Corporate Stock Trading Volume, Spreads and Depth Before, During and After the NYSE Trading Suspension on July 8, 2015

What Happened

NYSE suspended trading in all symbols on the exchange at 11:32 am on July 8, 2015, and reopened at 3:10 pm - a suspension of trading for 3 hours and 38 minutes.[1] The following is an analysis of trading before, during and after they NYSE trading suspension.

As discussed below, total trading volume in NYSE-listed stocks on July 8 was well within the range of observed trading volume in the first seven months of 2015. And, it appears that the remaining market centers – especially other exchanges – experienced unusually large increases in trading activity for NYSE-listed corporate stocks before, during and after the trading suspension on July 8.

From 11:24 am to 11:43 am, the equal-weighted mean relative quoted spread for NYSE-listed stocks increased from 18.3 basis points to 26.9 basis points - a 47% increase. Mean inside depth fell from $87,659 to $69,712 (a 20% decline) and reached a minimum of $60,469 at 11:38 am. During the same time interval, the equal-weighted mean relative quoted spread for Nasdaq-listed stocks increased from 1.17% to 1.19% - a 1.7% increase. Mean inside depth fell from $38,368 to $37,120 (a 3% decline) and reached a minimum of $34,645 at 11:38 am. Mean NYSE-listed quoted spreads did not reach their pre-11:32 am levels until after the resumption of trading on NYSE at 3:10 pm. Mean Nasdaq-listed spreads reached new lows by Noon. While mean Nasdaq-listed depth recovered by 12:30 pm, mean inside depth for NYSE-listed stocks did not reach pre-11:32 am levels until 1:46 pm.

Not all NYSE-listed stocks were equally affected by the trading suspension. Large NYSE-listed stocks experienced the brunt of the depth decline while small NYSE-listed stock depth increased. However, small NYSE-listed stocks experienced the greatest increase in relative quoted spreads. While these spreads remained high when compared to small Nasdaq-listed stock spreads they did improve throughout the event window.

Impact on Trading Volume and Market Share

Dollar volume traded for NYSE-listed stocks during normal market hours on July 8 was $87.3 Billion, well within the range of $65 Billion to $126 Billion during 2015.[2] For Nasdaq-listed stocks, $55 Billion traded on July 8 and the yearly range was $39 Billion to $75 Billion.[3] Figure 1 shows the

[1] See https://www.nyse.com/market-status/history for a description of the events leading up to the trading suspension at NYSE on July 8, 2015.

[2] Normal market hours are 9:30 am to 4:00 pm, excluding auctions. The yearly range includes trading days from January to July, 2015. Listing exchange is taken directly from the Center for Research in Security Prices (CRSP) daily files.

[3] To facilitate a straightforward comparison of NYSE-listed and Nasdaq-listed securities, the sample of securities is limited to US-listed, US-domiciled corporate stocks.

evolution of trading volume for NYSE-listed (red line) and Nasdaq-listed (orange line) stocks during 2015. The ratio of NYSE-listed volume to Nasdaq-listed volume (blue line, right scale) is also well within the yearly range.[4] Figure 2 shows the distribution of trading volume across the three time periods defined by the suspension (11:32 am) and resumption (3:10 pm) of trading on the NYSE. There is not much evidence that the distribution of trading volume across the day on July 8 is any different than other days in 2015.

[4] Figure 1 shows that trading volume for NYSE-listed shares was within the range observed during 2015, suggesting that the trading suspension did not have a dramatic effect on NYSE-listed trading volume. However, it is possible that in the absence of a trading suspension NYSE-listed volume would have been higher than was observed for July 8.

