end up filled, partially filled or unfilled. If an order loses priority, it can be re-requested by changing the quantity, price or account type. This only occurs on NYSE, since electronic models do not have pro-rata allocation. Ex: There are the same two active buy orders, 250 shares and 50 shares at \$85; if a 240 share sell order comes in, the system matches 200 shares and 40 shares respectively to the two buy orders (80% of each order is filled).

### Exchange Examples

#### NYSE

- NYSE's market model combines technology with human judgment, executing volumes through electronic order flow, DMMs and floor brokers. It utilizes DMMs on the NYSE exchange to maintain fair and orderly markets for their assigned securities, operating manually and electronically to facilitate price discovery during market opens, closes and during periods of trading imbalances or instability, to offer best prices, dampen volatility, add liquidity and enhance value. NYSE's model offers parity allocation of all trades, enabling multiple orders from DMMs, floor brokers and those at the top of the electronic book at the same price point to each participate in a trade (versus price-time priority basis).
- American is an exchange designed for growing companies, blending features from the NYSE exchange, such as electronic DMMs with quoting obligations for each NYSE American listed company, with NYSE Arca's fully electronic price/time priority execution model. In the future, NYSE American will re-introduce DMMs to the exchange trading floor.
- Arca, an all electronic exchange, offers fully automated, transparent open and closing auctions in ETFs and significant price improvement opportunities at the midpoint in all securities (stocks and ETFs). Arca offers traders direct access to open, anonymous markets, delivering transparency and speed, as well as displayed and dark liquidity.
- Chicago is a fully electronic equities exchange with features to support institutional brokers, particularly those trading ETDs. Chicago uses NYSE Pillar order entry/market data protocols and order types to improve efficiency and reduce complexity, connecting traders to all NYSE markets via a single specification.
- National is a fully electronic market combining NYSE Pillar technology (order entry/market data protocols and order types) with a taker/maker fee schedule. With exchange rebates for removing liquidity, National supports fee-sensitive strategies to take liquidity or for passive traders seeking to minimize time to fill.

#### Nasdaq

- NASDAQ features a price/time priority model where the execution logic is fair and transparent for all market participants: displayed limit orders are treated equally and executed in the order in which they were received at the same price; non-displayed shares are executed after displayed shares in the order in which they were received at that price.
- NASDAQ BX features a price/time priority market structure, with a rebate to remove liquidity, or a taker/maker model. For adders of liquidity, BX offers discounted rates through its Qualified Liquidity Provider program (discounted fee to add liquidity of \$0.0015 per share).
- NASDAQ PSX features a price/time priority model with a Qualified Market Maker Program to reward market makers who actively quote at the NBBO in a broad set of securities.

#### CBOE

- Through its four exchanges (BZX, BYX, EDGX, EDGA), Cboe offers unique pools of liquidity to provide customers choice when executing their trading strategies. Retail priority seeks to improve execution quality for individual investors and the firms facilitating their orders on the EDGX exchange, offering an allocation model differing from the traditional price-time allocation model used by most exchanges, by reducing time to execution. Individual investors' displayed limit orders will post at the front of the order queue for same-priced orders submitted on EDGX.

