



# SIFMA Insights

## US Equity Market Structure Analysis

### *Analyzing the Meaning Behind the Level of Off-Exchange Trading*

September 2021

#### Key Takeaways

As discussed in our Market Structure & Liquidity Matter [note](#), Reg NMS had several unintended consequences, including the rise in off-exchange trading. While this aspect of market structure may have changed, it is not necessarily a bad thing. It is a function of market structure and will shift based on current characteristics. In this report, we analyze:

- Traditional View: Analysts traditionally calculate the level of off-exchange volumes as a percent of total volumes: 41.5% in 2020, 44.2% YTD (+4.7 pps, +7.4 pps versus historical)
- Off & On Exchange Volumes: Both off- and on-exchange volumes have experienced significant increases since 2019: off exchange YTD ADV 5.4B shares, +104.2%; on exchange 6.8B shares, +49.8%
- Alternative Views: While both notional value traded & trade count have also seen strong growth, the level of off-exchange trading is lower under both views: notional YTD 37.7%, -6.5 pps to volume; count 30.1%, -14.1 pps
- Another Look by Tape: Tape C (Nasdaq-listed stocks) showed the highest increases for volume (+106.8%), notional (+87.8%) and trade count (+108.3%), driving the overall market increases
- Market Quality: What does this mean? Variances by metric, off-exchange trading not 100% retail trades, the level is a function of market structure...in short, the increasing level is not a sign of declining market quality.

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## Executive Summary

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There have been many discussions lately, including among regulators and legislators, about the increase in the level of off-exchange trading as a percent of total equity volumes in the U.S.<sup>1</sup> The level reached 41.5% in 2020 and is at 44.2% YTD 2021 (through July 30), representing increases of 4.7 pps and 7.4 pps respectively versus the historical average (36.8%).

As discussed in our Market Structure Matters note, Regulation National Market System (NMS) had several unintended consequences. One of which is this rise in off-exchange trading. While this aspect of market structure may have changed, it is not necessarily a bad thing. The level of off-exchange trading is a function of market structure and will shift based on current market structure characteristics.

This report analyzes the data behind the numbers stated above, as well as presents alternative views to measure the level of off-exchange trading. Additionally, we look at these figures as related to retail trading and market quality.

**A traditional view of volumes:** Exchange and market structure analysts traditionally look at consolidated equity trading volumes in shares and then calculate the level of off-exchange volumes as a percent of total volumes. This is also the method used by regulators when discussing off-exchange trading. As such, we first assess the level of off-exchange trading under this view. Using the share method, unquestionably the level of off-exchange trading increased last year and remains elevated as compared to historical trends. On average for 2018 and 2019 the level of off-exchange trading as a percent of total volumes was 36.8%. The 2020 average of 41.5% was +4.7 pps greater than (or 1.13x) the historical average, while 2021 YTD (through July 30) was 44.2% (+7.4 pps, 1.20x historical average).

**Trends in off- and on-exchange volumes:** Before we move on to look at new views of measuring and analyzing off-exchange trading, we compare recent trends in off-exchange and on-exchange volumes in shares. Since 2020, volumes have gone up in aggregate: total equity ADV moved to 10.9 billion shares in 2020 and 12.2 billion shares in YTD 2021 (as of July 30), from 7.0 billion shares in 2019, +52.5% and +69.8% to the historical average respectively. While both off- and on-exchange volumes have experienced significant increases since 2019, the increase in off-exchange trading has been greater than that of on-exchange trading. From 2018 to YTD 2021, off-exchange trading volumes have more than doubled.

- Off-Exchange – 2020 ADV 4.5 billion shares and 2021 YTD ADV 5.4 billion shares, from 2.6 billion shares in 2019 (+72.0% and +104.2%)
- On-Exchange – 2020 ADV 6.4 billion shares and 2021 YTD ADV 6.8 billion shares, from 4.4 billion shares in 2019 (+41.2% and +49.8%)

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<sup>1</sup> This analysis of consolidated volumes covers listed securities governed by Reg NMS, not over-the-counter (unlisted) equities

**Alternative views of volumes:** Statistics can also be viewed by total notional (or dollar) value traded daily and total number of trades occurring daily. Like volumes, notional value traded has seen strong growth. On average for 2018 and 2019 the level of off-exchange trading as a percent of notional value was 34.5%. The 2020 average of 38.2% was +3.7 pps greater than (or 1.11x) the historical average, while 2021 YTD (through July 30) was 37.7% (+3.2 pps, 1.09x historical average). What is more interesting than the growth trend is that the level of off-exchange trading as a percent of total notional is less than the level as a percent of volumes: 2.3 pps less historically (-6.1%), 3.3 pps less in 2020 (-7.9%), and 6.5 pps less in YTD 2021 (-14.7%).

- Average volumes increased 58.5% versus 50.9% for average notional value – as notional value equals price times volume, if notional is increasing less than volumes, price must be declining – the average price of stocks traded has declined

Similarly, trade count traded has seen robust growth. On average for 2018 and 2019 the level of off-exchange trading as a percent of trade count was 22.17%. The 2020 average of 26.5% was +4.4 pps greater than (or 1.20x) the historical average, while 2021 YTD (through July 30) was 30.1% (+7.9 pps, 1.36x historical average). As with notional value, the level of off-exchange trading as a percent of total trade count is less than the level as a percent of volumes: 14.6 pps less historically (-39.7%), 14.9 pps less in 2020 (-36.1%), and 14.1 pps less in YTD 2021 (-32.0%).

- Trade Count increased 72.6% versus 58.5% for volumes – the increase in trade, or transactions, count outpaced the increase in shares traded – there are less shares traded per transaction

**Another look at volumes by tape:** The historical market volume data also includes statistics for volumes broken down by tape: Tape A is NYSE-listed stocks; Tape B is everything else, used to be referred to as the regionals (now mostly ETFs); and Tape C is Nasdaq-listed stocks. We highlight the following trends for volumes by tape:

- Tape A – volumes +34.9%, notional +32.0%, trade count +52.6% – while it posted the lowest increases in volume and trade count versus the other tapes, it still saw significant increases across all measures
- Tape B – volumes +43.1%, notional +32.0%, trade count +60.0% – the smallest tape (0.4x volumes of both Tape C and Tape A) also saw significant increases in all measures
- Tape C – volumes +106.8%, notional +87.8%, trade count +108.3% – showed the highest increases for volume, notional and trade count, driving the overall market increases; for example, Tape C volumes increased 106.8% while the market increased 58.5%

**Off-exchange trading and market quality:** As analyzed in this report, the level of off-exchange trading as a percent of total equity volumes (and notional value and trade count) has increased. While this is an accurate trend analysis of the data, what does it mean or not mean?

- Variances by metric – There are different growth rates when looking at off-exchange as a percent of volumes versus notional value or trade count. Which is the “correct” metric? Most other countries look at the market in terms of notional value instead of volumes, and this metric shows a lower level of off-exchange trading.

- Off-exchange not all retail – Much of the growth in off-exchange trading starting in 2020 has been attributed to retail investors. Based on our market structure survey, market participants estimate retail investors now represent 20%-30% of total equity volumes, up from 10% historically. However, all off-exchange trading is not 100% retail trades – off-exchange trading as a percent of volumes in July was 43.1%, greater than the estimate for retail trading from market participants. Off-exchange volumes also include block (trade size 10,000+ shares) and other institutional trades (plus bank capital commitment as part of institutional trades).
- Function of market structure – Further, as one market participant eloquently said, “So what if the level of off-exchange trading has risen”? Market participants note that the level of the percent off-exchange trading is not a measure of market quality, more directly, the increase in off-exchange trading is not a sign of declining market quality. The increase in off-exchange volumes is an indicator of volume growth, in particular retail trading growth and trading in low dollar stocks, not a sign that flows are shifting. The percent of off-exchange trading is a function of market structure, and the optimal level of off-exchange trading is the actual amount in that given time period. Any increase may impede price discovery, and any decrease may hinder trading. In other words, the percent of off-exchange trading is self-correcting, ebbing and flowing based on current market structure characteristics.

## Traditional View of Volumes

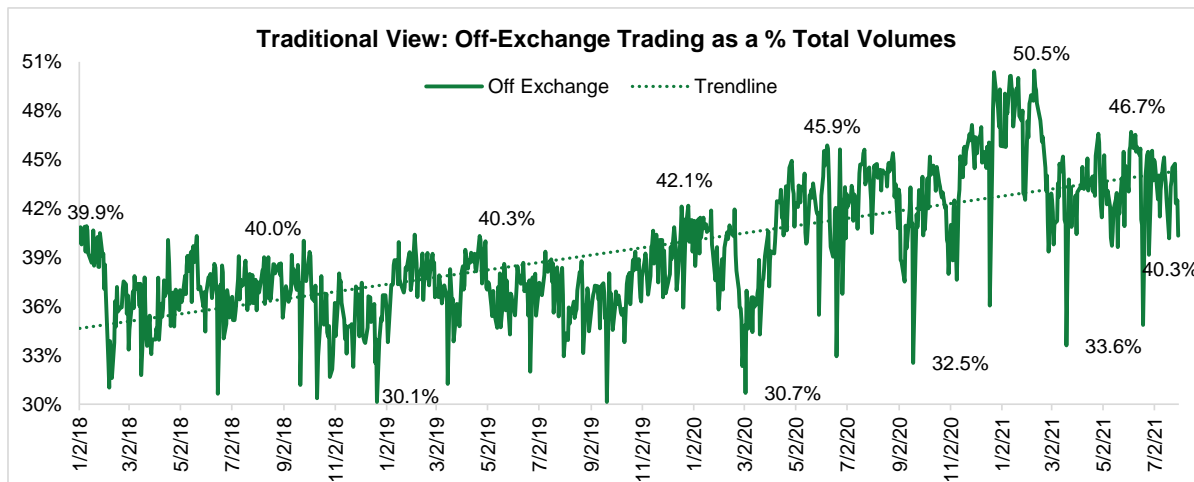
Exchange and market structure analysts traditionally look at equity trading volumes in shares and then calculate the level of off-exchange volumes as a percent of total volumes. This is also the method used by regulators when discussing off-exchange trading. As such, we first assess the level of off-exchange trading under this view.