Figure 1: Dollar Value Traded – January to July, 2015

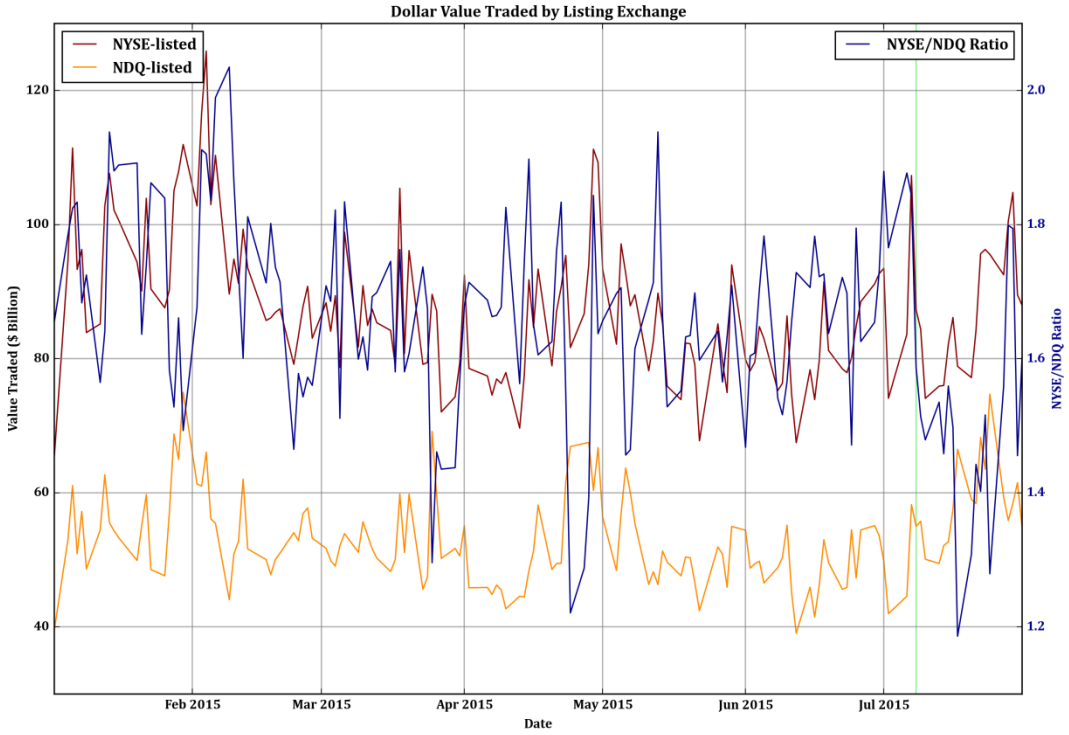
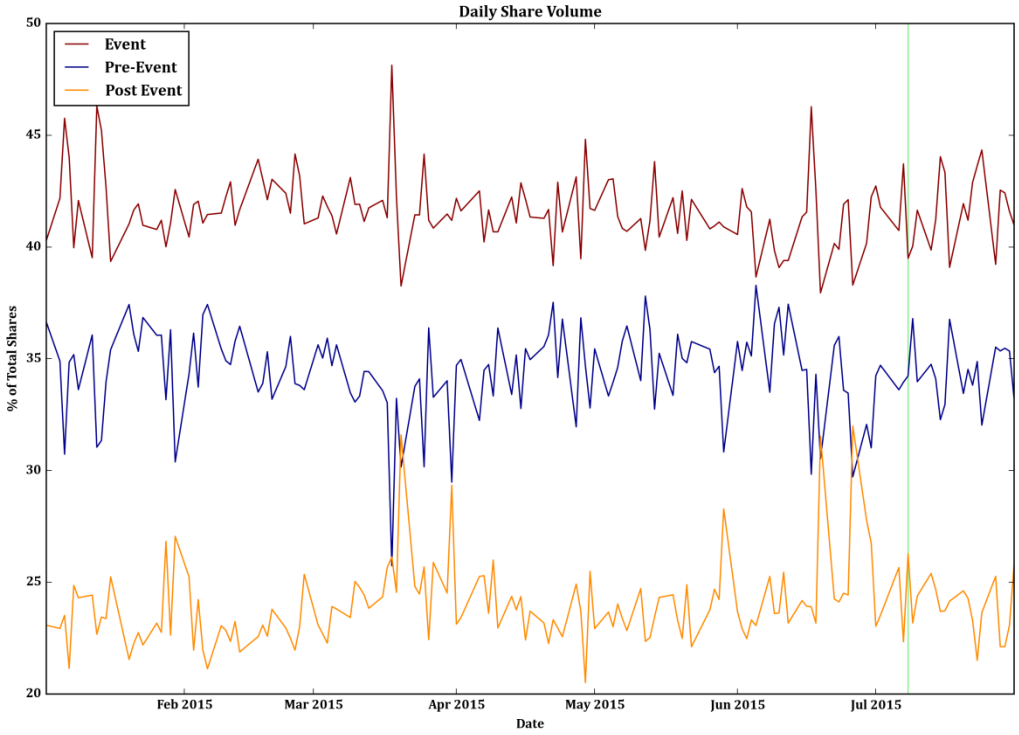


Figure 2: Percentage of NYSE-listed Shares Traded – January to July, 2015



If NYSE-listed trading volume on July 8 was about the same as other days and this volume did not shift into the pre- or post- suspension period, then where did it go? Figure 3 shows that trading in NYSE-listed stocks (red line) migrated to other exchanges during the trading suspension event window (11:32 am to 3:10 pm) on July 8, with Nasdaq (orange line) attracting a large proportion of the trading NYSE-listed shares and many other exchanges (gray lines) picking up market share as well. The TRF (blue line) could have picked up some volume in NYSE-listed shares, too. However, on a proportional basis the TRF share is not much different than other days in 2015. Figure 4 shows that NYSE's share of trading during the pre-event window (9:30 am to 11:32 am) was lower on July 8 than on the surrounding days. Figure 5 shows that NYSE's share of trading during the post-event window (3:10 pm to 4:00 pm) continued to suffer despite the resumption of trading. In short, it appears that traders simply migrated to other exchanges when the NYSE suspended trading on July 8.