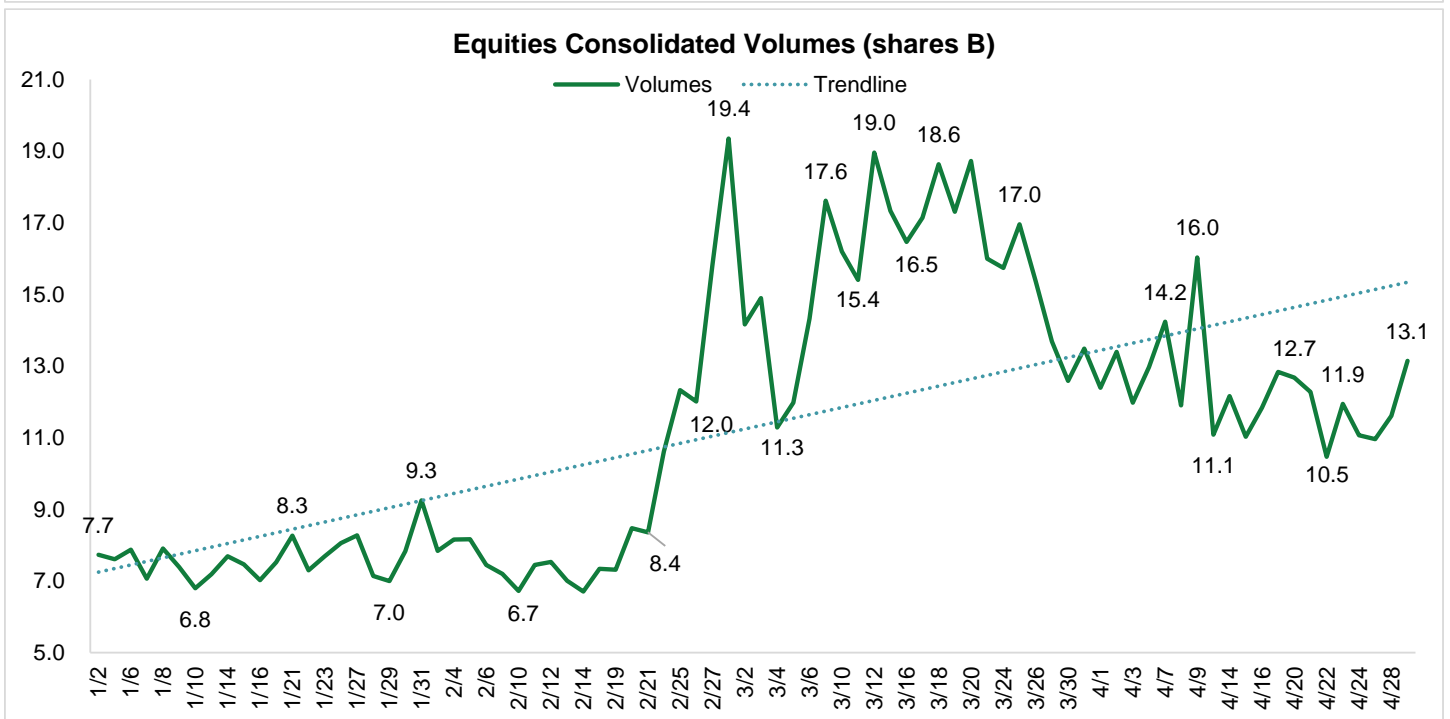
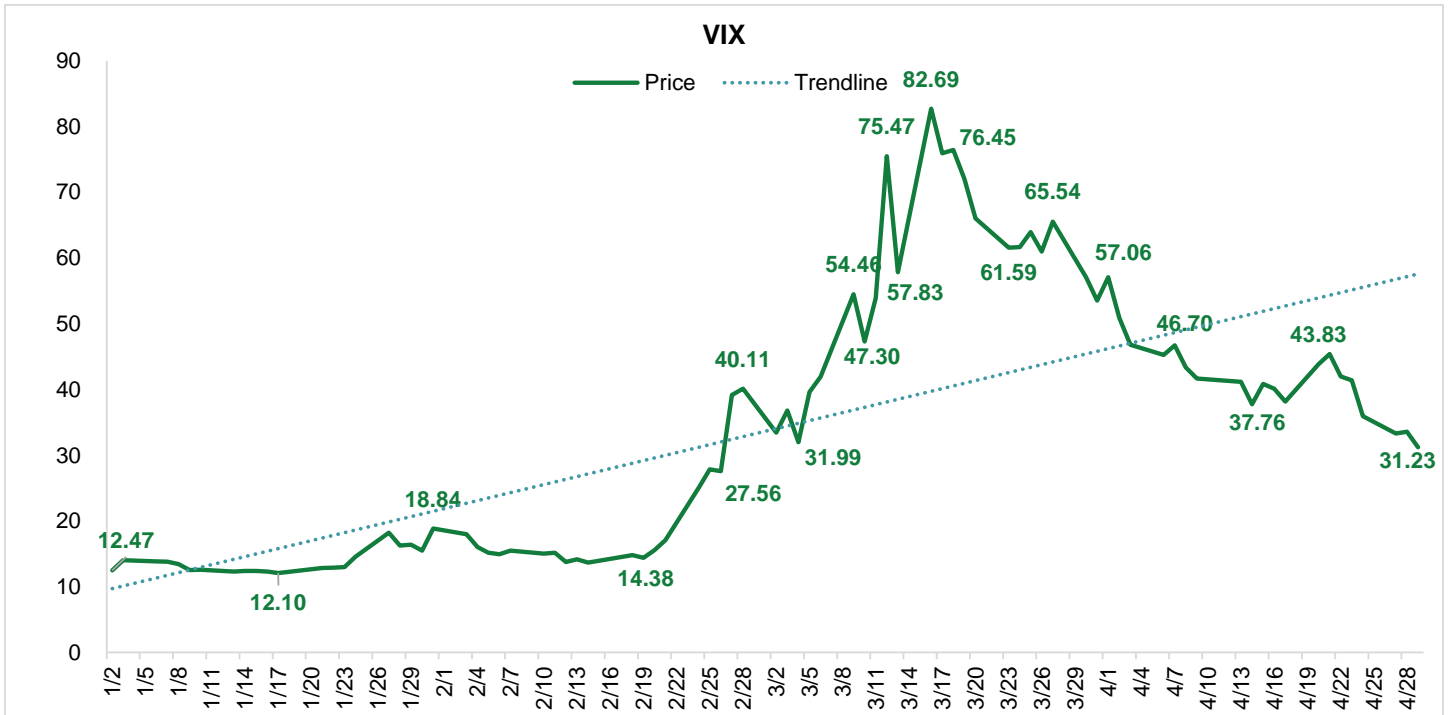
## Appendix: Market Share Movements Overview