Using the share method, unquestionably the level of off-exchange trading increased last year and remains elevated as compared to historical trends. On average for 2018 and 2019 the level of off-exchange trading as a percent of total volumes was 36.8%. The 2020 average of 41.5% was +4.7 pps greater than (or 1.13x) the historical average, while 2021 YTD (through July 30) was 44.2% (+7.4 pps, 1.20x historical average). Overall, there has been a solid upward sloping trend since 2018.

	Market ADV	On Exchange ADV	Off Exchange ADV	Off Exchange
2018	7.3	4.6	2.65	36.3%
2019	7.0	4.4	2.62	37.3%
Y/Y change	-3.6%	-5.0%	-1.1%	0.9%
Historical Avg	7.2	4.5	2.63	36.8%
2020	10.9	6.4	4.5	41.5%
to hist. avg.	52.5%	41.2%	72.0%	4.7%
YTD	12.2	6.8	5.4	44.2%
to hist. avg.	69.8%	49.8%	104.2%	7.4%

Source: Cboe Global Markets, SIFMA estimates (as of July 30)

Note: ADV = billion shares

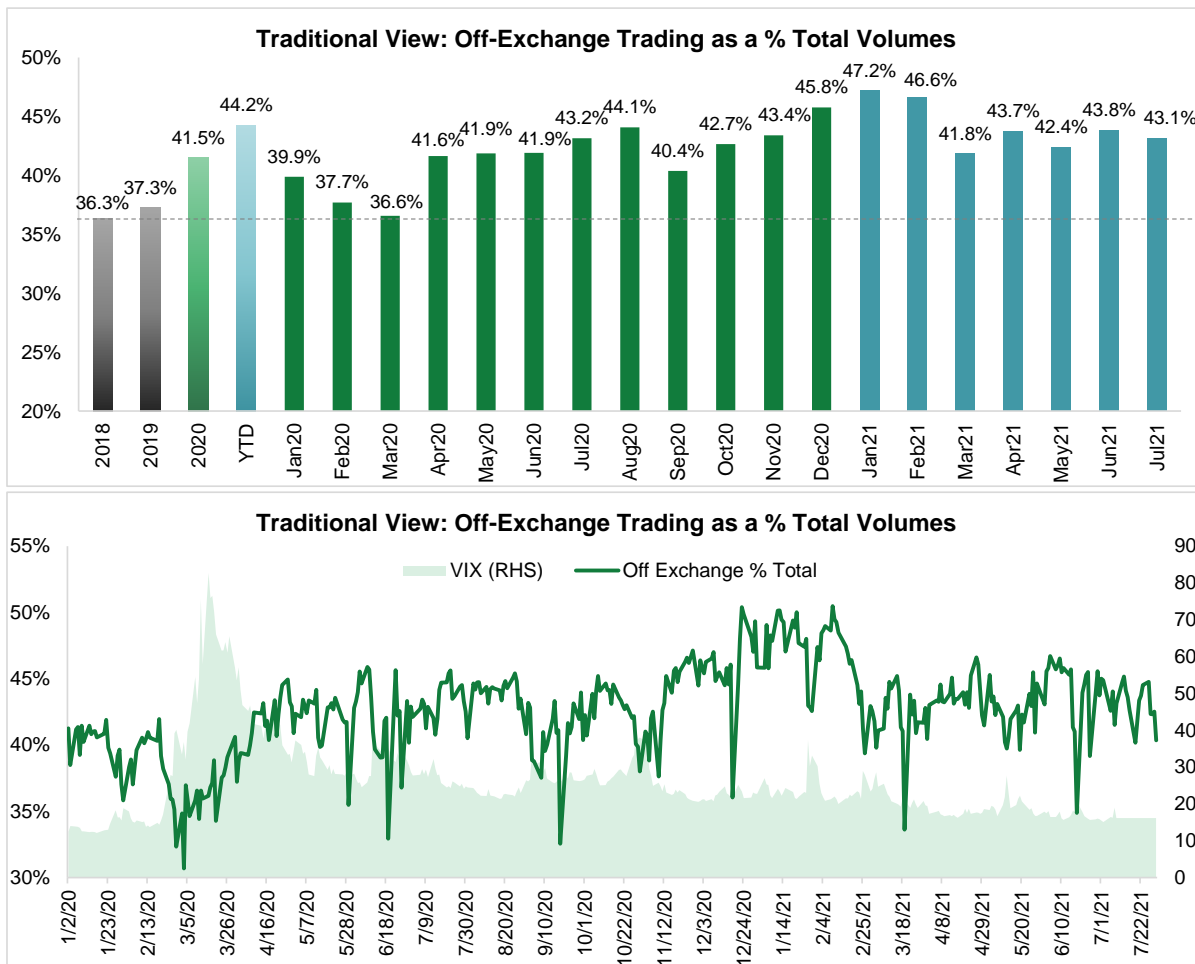


Source: Cboe Global Markets, SIFMA estimates (as of July 30)



Historically, levels of off-exchange trading decline during periods of high volatility or market stress, as trades move back onto exchanges to improve price discovery (and vice versa during lower volatility periods). This is what we saw at the start of the pandemic last year. Off-exchange trading as a percent of total equities volumes was 39.9% on average in January 2020, dropping to 36.6% on average in March 2020 (-3.3 pps), the height of the COVID-related market turmoil. Then levels of off-exchange trading began to rise and remain elevated. The full year 2020 percentage closed 4.2 pps higher than the 2019 average, with 2021 YTD running at +6.9 pps. Make no mistake, the level of off-exchange trading in percent terms has – and remains – increased to historical averages.

Market participants have pondered the driver behind the increased level in off-exchange trading – which was originally attributed to floor closures early on in 2020 – including: traders have become accustomed to higher levels of volatility and therefore learned to execute efficiently off exchange under these conditions; increased fragmentation after adding three new exchanges in September 2020; or an increase in retail trading. The truth is, as with everything in market structure, there are multiple factors in play driving what many believe to be a new normal for the level of off-exchange trading. In our 2021 market structure survey (populated between April 16 to April 30), 56.3% of respondents expect off-exchange trading to remain in the low 40s, while 25.0% expect the level to be in the mid-to-high 40s. Only 15.6% of respondents expect the level to return to historical levels (mid-to-high 30s).



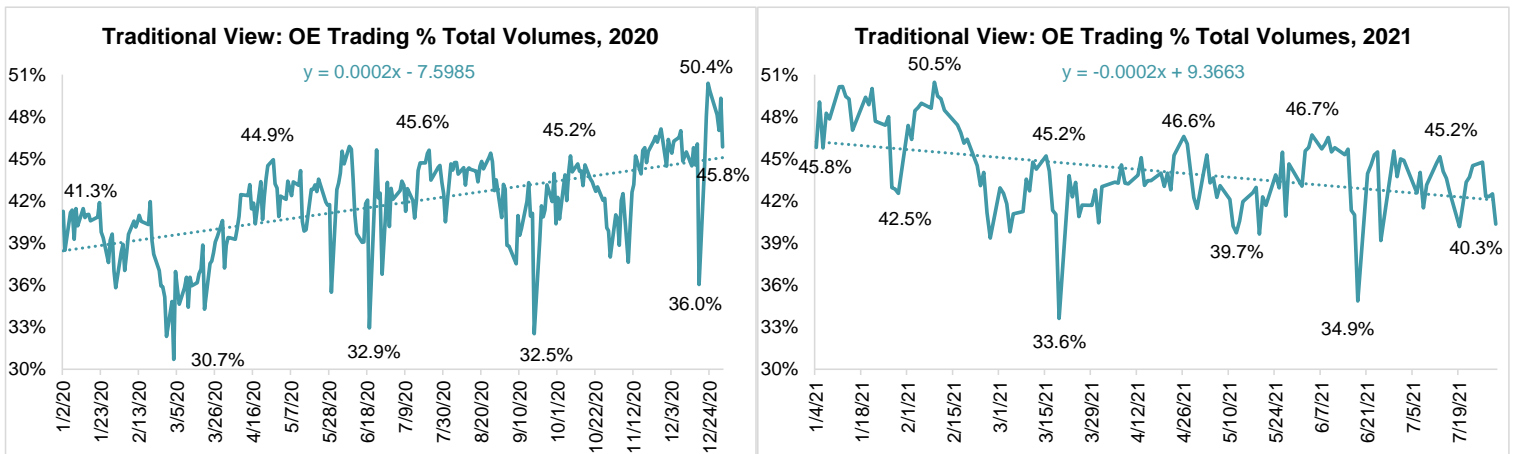
Source: Bloomberg, Cboe Global Markets, SIFMA estimates (as of July 30)



Where are we now? Looking at the off-exchange trading in the traditional manner concludes that the level has increased substantially versus historical levels: 36.3% in 2018 to 44.2% YTD 2021, +7.9 pps. Looking further at the data, we analyze the distribution of days with higher than historical levels as well as the shifts in trends.

- 2020 – 1 day above 50%, 187 days above 40%
- 2021 – 4 days above 50%, 138 days above 40%
- Slopes are the same (0.0002x) but in reverse, 2021 has a downward trend for the year
  - 2020 off-exchange level increased 5.5 pps from start to end of year
  - 2021 off-exchange level decreased 1.1 pps from start to end of year

While 2021 saw more days greater than 50%, these were at the start of the year (mid-January to early February). Since then, the pattern appears to be shifting to a downward slope.



Source: Cboe Global Markets, SIFMA estimates (as of July 30)

## Trends in Off- and On-Exchange Volumes

Before we move on to look at new views of measuring and analyzing off-exchange trading, we compare recent trends in off-exchange and on-exchange volumes in shares. Since 2020, volumes have gone up in aggregate: total equity ADV moved to 10.9 billion shares in 2020 and 12.2 billion shares in YTD 2021 (as of July 30), from 7.0 billion shares in 2019, +52.5% and +69.8% to the historical average respectively.