Figure 3: Market Share by Market Center – Event Window (11:32 am – 3:10 pm)

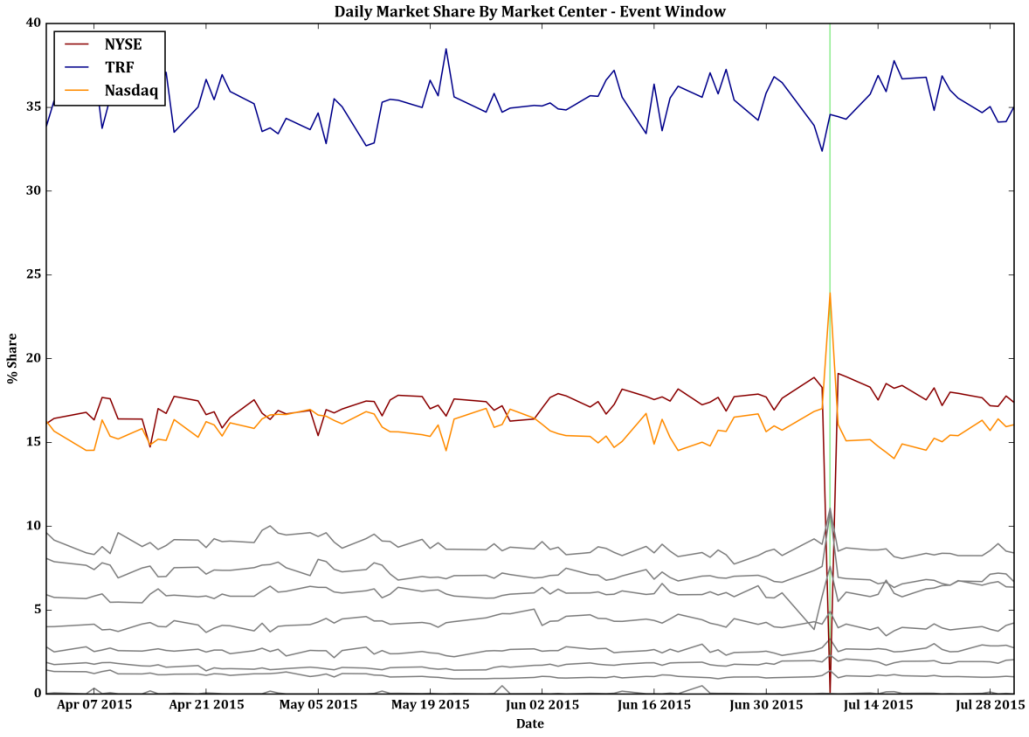


Figure 4: Market Share by Market Center – Pre Event Window (9:35 am – 11:32 am)