## % Total Market

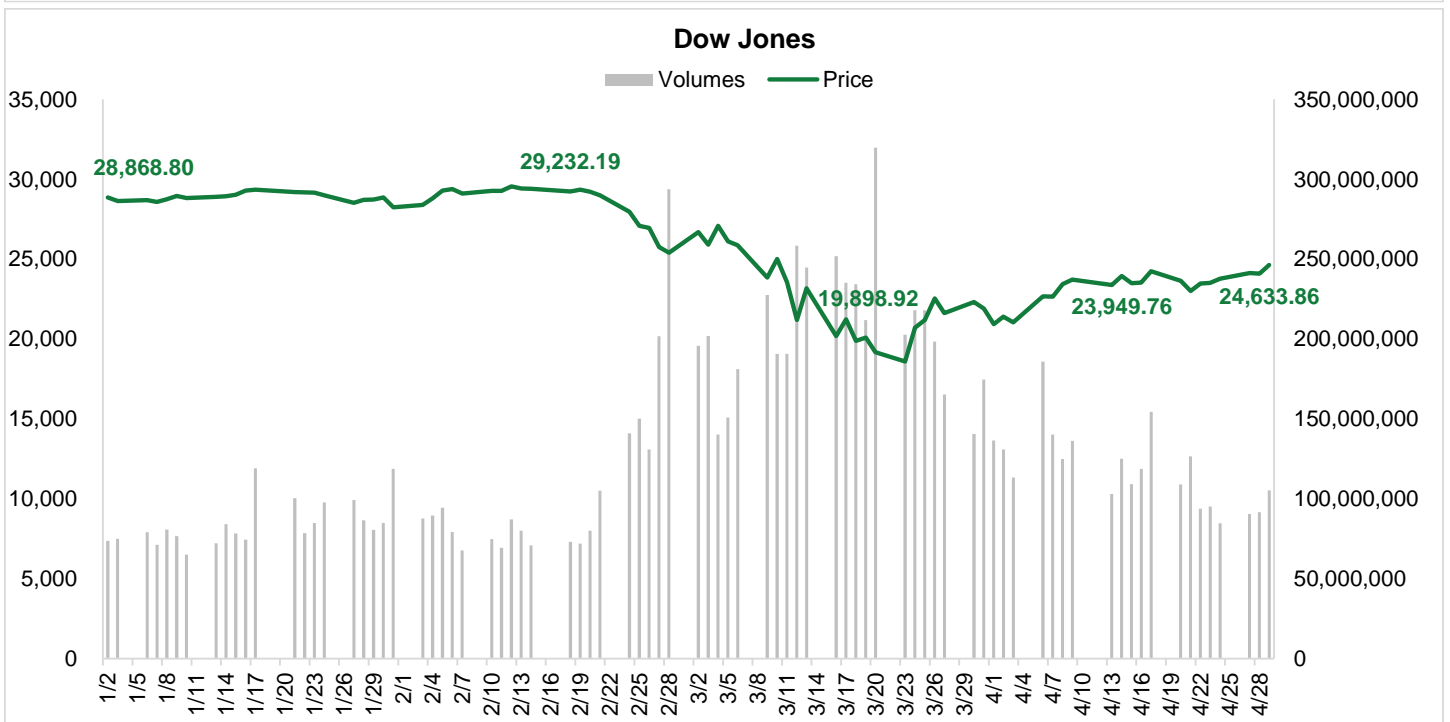
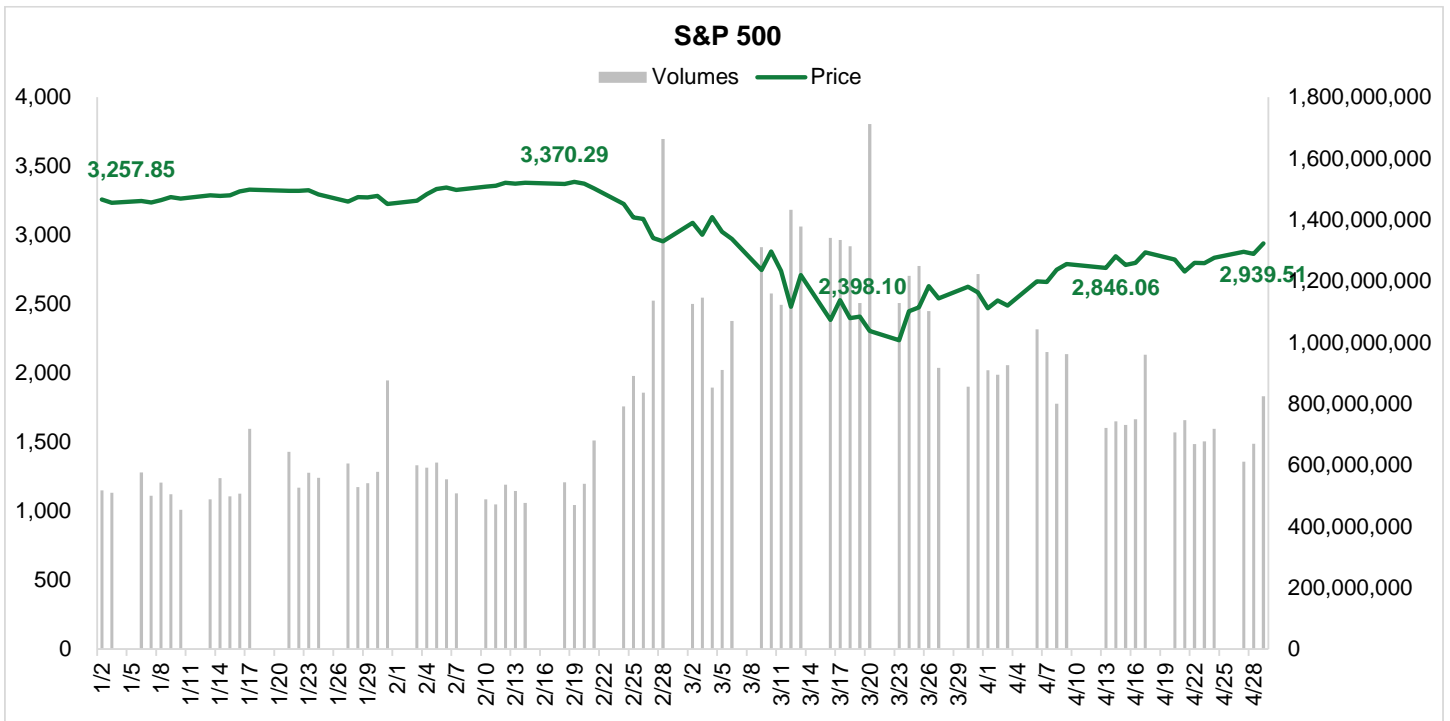
	NYSE	Arca	National	American	Chicago	Total NYSE	Nasdaq	BX	PSX	Total Nasdaq	BZX	EDGX	BYX	EDGA	Total Cboe	IEX
<b>General Stats</b>																
Jan 2	12.2%	17.4%	16.8%	0.3%	0.3%	22.3%	15.6%	1.2%	0.6%	2.3%	5.4%	6.2%	2.9%	2.3%	16.8%	2.3%
Peak	15.5%	21.6%	18.7%	0.8%	0.6%	27.3%	19.3%	1.4%	1.0%	3.4%	8.5%	6.7%	2.9%	2.7%	18.7%	3.4%
Peak/Jan2	27.7%	24.4%	11.6%	151.1%	118.5%	22.2%	24.0%	20.1%	65.7%	49.7%	56.8%	8.4%	0.0%	16.5%	11.6%	49.7%
Trough	9.4%	16.5%	14.9%	0.3%	0.2%	20.5%	15.1%	0.8%	0.5%	1.9%	5.2%	4.8%	1.7%	1.5%	14.9%	1.9%
Average	12.3%	18.2%	16.5%	0.4%	0.3%	23.7%	16.4%	1.2%	0.7%	2.5%	6.6%	5.6%	2.3%	2.1%	16.5%	2.5%
Avg/Jan2	0.9%	4.8%	-1.6%	28.6%	19.4%	6.0%	5.3%	-2.7%	7.3%	10.7%	21.6%	-9.5%	-21.7%	-9.6%	-1.6%	10.7%