While both off- and on-exchange volumes have experienced significant increases since 2019, the increase in off-exchange trading has been greater than that of on-exchange trading. From 2018 to YTD 2021, off-exchange trading volumes have more than doubled while on-exchange trading volumes also increased significantly, nearly 50%.

- **Off-Exchange** – 2020 ADV 4.5 billion shares and 2021 YTD ADV 5.4 billion shares, from 2.6 billion shares in 2019 (+72.0% and +104.2%)
- **On-Exchange** – 2020 ADV 6.4 billion shares and 2021 YTD ADV 6.8 billion shares, from 4.4 billion shares in 2019 (+41.2% and +49.8%)

(B shares)	Market ADV	On Exchange ADV	Off Exchange ADV	Correlation Coefficient
2018	7.3	4.6	2.65	0.91376
2019	7.0	4.4	2.62	0.87503
2020	10.9	6.4	4.5	0.82637
YTD	12.2	6.8	5.4	0.83632
2019/2018 change	-3.6%	-5.0%	-1.1%	-4.2%
2020/2019 change	55.4%	44.9%	73.0%	-5.6%
2021/2020 change	11.3%	6.1%	18.7%	1.2%
2020/historical avg.	52.5%	41.2%	72.0%	-7.6%
2021/historical avg.	69.8%	49.8%	104.2%	-6.5%

Source: Cboe Global Markets, SIFMA estimates (as of July 30)

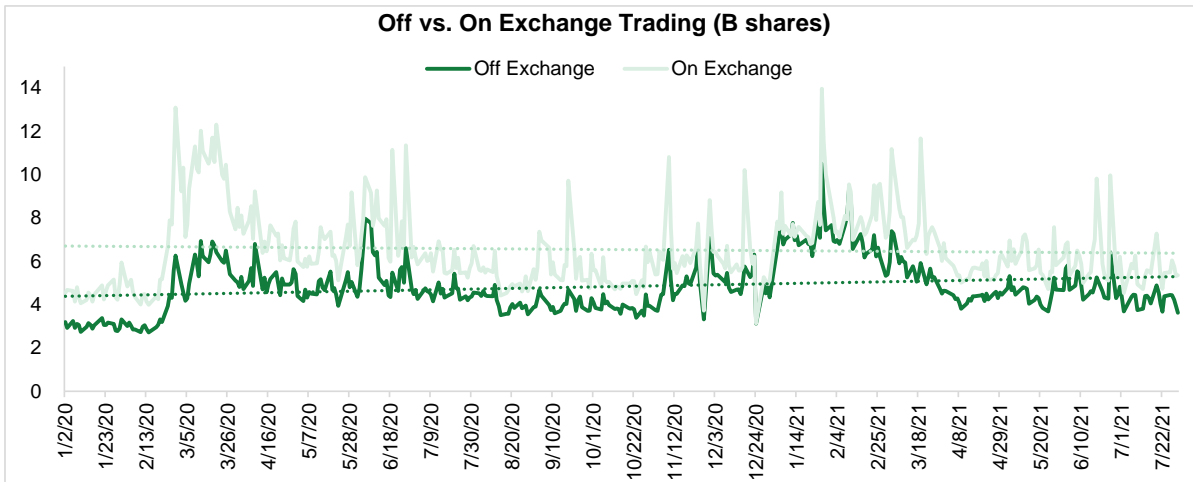
It is also interesting to note that the correlation coefficient – a measurement of the statistical relationship between two continuous variables<sup>2</sup> – between off- and on-exchange trading has decreased since 2018. The two variables have always had a very strong correlation, nearly a perfect correlation back in 2018 at 0.91376. In 2020, this relationship declined 7.6% versus the historical average, recovering somewhat in YTD 2021 to -6.5% versus historical. As noted earlier, the trend in 2021 appears to be shifting to a downward sloping line, i.e., a settling in the average percentage of off-exchange trading versus last year. Despite the decrease in current correlation coefficients versus historical, the two variables still have a very strong correlation. In other words, off-exchange trading volumes are not increasing in a vacuum. They are increasing along with all volumes.

<sup>2</sup> See appendix for more information on the correlation coefficient

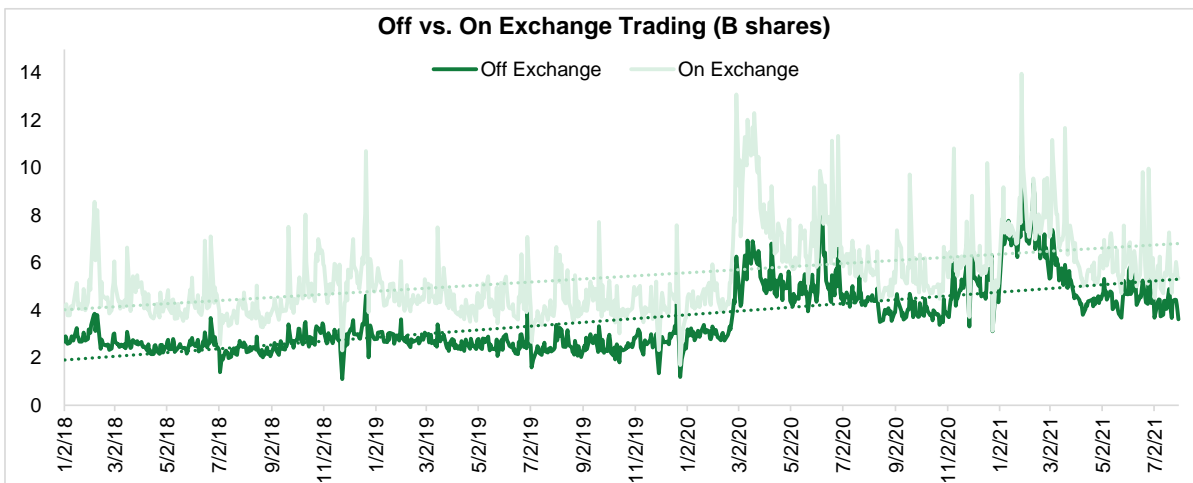
To show this more clearly, we graph off- and on-exchange trading, analyzing the more recent period versus the historical time series. In general, you see that spikes in off-exchange trading are accompanied by greater spikes in on-exchange trading, regardless of time period shown.

In terms of slopes of the trend line, there has been a shift in pattern in the more recent time period. Looking at the full time series, both volumes show similar upward slopes. Since 2020, the off-exchange volumes slope remains upward sloping but to a lesser degree (slope for full time series 1.6x the more recent series). The on-exchange trading slope has reverted to a downward pattern, also showing a much smaller slope coefficient.

**More Recent Series**



**Full Historical Series**



Source: Cboe Global Markets, SIFMA estimates (as of July 30)

## Alternative Views of Volumes

The publicly available data for the U.S. equities markets, provided by Cboe Global Markets, contains data collected from all sixteen exchanges and the three trade-reporting facilities (TRFs). Statistics can be viewed by:

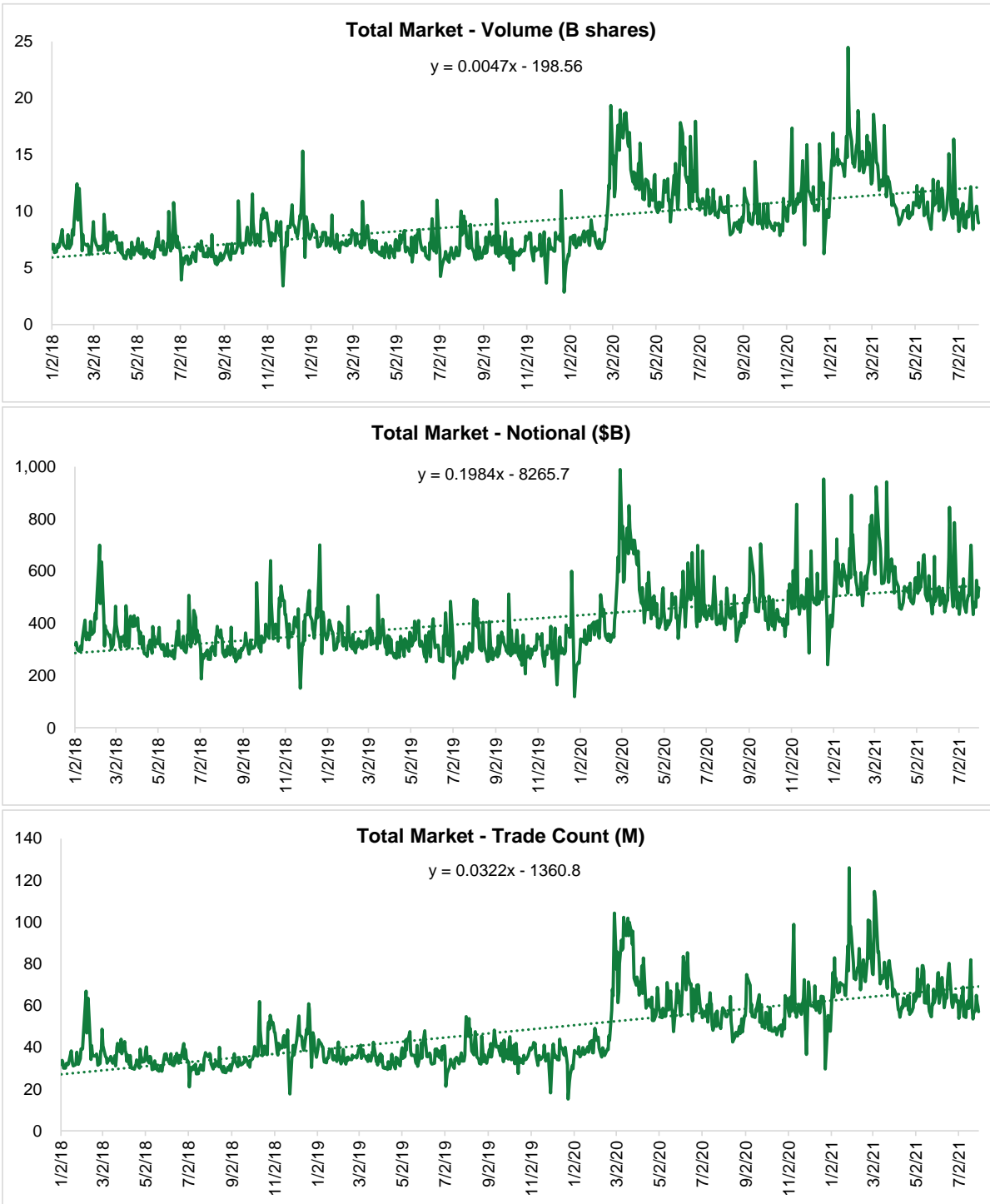
- Total shares traded daily;
- Total notional (or dollar) value traded daily; and
- Total number of trades occurring daily