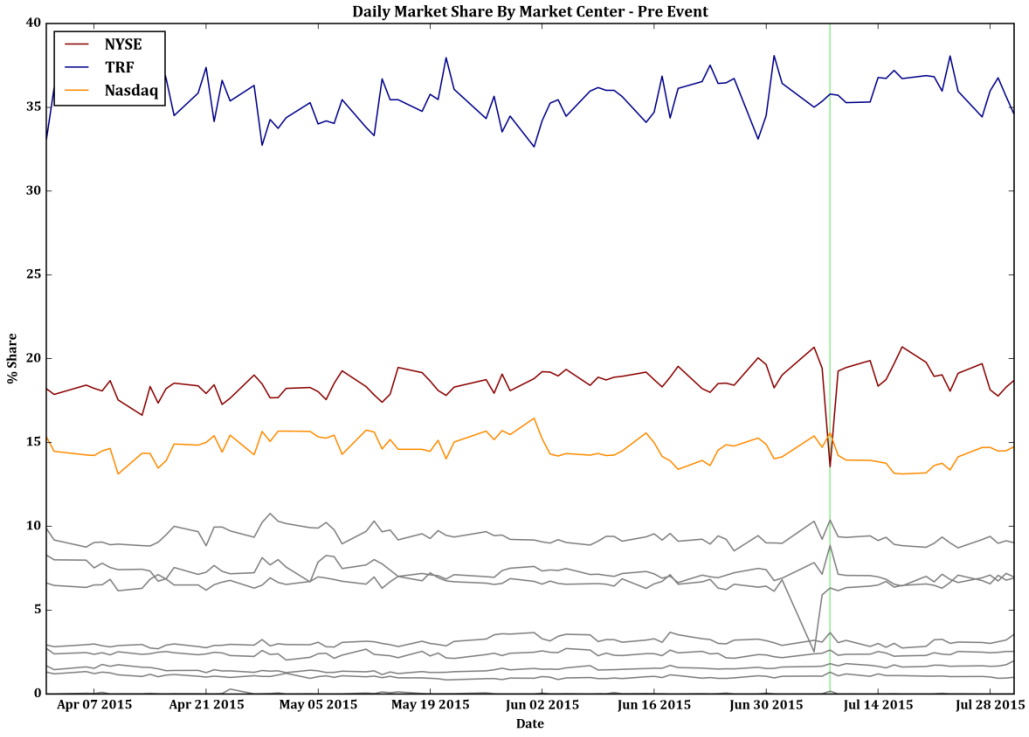
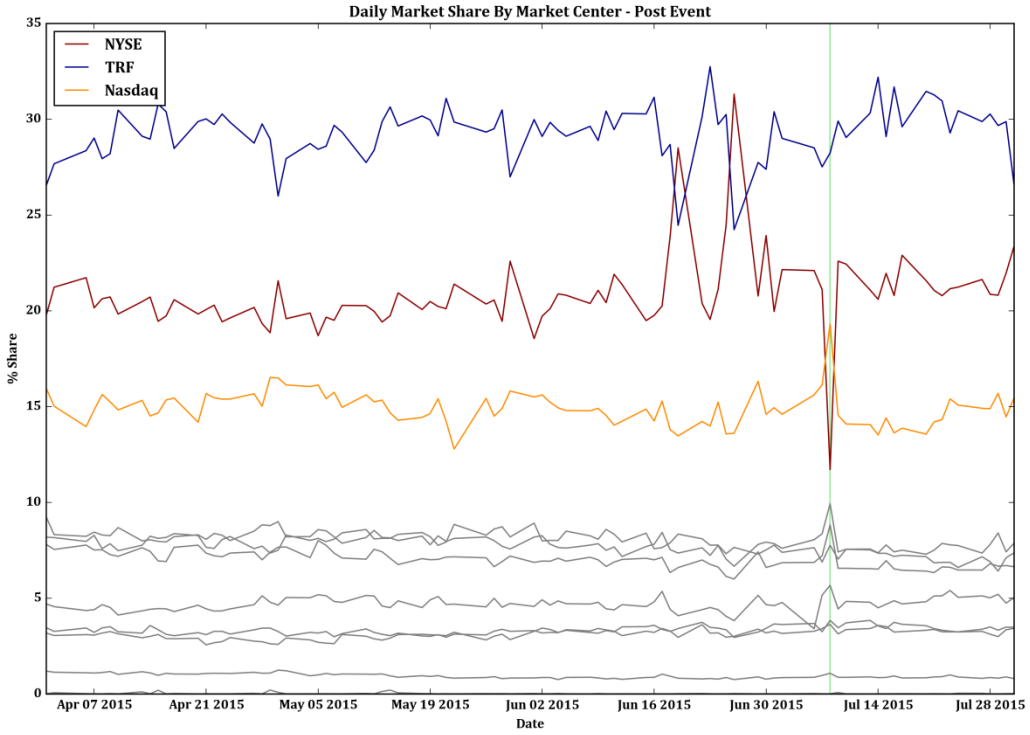


Figure 5: Market Share by Market Center – Post Event Window (3:10 pm – 4:00 pm)