Apr 29	10.1%	18.3%	16.0%	0.4%	0.2%	20.7%	16.5%	1.2%	0.6%	2.1%	6.5%	6.3%	1.6%	1.6%	16.0%	2.1%
Apr29/Jan2	-17.0%	5.2%	-4.7%	25.5%	-30.3%	-7.2%	5.9%	-0.3%	-0.8%	-8.0%	19.6%	2.0%	-46.0%	-28.3%	-4.7%	-8.0%
<b>The Close</b>																
Mar 16	12.3%	19.0%	16.9%	0.4%	0.2%	24.6%	17.3%	1.2%	0.5%	3.4%	7.2%	5.6%	2.1%	2.1%	16.9%	3.4%
Mar 20	15.4%	20.1%	16.4%	0.6%	0.2%	26.7%	18.5%	1.1%	0.5%	2.5%	8.0%	5.1%	1.9%	1.5%	16.4%	2.5%
Mar 23	10.9%	19.3%	18.0%	0.3%	0.2%	22.6%	17.6%	1.1%	0.5%	2.6%	8.4%	5.7%	2.0%	1.9%	18.0%	2.6%
Mar23/Mar16	-12.0%	1.6%	6.2%	-20.8%	-0.9%	-7.8%	1.9%	-6.1%	9.6%	-24.2%	16.6%	1.8%	-1.9%	-9.7%	6.2%	-24.2%
Mar23/Mar20	-29.4%	-4.0%	9.3%	-39.7%	-12.1%	-15.2%	-4.7%	2.9%	2.8%	2.8%	5.1%	11.7%	9.1%	23.5%	9.3%	2.8%
Apr 29	10.1%	18.3%	16.0%	0.4%	0.2%	20.7%	16.5%	1.2%	0.6%	2.1%	6.5%	6.3%	1.6%	1.6%	16.0%	2.1%