When looking at the 2020 to YTD 2021 time period versus historical, or 2018 to 2019, we highlight the following:

- Volumes, notional value, and trade count have all increased substantially, ranging from 51% to 73%; each segment is also seeing both higher highs (maximum) and higher lows (minimum)
- Average volumes increased 58.5% versus 50.9% for average notional value – as notional value equals price times volume, if notional is increasing less than volumes, price must be declining – the average price of stocks traded has declined
- Trade Count increased 72.6% versus 58.5% for volumes – the increase in trade, or transactions, count outpaced the increase in shares traded – there are less shares traded per transaction

	Average	Maximum	Minimum
<b>2020 to YTD</b>			
Volume (B shares)	11.4	24.5	6.3
Notional (\$B)	512.2	989.3	241.7
Trade Count (M)	63.0	126.0	29.7
<b>2018/2019 Avg.</b>			
Volume (B shares)	7.2	15.3	2.9
Notional (\$B)	339.5	700.6	119.6
Trade Count (M)	36.5	67.0	15.2
<b>Current/History</b>			
Volume (B shares)	58.5%	59.7%	117.5%
Notional (\$B)	50.9%	41.2%	102.1%
Trade Count (M)	72.6%	88.2%	94.5%

Source: Cboe Global Markets, SIFMA estimates (as of July 30)



Source: Cboe Global Markets, SIFMA estimates (as of July 30)

**Notional Value**

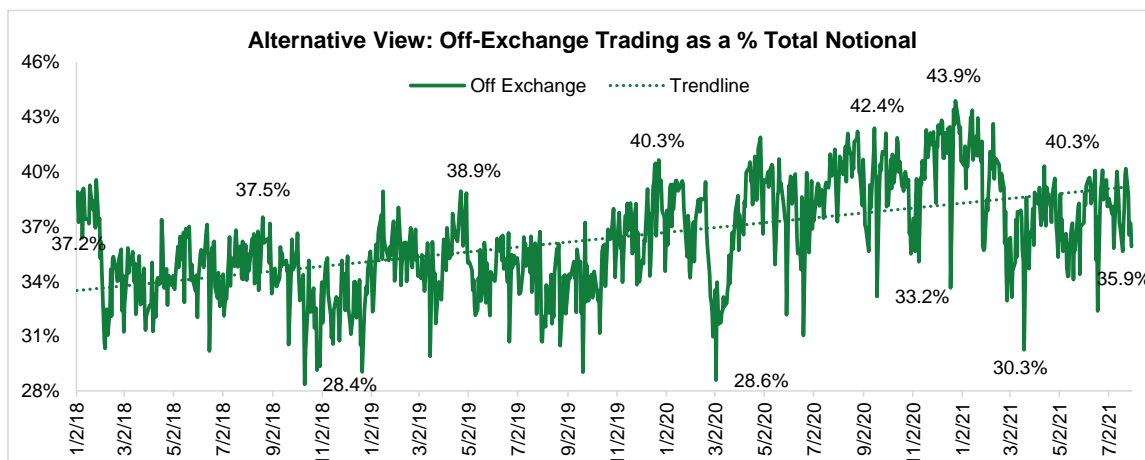
While in the U.S., we tend to look at volumes in terms of shares, other countries look at value. Therefore, our first alternative view of off-exchange trading is to look at levels as a percent of total notional traded.

Notional, or dollar, value traded is calculated by multiplying the execution price of each transaction by the total number of shares executed in each transaction. It can be used to gain a more representative view of the size of the market rather than just looking at shares changing hands. The larger the notional value traded, the more activity taking place in the market. For example, if trading is being done in larger market cap names, the larger the size of markets: 100 shares of a \$3,356.30 stock equates to \$335,630, versus 100 shares of a \$14.01 stock represents a \$1,401 value.

As indicated above, like volumes, notional value traded has seen strong growth. On average for 2018 and 2019 the level of off-exchange trading as a percent of notional value was 34.5%. The 2020 average of 38.2% was +3.7 pps greater than (or 1.11x) the historical average, while 2021 YTD (through July 30) was 37.7% (+3.2 pps, 1.09x historical average). Overall, there has been a solid upward sloping trend since 2018.

What is more interesting than the growth trend is that the level of off-exchange trading as a percent of total notional is less than the level as a percent of volumes: 2.3 pps less historically (-6.1%), 3.3 pps less in 2020 (-7.9%), and 6.5 pps less in YTD 2021 (-14.7%). Additionally, the growth rates for notional value versus historical levels are less than that of volumes: -1.0 pps in 2020, -4.2 pps in YTD 2021. **The level of off-exchange trading as a percent of notional is clearly lower than when looking at the percent of volumes (shares).**

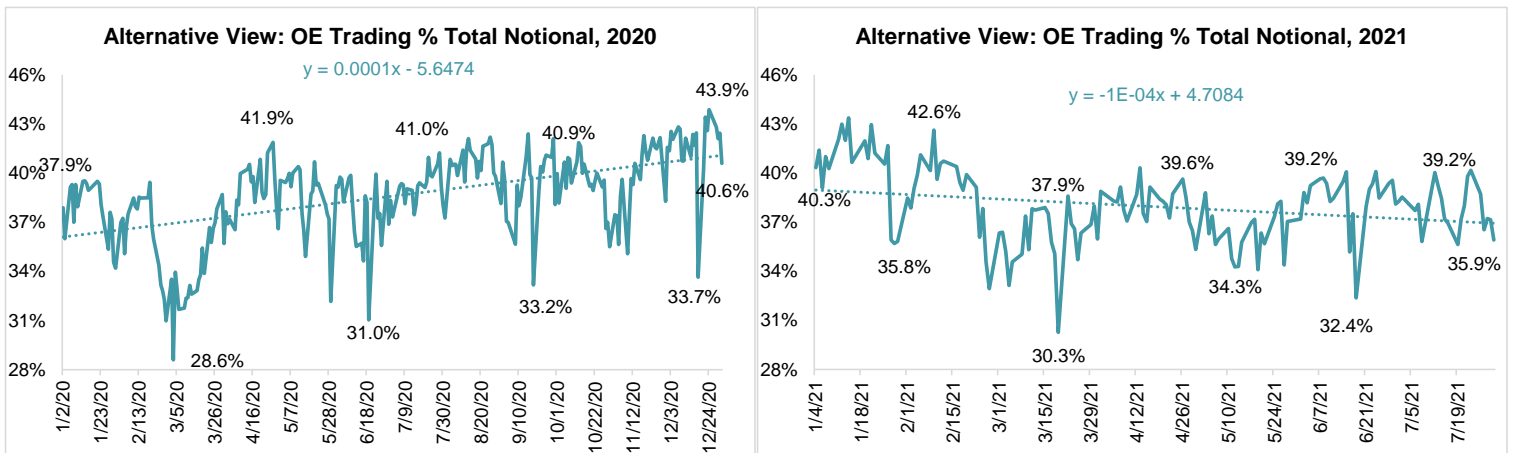
(\$B)	Market Notional	On Exchange Notional	Off Exchange Notional	OE - Notional	OE - ADV	Difference (pps)
2018	356.0	234.5	121.4	34.1%	36.3%	(2.2)
2019	321.7	209.1	112.6	35.0%	37.3%	(2.3)
Y/Y change	-9.6%	-10.8%	-7.3%	0.89%	0.93%	(0.04)
Historical Avg	338.8	221.8	117.0	34.5%	36.8%	(2.3)
2020	479.4	296.3	183.2	38.2%	41.5%	(3.3)
to hist. avg.	41.5%	33.6%	56.5%	3.7%	4.7%	(1.0)
YTD	569.5	354.5	214.9	37.7%	44.2%	(6.5)
to hist. avg.	168.1%	59.8%	83.6%	3.2%	7.4%	(4.2)



Source: Cboe Global Markets, SIFMA estimates (as of July 30)

Comparing off-exchange trading as a percent of notional versus percent of volumes (shares), we highlight:

- Similarly, to volumes, the slope for off-exchange as a percent of notional value reverses in YTD 2021 to a downward trend, from an upward trend in 2020
  - 2020 off-exchange level increased 2.7 pps from start to end of year
  - 2021 off-exchange level decreased 4.4 pps from start to end of year
- However, off-exchange as a percent of notional value differs from that for off-exchange as a percent of volumes in distribution of days
  - Off-exchange as a percent of notional value had 0 days above 50%, versus 1 in 2020 and 4 in 2021 for off-exchange as a percent of volumes
  - Off-exchange as a percent of notional value had 75 days above 40% in 2020, versus 187 for off-exchange as a percent of volumes
  - Off-exchange as a percent of notional value had 26 days above 40% in 2021, versus 138 for off-exchange as a percent of volumes
- Off-exchange as a percent of notional value also saw a lower peak versus volumes – peak 43.9% for notional, versus 50.5% for volumes