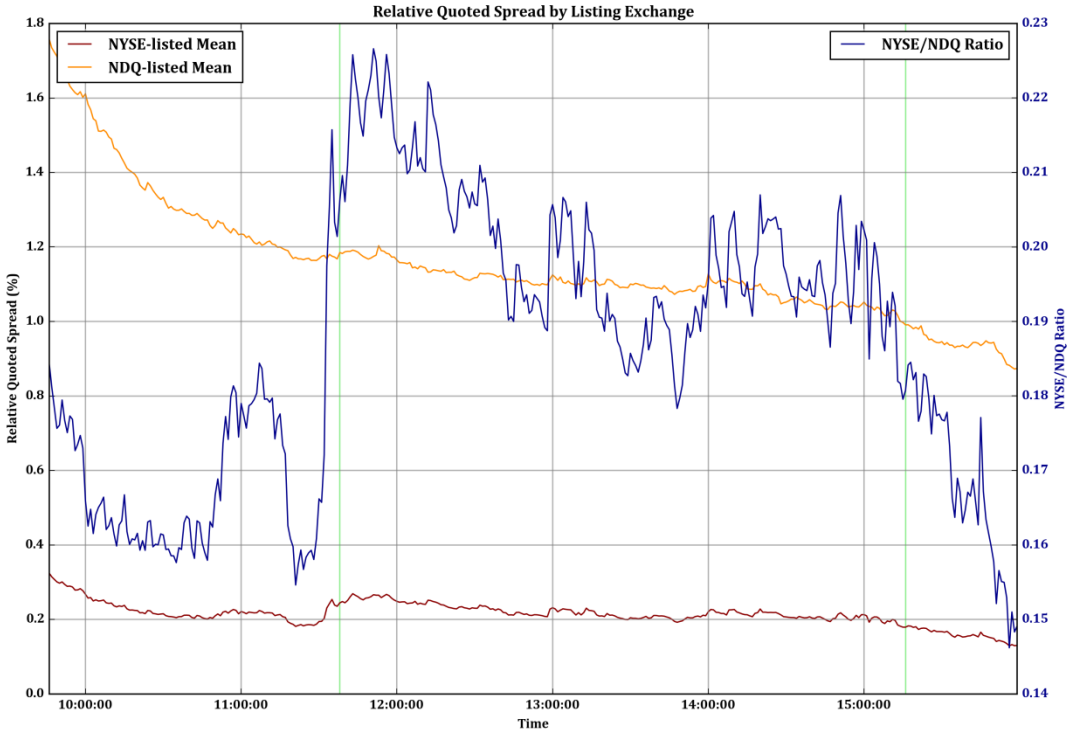


Impact on NYSE-listed and Nasdaq-listed Corporate Stock Spreads

Figure 6 shows the evolution of equal-weighted mean relative quoted spreads for corporate stocks on July 8.[5] NYSE-listed stocks (red line – left axis) show a noticeable increase in spreads just prior to and after the 11:32 NYSE suspension (green vertical line) and Nasdaq-listed stocks (orange line – left axis) experience a much more modest increase. Both spreads tend to decline after the NYSE reopened in the afternoon. The ratio of mean spreads (blue line – right axis) shows that NYSE-listed stocks experienced a greater impact than Nasdaq-listed stocks during the event window, and especially during the first 75 minutes after trading suspension. The ratio increases (blue line rises) when the difference between the percentage change in NYSE-listed spreads and the percentage change in Nasdaq-listed spreads is positive. For example, in the ten minutes bracketing 11:32, NYSE-listed spreads and Nasdaq-listed spreads both increase on average. However, on a percentage basis, NYSE-listed spreads increase much more than Nasdaq-listed spreads and the blue ratio line rises.

[5] Quoted spreads are computed from one minute snapshots of the best bid and ask prices printed on the SIP. Four ticker symbols, BOTJ, CXRX, FNTC and RDIB, are excluded because they experienced limit-up limit-down halts for all or part of the day.

Figure 6: Equal-weighted Mean Quoted Spread (%) for All Stocks



The average relative quoted spreads portrayed in Figure 6 are equal-weighted averages computed within each listing bin. Equal-weighting treats each stock spread in the NYSE-listed bin the same and similarly for spreads in the Nasdaq-listed bin. It is possible that this weighting choice could obscure some feature of large or actively-traded stocks while accentuating some feature of small or thinly-traded stocks. Figures 7 and 8 provide mean relative quoted spreads with market capitalization weights and trading volume weights, respectively.[6] Overall, the patterns are similar to those observed with equal-weighted mean spreads. Quoted spreads for NYSE-listed stocks rise immediately prior to the trade suspension and plateau for the next 75 minutes and the ratio of NYSE-listed spreads to Nasdaq-listed spreads remains elevated throughout the event window. However, the relative change in spreads (blue line) is not as stark in Figures 7 and 8, suggesting that smaller and less actively traded NYSE-listed stocks might have been impacted more by the trading suspension.

[6] Trading volume is computed for the continuous market and excludes opening and closing auctions. Market capitalization is computed from the CRSP daily files.