Apr29/Mar16	-18.2%	-3.5%	-5.7%	-5.2%	-12.7%	-15.5%	-4.4%	-3.3%	28.1%	-38.5%	-9.5%	12.7%	-24.7%	-22.8%	-5.7%	-38.5%
<b>ADVs</b>																
Jan ADV	13.0%	17.9%	16.2%	0.4%	0.4%	23.5%	16.0%	1.2%	0.7%	2.5%	5.8%	5.7%	2.5%	2.2%	16.2%	2.5%
Feb ADV	13.0%	18.5%	16.2%	0.5%	0.4%	25.0%	16.6%	1.2%	0.8%	2.6%	6.4%	5.2%	2.4%	2.3%	16.2%	2.6%
Feb/Jan	0.1%	3.5%	0.0%	37.5%	-6.6%	6.6%	3.7%	-5.7%	17.6%	0.8%	10.5%	-9.0%	-6.7%	3.4%	0.0%	0.8%
Mar ADV	12.3%	19.1%	17.3%	0.4%	0.3%	24.4%	17.2%	1.2%	0.6%	2.7%	7.7%	5.4%	2.1%	2.0%	17.3%	2.7%
Mar/Jan	-5.7%	6.4%	6.6%	14.6%	-24.0%	4.0%	8.0%	-3.3%	-11.5%	6.2%	33.4%	-5.2%	-16.0%	-7.0%	6.6%	6.2%
Apr ADV	10.7%	17.6%	16.5%	0.4%	0.2%	22.1%	16.1%	1.0%	0.6%	2.1%	6.8%	6.0%	2.0%	1.7%	16.5%	2.1%
Apr/Jan	-17.5%	-1.4%	2.2%	8.8%	-38.2%	-5.8%	0.6%	-21.1%	-12.0%	-18.3%	17.8%	5.3%	-20.2%	-21.0%	2.2%	-18.3%