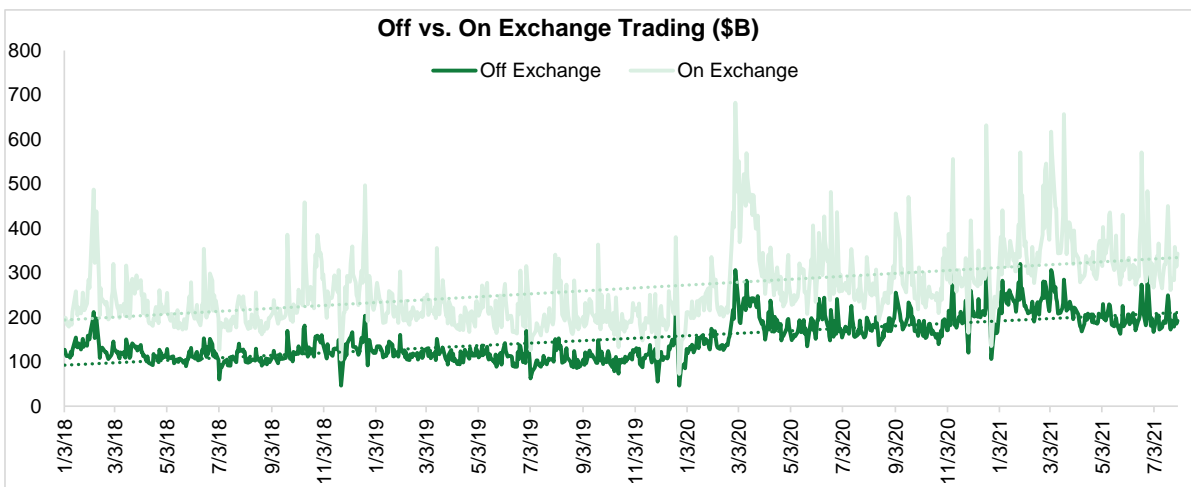
Source: Cboe Global Markets, SIFMA estimates (as of July 30)



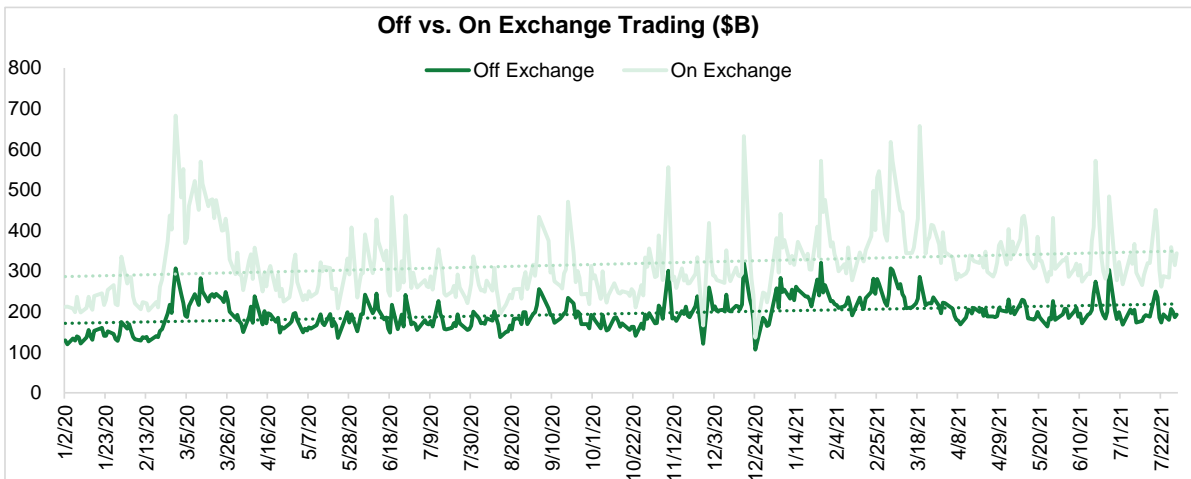
As with volumes, we also look at off- and on-exchange trading as a percent of notional, analyzing the more recent period versus the historical time series. Spikes in off-exchange trading are accompanied by much greater jumps in on-exchange trading, in both time periods shown.

In terms of slopes of the trend line, both segments remain upward sloping across time periods. However, while the slope of the trendline for on-exchange trading has increased 0.6%, that for off-exchange trading has actually decreased 9.4%.

**More Recent Series**



**Full Historical Series**



Source: Cboe Global Markets, SIFMA estimates (as of July 30)

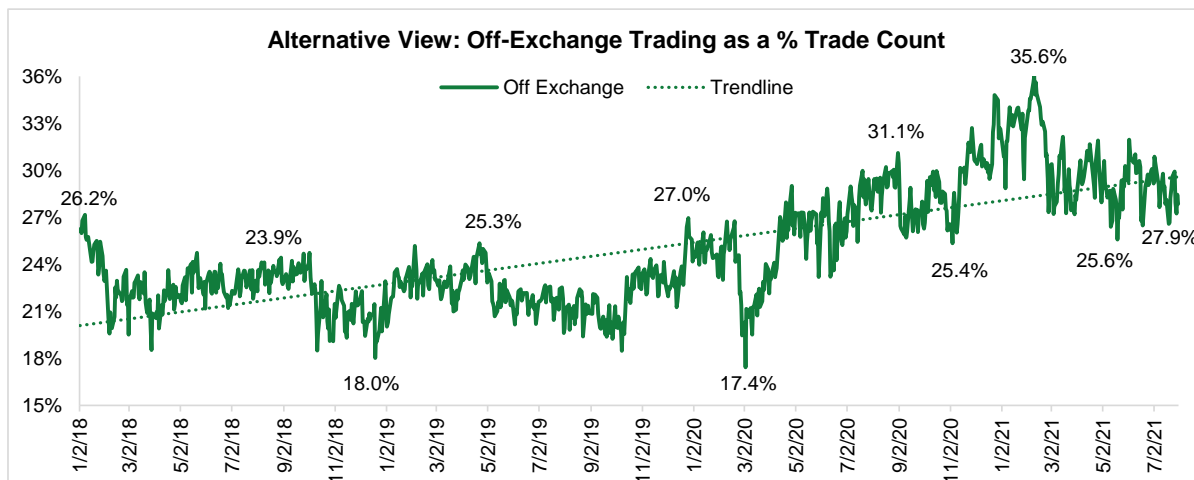
Trade Count

Next, we look at trade count as an alternative view of analyzing volumes. As with volumes, trade count traded has seen robust growth. On average for 2018 and 2019 the level of off-exchange trading as a percent of total trade count was 22.17%. The 2020 average of 26.5% was +4.4 pps greater than (or 1.20x) the historical average, while 2021 YTD (through July 30) was 30.1% (+7.9 pps, 1.36x historical average). Overall, there has been a strong upward sloping trend since 2018.

Similar to notional value, the level of off-exchange trading as a percent of total trade count is less than the level as a percent of volumes: 14.6 pps less historically (-39.7%), 14.9 pps less in 2020 (-36.1%), and 14.1 pps less in YTD 2021 (-32.0%). However, unlike with notional value, the growth rates for trade count versus historical levels are more in line with that of volumes in 2020 (-0.3 pps) but greater than volumes in 2021 (+0.5 pps). Regardless of shifting patterns in growth rates, **the level of off-exchange trading as a percent of trade count is substantially lower than when looking at the percent of volumes (shares).**

(#M)	Market Count	On Exchange Count	Off Exchange Count	OE - Count	OE - ADV	Difference (pps)
2018	36.42	28.34	8.08	22.19%	36.3%	(14.1)
2019	36.38	28.32	8.06	22.15%	37.3%	(15.1)
Y/Y change	-0.1%	-0.1%	-0.3%	-0.03%	0.93%	(1.0)
Historical Avg	36.40	28.33	8.07	22.17%	36.8%	(14.6)
2020	58.6	43.1	15.6	26.5%	41.5%	(14.9)
to hist. avg.	61.1%	52.1%	92.9%	4.4%	4.7%	(0.3)
YTD	70.5	49.3	21.2	30.1%	44.2%	(14.1)
to hist. avg.	93.6%	73.9%	162.8%	7.9%	7.4%	0.5

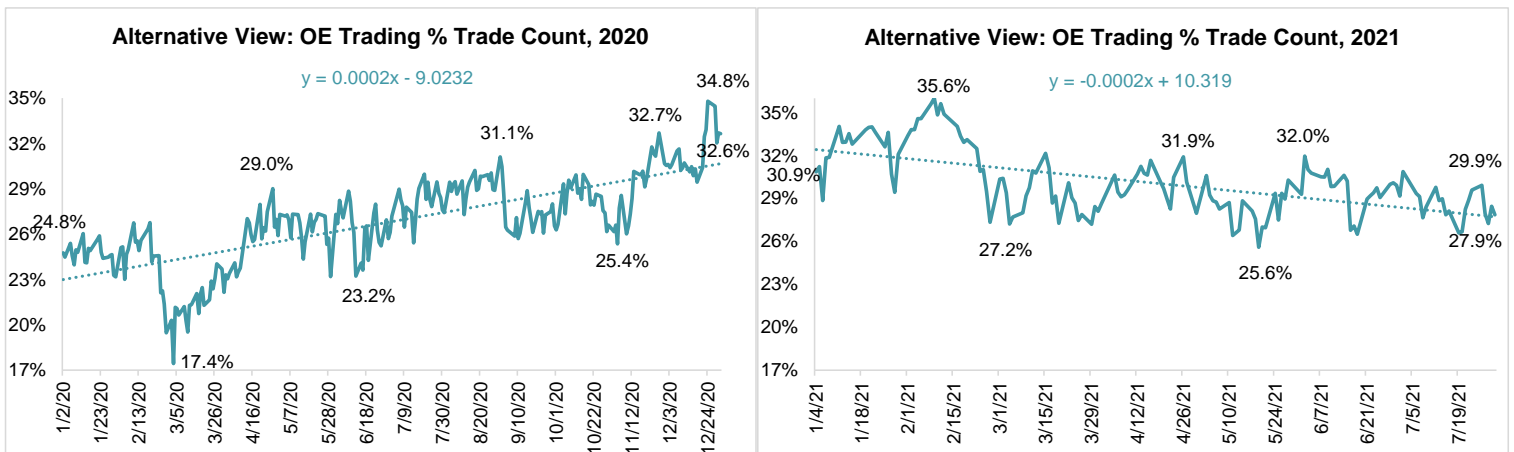
Source: Cboe Global Markets, SIFMA estimates (as of July 30)