Figure 7: Market Cap-weighted Mean Quoted Spread (%) for All Stocks

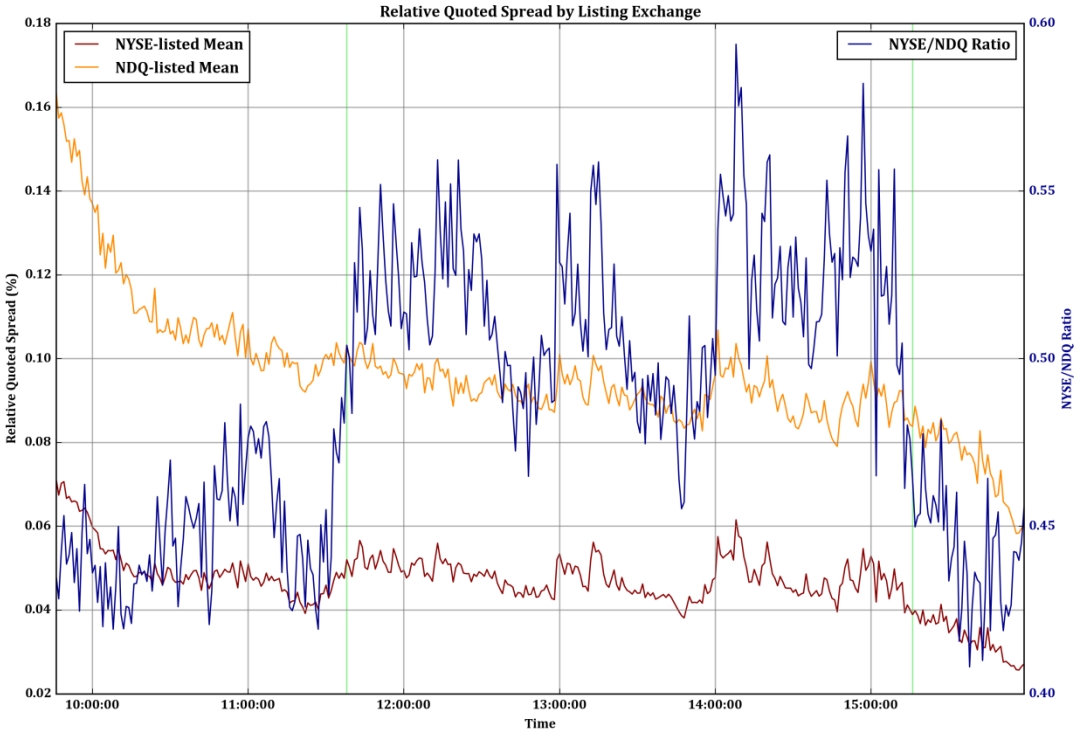
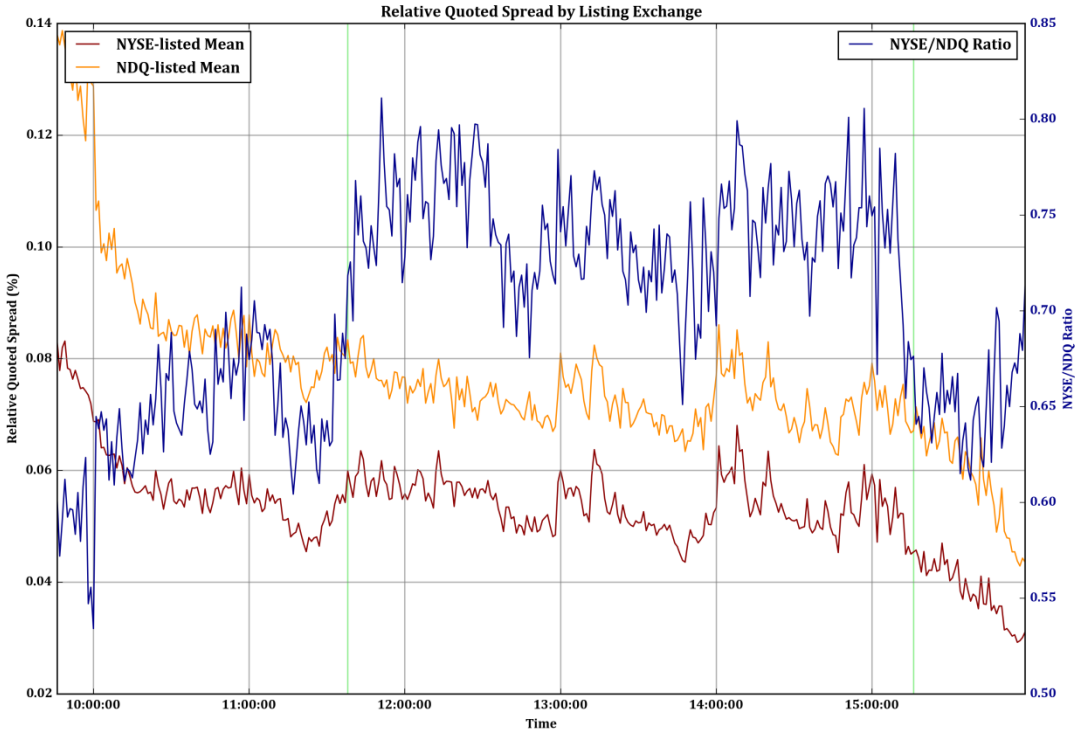


Figure 8: Dollar Volume-weighted Mean Quoted Spread (%) for All Stocks



Figures 9, 10 and 11 show mean equal-weighted relative quoted spreads for stocks parsed by market capitalization. Three size bins are created from NYSE-listed market capitalization percentiles: small stocks are stocks with market capitalizations between the minimum and 30th percentile of NYSE market capitalizations; mid stocks are stocks with market capitalizations between the 30th and 70th percentiles of NYSE market capitalizations; and large stocks have market capitalizations greater than the 70th percentile of NYSE market capitalizations.[7]