Source: CBOE Global Markets, SIFMA estimates

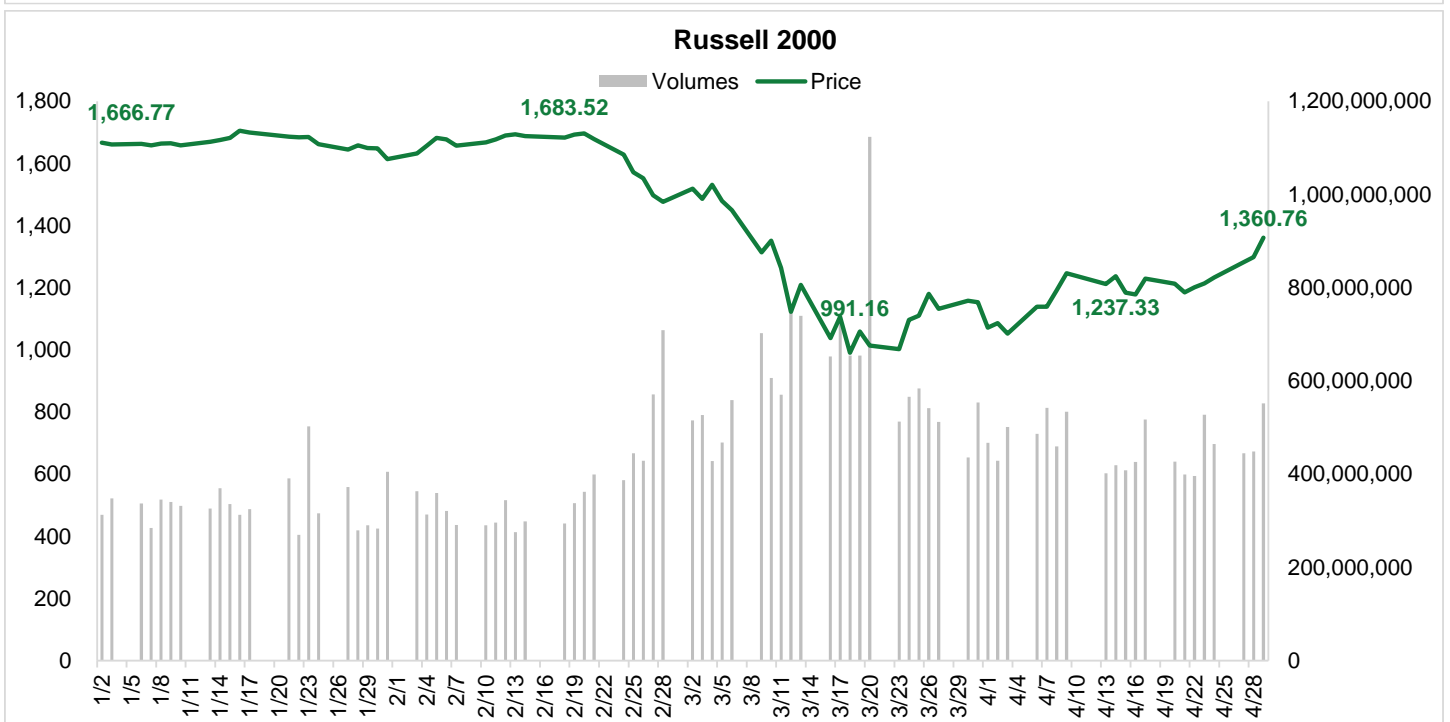
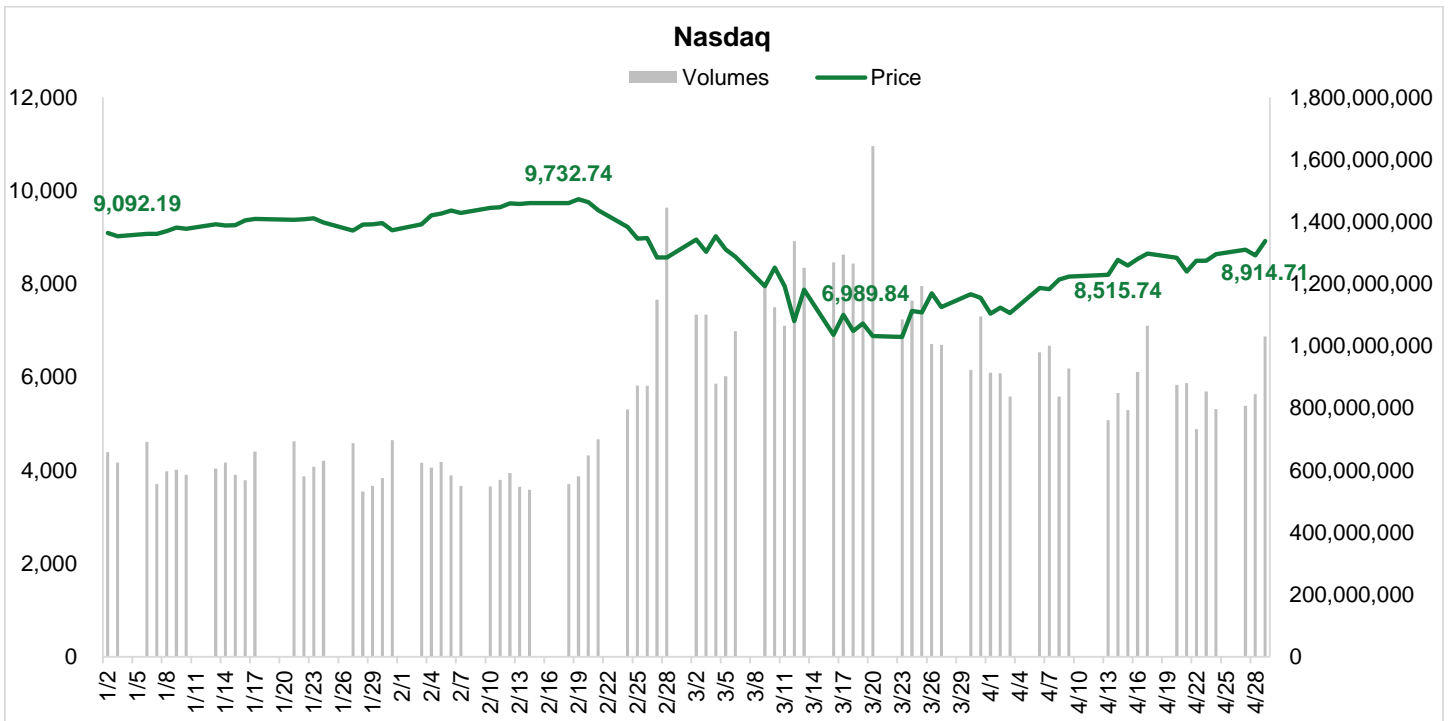
## Appendix: Market Prices, Volumes & Volatility