Source: Cboe Global Markets, SIFMA estimates (as of July 30)

Comparing off-exchange trading as a percent of trade count versus percent of volumes (shares), we highlight:

- Similarly, to volumes, the slope for off-exchange as a percent of trade count reverses in YTD 2021 to a downward trend, from an upward trend in 2020
  - 2020 off-exchange level increased 7.8 pps from start to end of year
  - 2021 off-exchange level decreased 3.0 pps from start to end of year
- However, off-exchange as a percent of trade count differs from that for off-exchange as a percent of volumes in distribution of days
  - Off-exchange as a percent of trade count had 0 days above 50%, versus 1 in 2020 and 4 in 2021 for off-exchange as a percent of volumes
  - Off-exchange as a percent of trade count had 0 days above 40%, versus 187 in 2020 and 138 in 2021 for off-exchange as a percent of volumes
  - Off-exchange as a percent of trade count actually only had 3 days over 35% in 2021 (in early February) and 31 and 63 days over 30% in 2020 and 2021 respectively
  - Off-exchange as a percent of trade count also saw a much lower peak versus volumes – peak 36.0% for trade count, versus 50.5% for volumes

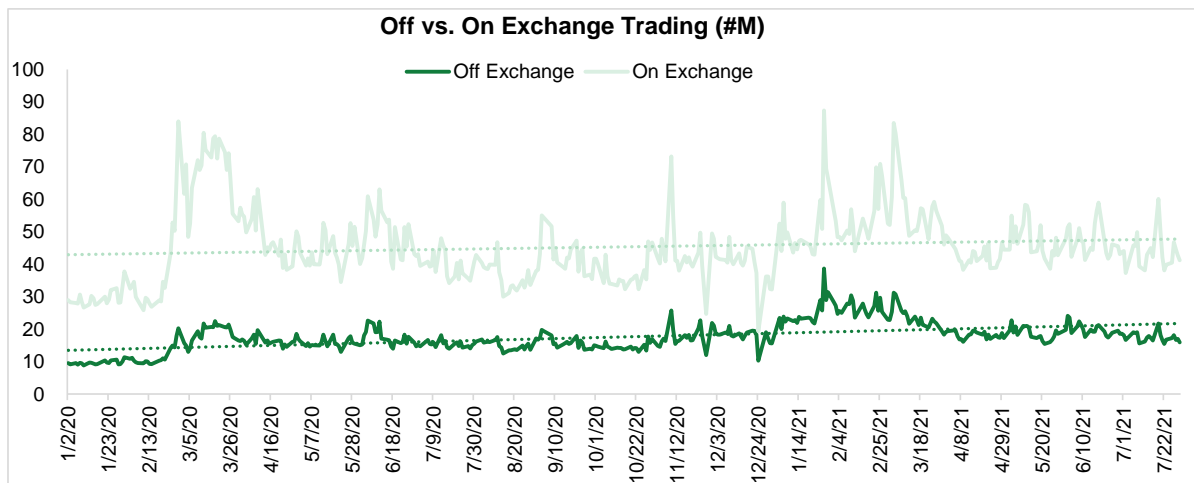


Source: Cboe Global Markets, SIFMA estimates (as of July 30)

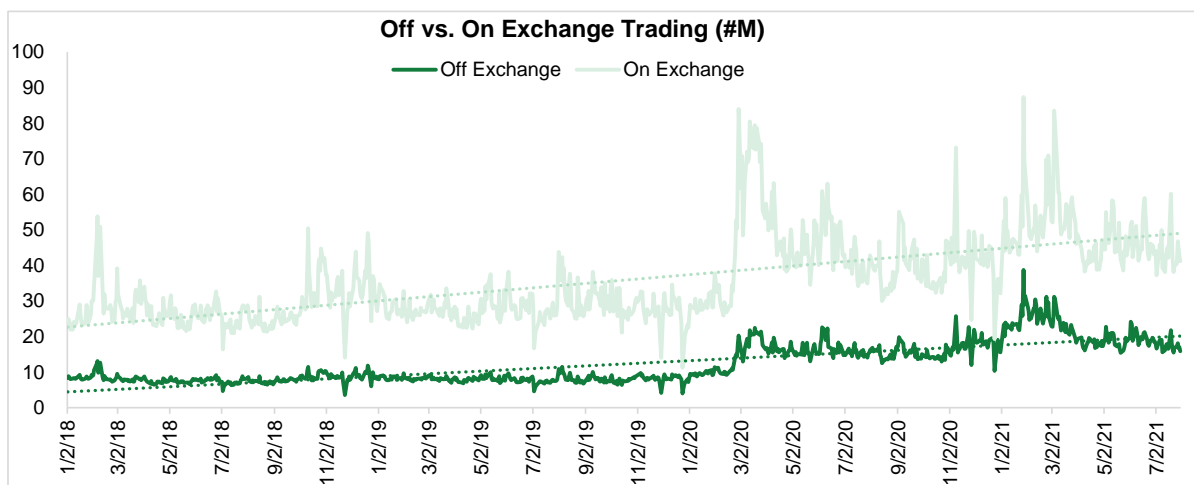
As with the other segments, we also look at off- and on-exchange trading as a percent of trade count, analyzing the more recent period versus the historical time series. Spikes in off-exchange trading are accompanied by significantly greater jumps in on-exchange trading, in both time periods shown.

In terms of slopes of the trend line, both segments remain upward sloping across time periods. In this segment, the slope for off-exchange trading has increased 20.0%, while that for on-exchange trading decreased 58.9%.

**More Recent Series**



**Full Historical Series**



Source: Cboe Global Markets, SIFMA estimates (as of July 30)

## Another Look: Volumes by Tape

The historical market volume data also includes statistics for volumes broken down by tape. The three tapes, together called the consolidated tape, are:

- Tape A – NYSE-listed stocks
- Tape B – Everything else; used to be referred to as the regionals, most trading now on NYSE Arca and American (also a main tape for ETF trading)
- Tape C – Nasdaq-listed stocks

Before looking at the numbers, we find it useful to recap the listings environment. There are two exchanges in the listings business, Nasdaq and NYSE<sup>3</sup>. While it has diversified over the years, Nasdaq's listing composition is heavily weighted to technology stocks. It currently lists eight of the top ten stocks by market cap in the S&P 500 index<sup>4</sup>. Therefore, volumes on Nasdaq exchanges benefited from the strong tech trade during the COVID crisis.

We highlight the following trends for volumes by tape:

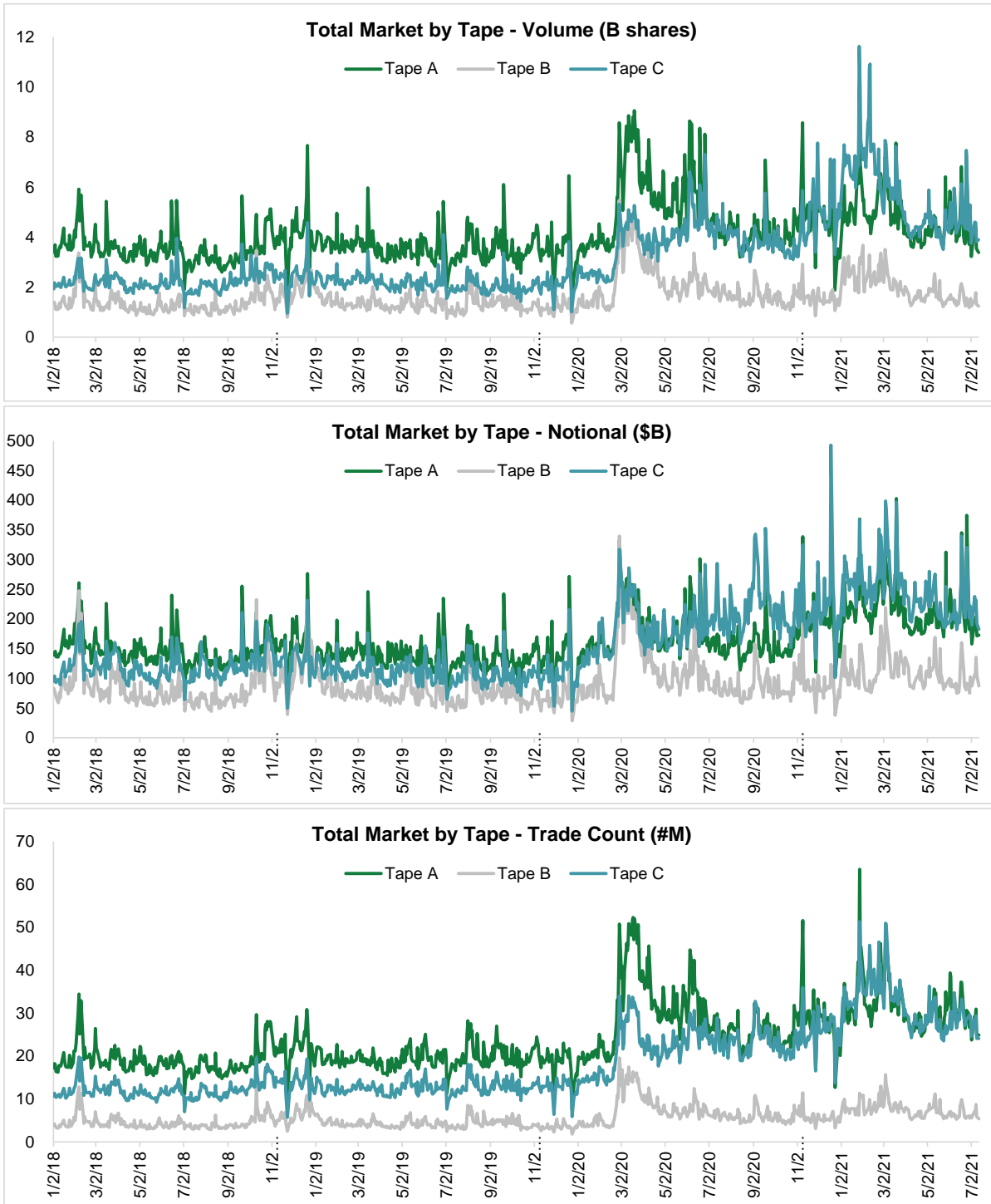
- While Tape A posted the lowest increases in volume and trade count versus the other tapes, it still saw significant increases in all measures, ranging from +32.0% to +52.6%
- Tape B, the smallest tape (0.4x volumes both Tape C and Tape A), also saw solid increases in all measures
- Tape C showed the highest increases for volume, notional and trade count, driving the overall market increases; for example, Tape C volumes increased 106.8% while the market increased 58.5%