Figure 9: Equal-weighted Mean Quoted Spread (%) for Small Stocks

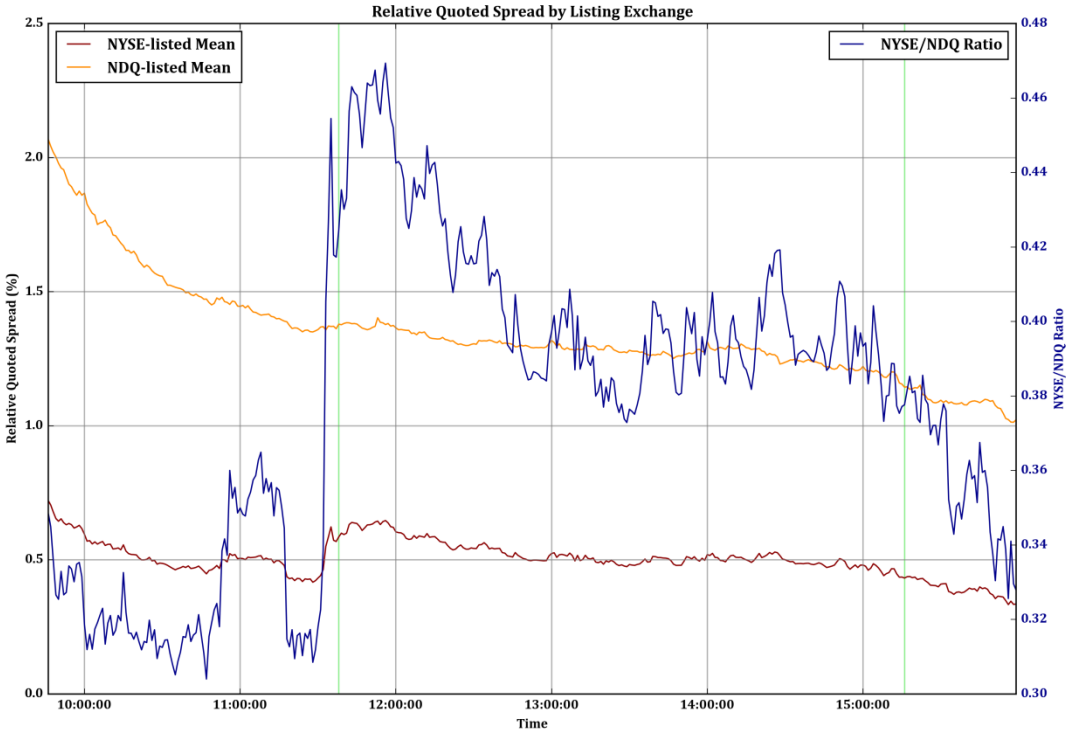


Figure 9 shows that the mean relative quoted spread for the smallest 30 percent of NYSE-listed stocks rises from 41.9 bp to 63.2 bp (a 51% increase) during the 11:24 to 11:43 interval surrounding the NYSE trading suspension and remain elevated for the remainder of the trading suspension. For Nasdaq-listed stocks, mean relative quoted spread rises from 1.35% to 1.38% (a 2% increase) over the same interval and tends to decline throughout the remainder of the day.

[7] On average, NYSE-listed stocks are larger than Nasdaq-listed stocks and are more likely to inhabit the top size deciles of stocks. For example, there are 398 NYSE-listed stocks and 135 Nasdaq-listed stocks in the large bin (market cap > $6.5 Billion); 530 NYSE-listed stocks and 438 Nasdaq-listed stocks in the mid bin ($6.5 Billion > market cap > $1.14 Billion); and 389 NYSE-listed stocks and 1524 Nasdaq-listed stocks in the small bin ($1.14 Billion > market cap > $20 Million). Nasdaq stocks with market capitalizations less than the minimum NYSE market capitalization are not included in the small bin.