Source: Bloomberg, Cboe Global Markets, SIFMA estimates

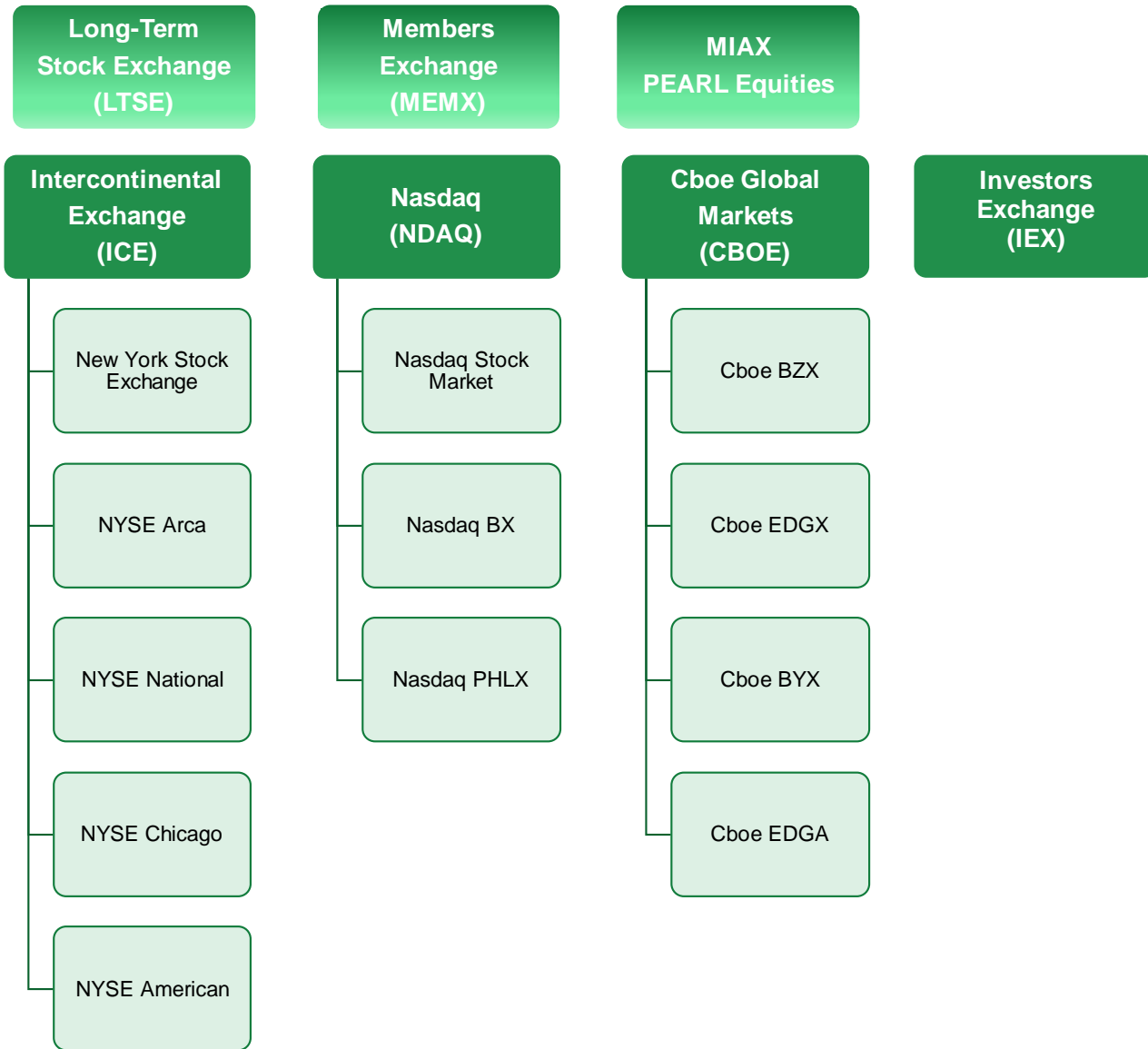


Source: Bloomberg



Source: Bloomberg

Appendix: Market Landscape



**Announced/Not Live** (original target dates): LTSE TBD; MEMX mid-2020; MIAX 2Q20



## Appendix: Terms to Know

### Witching Days

Witching Days involve the expiration of select equity-related derivatives contracts on the same day. Contracts that are allowed to expire may necessitate the purchase or sale of the underlying security. Additionally, investors who only want derivative exposure must close, roll over or offset open positions. This can result in increased trading volume and volatility, especially in the final hour of trading preceding the closing bell, or the witching hour.

- Double witching: The quarterly expiration of any two of stock options, index options, stock index futures or single stock futures on the same day, most likely to occur on the third Friday of the eight months that are not triple/quadruple witching.
- Triple witching: The quarterly expiration of stock options, stock index futures and stock index option contracts on the same day, happening on the third Friday of March, June, September and December.
- Quadruple witching: The quarterly expiration of stock options, stock index futures, index options and single stock futures on the same day, which happens on the third Friday of March, June, September and December (since including the expiration of single stock futures only since 2002, it is still often referred to as triple witching).

### Additional Terms

FINRA	Financial Industry Regulatory Authority
SEC	Securities and Exchange Commission
ADV	Average Daily Trading Volume
ATS	Alternative Trading System
Best Ex	Best Execution
CAT	Consolidated Audit Trail
Dark Pool	Private trading venues
EMS	Equity Market Structure
ETF	Exchange Traded Fund
ETD	Exchange Traded Derivative
ETP	Exchange Traded Product
MM	Market Maker