	Avg. Volume (B shares)	Avg. Notional (\$B)	Avg. Trade Count (#M)
<b>2020 to YTD</b>			
Tape A	4.9	189.8	29.8
Tape B	2.0	106.7	7.1
Tape C	4.5	215.7	26.1
Market	11.4	512.2	63.0
<b>2018/2019 Avg.</b>			
Tape A	3.6	143.8	19.5
Tape B	1.4	80.8	4.5
Tape C	2.2	114.9	12.5
Market	7.2	339.5	36.5
<b>Current/History</b>			
Tape A	34.9%	32.0%	52.6%
Tape B	43.1%	32.0%	60.0%
Tape C	106.8%	87.8%	108.3%
Market	58.5%	50.9%	72.6%
Tape A vs. Market	(23.6)	(18.9)	(20.0)
Tape B vs. Market	(15.4)	(18.9)	(12.6)
Tape C vs. Market	48.3	36.9	35.6

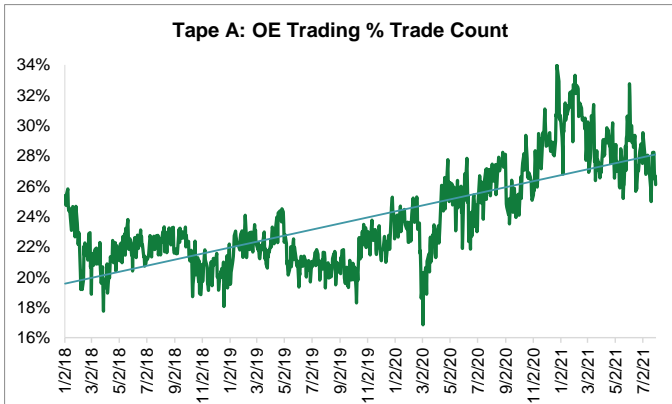
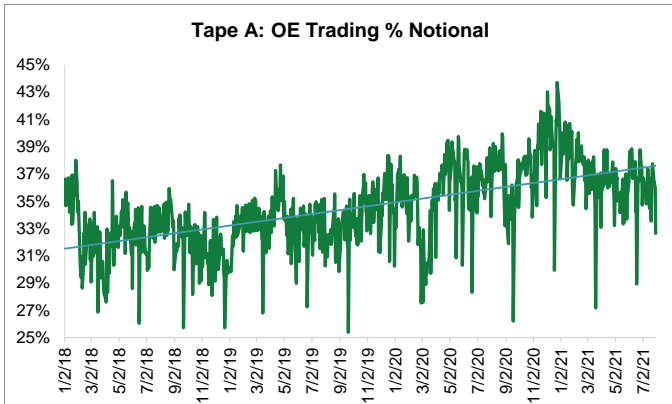
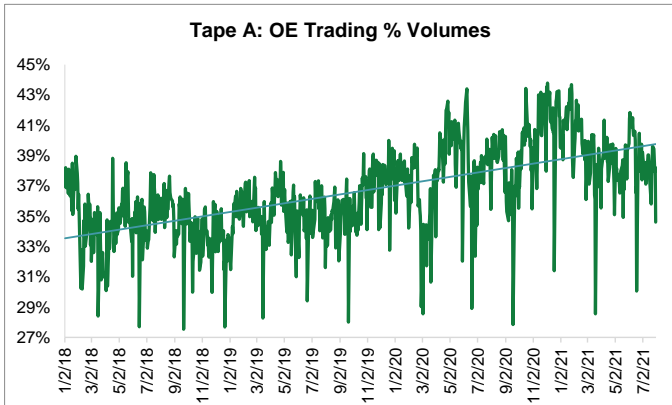
Source: Cboe Global Markets, SIFMA estimates (as of July 30)

<sup>3</sup> NYSE is a subsidiary of Intercontinental Exchange (ICE). Cboe Global Markets listed its own stock; ETFs are listed on NYSE Arca and Cboe and trade on Nasdaq as well

<sup>4</sup> Nasdaq: AAPL, MSFT, AMZN, FB, GOOGL, GOOG, TSLA, NVDA; NYSE = BRK.B, JPM. Please see Appendix for S&P 500 index characteristics



Source: Cboe Global Markets, SIFMA estimates (as of July 30)



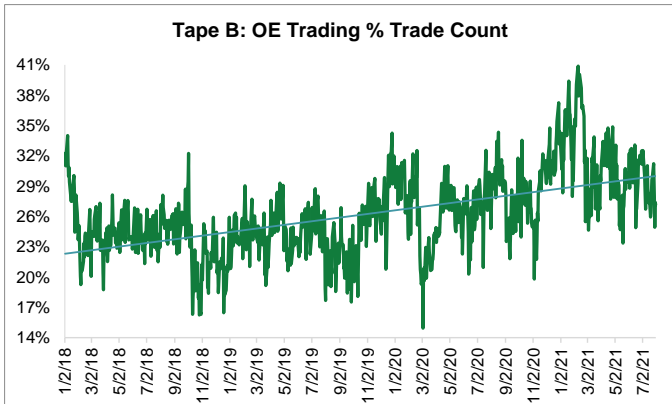
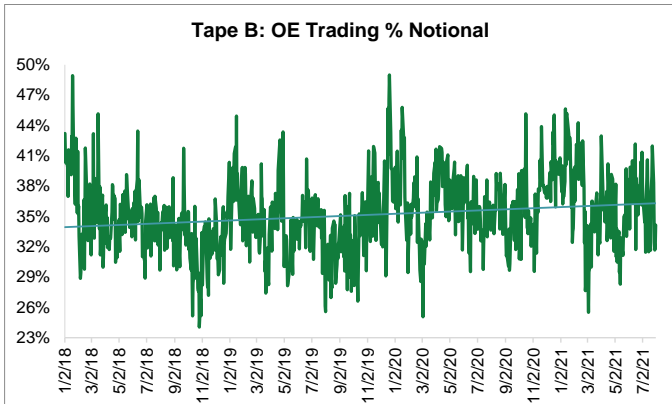
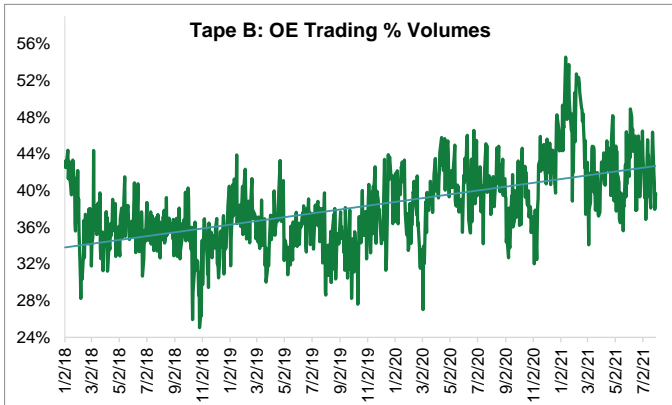
## Tape A

Strongest growth (in terms of slope of the trendline) was seen in trade count.

- Volumes
  - Average 36.7%
  - Minimum 27.5%
  - Maximum 43.8%
- Notional
  - Average 34.5%, -2.2 pps to off-exchange as a percent of volumes
  - Minimum 25.4%
  - Maximum 43.7%
- Trade Count
  - Average 23.8%, -12.9 pps to off-exchange as a percent of volumes
  - Minimum 16.8%
  - Maximum 34.0%

Source: Cboe Global Markets, SIFMA estimates (as of July 30)



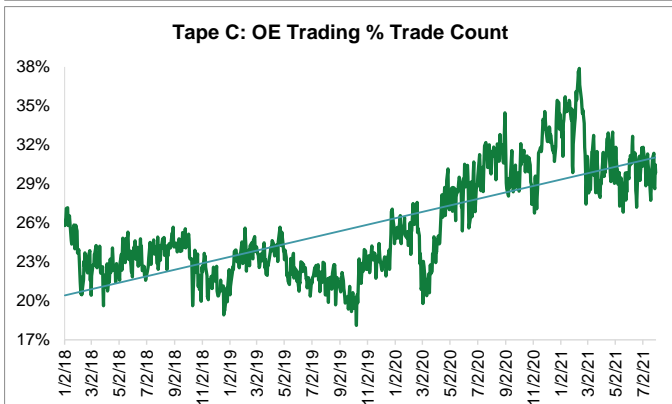
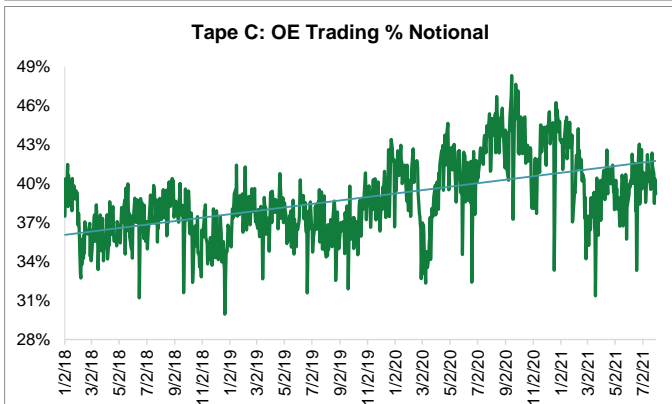
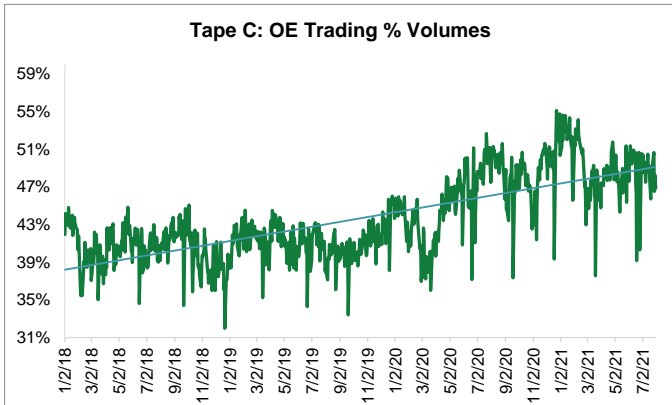


### Tape B

Strongest growth (in terms of slope of the trendline) was seen in volumes.