NMS	National Market System
OPR	Order Protection Rule
PFOF	Payment For Order Flow
Reg NMS	Regulation National Market System
SIP	Security Information Processor
SRO	Self Regulatory Organization
Tick Size	Minimum price movement of a security

Bid	An offer made to buy a security
Ask, Offer	The price a seller is willing to accept for a security
Spread	Difference between bid & ask price prices for a security, an indicator of supply (ask) & demand (bid)
NBBO	National Best Bid and Offer
Locked Market	A market is locked if the bid price equals the ask price
Crossed Market	A bid is entered higher than the offer or an offer is entered lower than the bid
Opening Cross	Determines the opening stock price, accumulating all buy & sell interest a few minutes before the market open
Closing Cross	Determines the closing stock price, accumulating all buy & sell interest a few minutes before the market close
Order Types	
AON	All or none; an order to buy or sell a stock that must be executed in its entirety, or not executed at all
Block	Trades with at least 10,000 shares in the order
Day	Order is good only for that trading day, else cancelled
FOK	Fill or kill; must be filled immediately and in its entirety or not at all
Limit	An order to buy or sell a security at a specific price or better
Market	An order to buy or sell a security immediately; guarantees execution but not the execution price
Stop	(stop-loss) Order to buy/sell a stock once the price of the stock reaches the specified price, the stop price

## Appendix: SIFMA Insights Research Reports

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SIFMA Insights Market Structure Primers: [www.sifma.org/primers](http://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](http://www.sifma.org/insights)

- Market Structure Week Debrief, 2019
- Spotlight: DTCC's Important Role in US Capital Markets

## Author

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