- Volumes
  - Average 38.2%
  - Minimum 25.1%
  - Maximum 54.5%
- Notional
  - Average 35.1%, -3.1 pps to off-exchange as a percent of volumes
  - Minimum 24.0%
  - Maximum 49.0%
- Trade Count
  - Average 26.2%, -12.0 pps to off-exchange as a percent of volumes
  - Minimum 15.0%
  - Maximum 40.9%

Source: Cboe Global Markets, SIFMA estimates (as of July 30)



### Tape C

Strongest growth (in terms of slope of the trendline) was tied amongst volume and trade count.

- Volumes
  - Average 43.7%
  - Minimum 32.0%
  - Maximum 55.1%
- Notional
  - Average 38.9%, -4.8 pps to off-exchange as a percent of volumes
  - Minimum 30.0%
  - Maximum 48.3%
- Trade Count
  - Average 25.7%, -18.0 pps to off-exchange as a percent of volumes
  - Minimum 18.1%
  - Maximum 37.9%

Source: Cboe Global Markets, SIFMA estimates (as of July 30)

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## Off-Exchange Trading and Market Quality

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As shown in this note, the level of off-exchange trading as a percent of total equity volumes (and notional value and trade count) has increased. While this is an accurate trend analysis of the data, what does it mean or not mean?

**Variances by Metric:** In this report, we have shown the different growth rates when looking at off-exchange as a percent of volumes versus notional value or trade count. Which is the “correct” metric? We discussed earlier in the report that most other countries look at the market in terms of notional value instead of volumes, and this metric shows a lower level of off-exchange trading.

**Off-Exchange Not All Retail:** Much of the growth in off-exchange trading starting in 2020 has been attributed to retail investors. Based on our market structure [survey](#), market participants estimate retail investors now represent 20%-30% of total equity volumes, up from 10% historically. However, all off-exchange trading is **not** 100% retail – off-exchange trading as a percent of volumes in July was 43.1%, greater than the retail estimate from market participants. Off-exchange volumes also include block (trade size 10,000+ shares) and other institutional trades, including bank capital commitment as part of institutional trades.

**Function of Market Structure:** Further, as one market participant eloquently said, “So what if the percentage of off-exchange trading volumes has risen”? Retail brokerages send much of their order flow to market makers, who then execute off exchange and report the trade to the Trade Reporting Facilities (TRF). Market participants note that the level of the percent off-exchange trading volumes is not a measure of market quality, more directly, the increase in off-exchange trading is not a sign of declining market quality. For example, a 43% share of a \$12 billion tape is better than 37% of a \$7 billion tape for execution. The increase in the percent of off-exchange volumes is an indicator of volume growth, in particular retail trading growth and trading in low dollar stocks, not a sign that flows are shifting.

In other words, the percent of off-exchange trading is a function of market structure, and the optimal level of the percent of off-exchange trading is the actual amount in that given time period. Any increase may impede price discovery, and any decrease may hinder trading. Fragmentation in U.S. equity markets – 16 exchanges, 33 alternative trading systems (ATS), multiple over-the-counter (OTC) venues<sup>5</sup> – forces traders to balance the likelihood of certainty of execution against potential price and size improvement and other transaction costs when choosing an execution venue.

Exchanges offer pre-trade transparency but may not provide the trader with sufficient liquidity. Off-exchange trading may not offer pre-trade transparency, meaning the quantity of shares for execution could be uncertain. Risk neutral traders must balance the cost of not filling the order with the potential for price improvement, the cost-immediacy tradeoff. Historically, off-exchange trading increases when bid-ask spreads widen, decreases when exchange depth increase, and decreases with increased volatility (which impacts bid-ask spreads). Academic studies suggest that the probability of execution is a critical determinant in choosing between off-exchange venues. One such study<sup>6</sup> found that the more trade-intense group of ATS platforms or OTC non-ATS dealers respond more elastically to spreads, depth and volatility.

**In other words, the percent of off-exchange trading volumes is self-correcting, ebbing and flowing based on current market structure characteristics.**

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<sup>5</sup> FINRA, as of 2Q21

<sup>6</sup> The Off-Exchange Routing Decision by Hyungil Kye and Bruce Mizrach, August 2019

## Appendix: Pearson's Correlation Coefficient

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Pearson's correlation coefficient measures the statistical relationship or association between two continuous variables. It gives information about the magnitude of the correlation and the direction of the relationship. Values can range from +1 to -1:

- Perfect – value near  $\pm 1$ ; as one variable increases, the other variable tends to also increase (if positive) or decrease (if negative)
- High degree – value lies between  $\pm 0.50$  and  $\pm 1$ , strong correlation
- Moderate degree – value lies between  $\pm 0.30$  and  $\pm 0.49$ , medium correlation
- Low degree – value lies between 0 and  $\pm 0.29$ , small correlation
- No correlation – value equals zero

## Appendix: S&P 500 Index Characteristics

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The S&P 500 index is a market capitalization weighted index of the 505 largest U.S. publicly traded companies. It is regarded as the best gauge of large-cap U.S. equities, covering around 80% of total market capitalization. There is over \$11.2 trillion indexed or benchmarked to the index.

### Sector Breakout

- Information Technology 27.8%
- Health Care 13.4%
- Consumer Discretionary 12.1%
- Communication Services 11.2%
- Financials 11.0%
- Industrials 8.4%
- Consumer Staples 5.9%
- Real Estate 2.6%
- Materials 2.6%
- Energy 2.6%
- Utilities 2.5%

### Top 10 Constituents by Index Weight

- Top 10 constituents represent 27.7% of the total index
- The weight of the largest constituent is 6.2%
- Apple Inc. (AAPL), Information Technology
- Microsoft Corp. (MSFT), Information Technology
- Amazon.com Inc. (AMZN), Consumer Discretionary
- Facebook Inc. A (FB), Communication Services
- Alphabet Inc. A (GOOGL), Communication Services
- Alphabet Inc. C (GOOG), Communication Services
- Tesla, Inc. (TSLA), Consumer Discretionary
- Berkshire Hathaway B (BRK.B), Financials
- Nvidia Corp (NVDA), Information Technology
- JP Morgan Chase & Co. (JPM), Financials

Source: S&P Dow Jones Indices

Note: Based on GICS sectors, as of July 30, 2021

## Appendix: Terms to Know

EMS	Equity Market Structure
NMS	National Market System
Reg NMS	Regulation National Market System
SIP	Security Information Processor
PFOF	Payment For Order Flow
Tick Size	Minimum price movement of a stock
CAT	Consolidated Audit Trail
SRO	Self Regulatory Organization
FINRA	Financial Industry Regulatory Authority
SEC	Securities and Exchange Commission
ADV	Average Daily Trading Volume
Algo	Algorithm (algorithmic trading)
ATS	Alternative Trading System
Best Ex	Best Execution
BPS	Basis Points
CLOB	Central Limit Order Book
D2C	Dealer-to-Client
D2D	Dealer-to-Dealer
Dark Pool	Private trading venues, not accessible by the public
ECN	Electronic Communication Network
ETP	Electronic Trading Platforms
HFT	High-Frequency Trading
IDB	Inter-Dealer Broker
IOI	Indication of Interest
MM	Market Maker
OTC	Over-the-Counter
SI	Systematic Internaliser
Bid	An offer made to buy a security
Ask, Offer	The price a seller is willing to accept for a security
Spread	The difference between the bid and ask price prices for a security, an indicator of supply (ask) and 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	To determine the opening price of a stock, accumulating all buy and sell interest a few minutes before the market open
Closing Cross	To determine the closing price of a stock, accumulating all buy and 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	(or stop-loss) An order to buy or sell a stock once the price of the stock reaches the specified price, known as the stop price

## Appendix: SIFMA Insights Research Reports

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Monthly Market Metrics and Trends: [www.sifma.org/insights-market-metrics-and-trends](http://www.sifma.org/insights-market-metrics-and-trends)

- Statistics on volatility and equity and listed options volumes
- Also highlights an interesting market trend

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

- Capital Markets Primer Part I: Global Markets & Financial Institutions
- Capital Markets Primer Part II: Primary, Secondary & Post-Trade Markets
- Electronic Trading
- US Capital Formation & Listings Exchanges
- US Equity
- US Multi-Listed Options
- US ETF
- US Fixed Income
- SOFR: The Transition from LIBOR
- The Evolution of the Fintech Narrative

SIFMA Insights: [www.sifma.org/insights](http://www.sifma.org/insights)

- Market Structure Survey: Volatility, Volumes, Market Levels & Retail Investor Participation
- SPACs versus IPOs
- A Look Back at 2020 Market Structure Themes
- US Capital Formation's 2020 Journey
- Market Structure Download: Post-Election Update
- Market Performance Around US Presidential Elections
- Market Volatility Around US Presidential Elections
- Market Structure Download
- A Deeper Look at US Listed Options Volumes
- The Cboe Trading Floor Reopened – Revisiting Volume Data
- NYSE Goes All Electronic – What Does It Mean?
- The NYSE Trading Floor Reopened – Revisiting Market Share Data
- COVID-19 Related Market Turmoil Recap: Part I (Equities, ETFs, Listed Options & Capital Formation)
- 2020, the Year of the SPAC
- The 2020 Market Madness
- The VIX's Wild Ride
- The 10th Anniversary of the Flash Crash
- DTCC's Important Role in US Capital Markets



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