Figure 10: Equal-weighted Mean Quoted Spread (%) for Mid Stocks

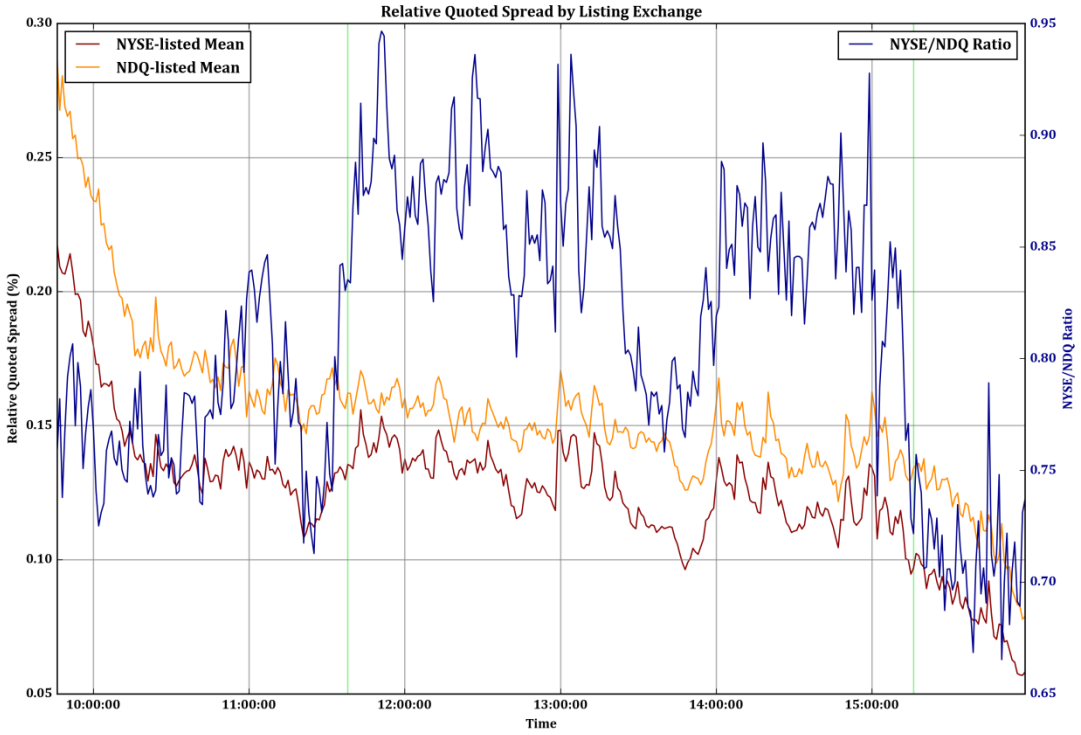


Figure 10 shows that the mean relative quoted spread for the middle 40 percent of NYSE-listed stocks (i.e., mid-cap stocks) rises from 11.4 bp to 15.6 bp (a 37% increase) during the 11:24 to 11:43 interval surrounding the NYSE trading suspension, but tends to decline throughout the remainder of the day. Over the same interval, mean relative quoted spread for mid-sized Nasdaq-listed stocks rises from 15.7 bp to 17.1 bp (a 9% increase) and also declines throughout the day.

Figure 11: Equal-weighted Mean Quoted Spread (%) for Large Stocks

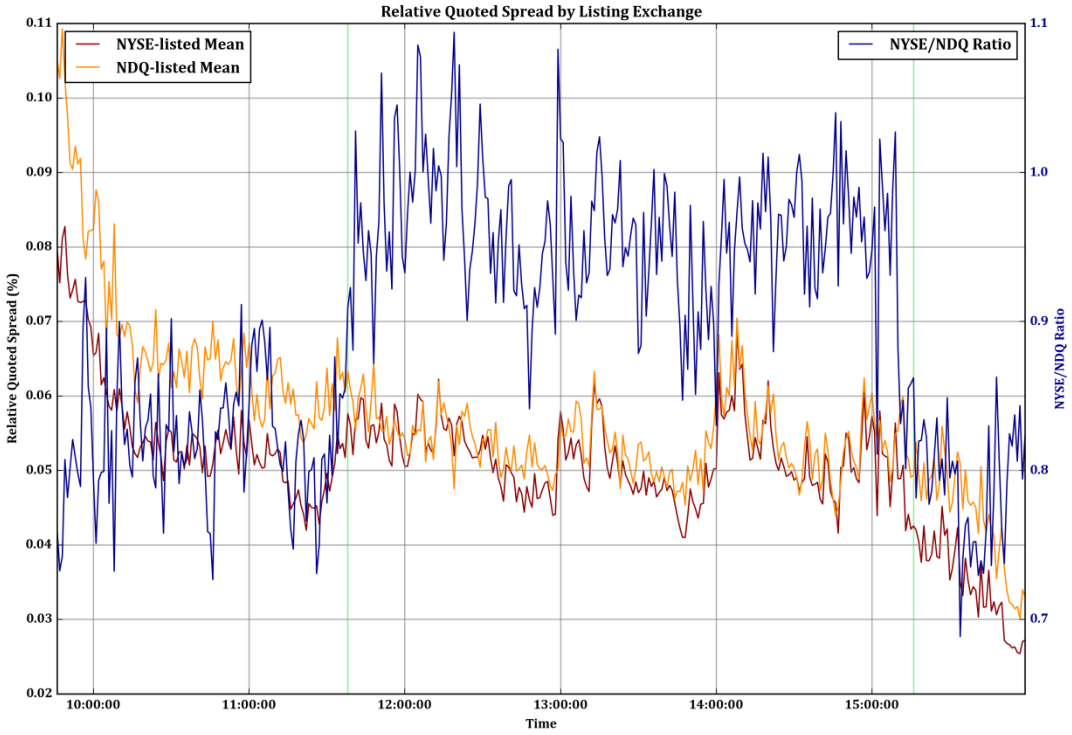


Figure 11 shows that the mean relative quoted spread for the largest 30% percent of NYSE-listed stocks rises from 4.50 bp to 5.97 bp (a 33% increase) during the 11:24 to 11:43 interval surrounding the NYSE trading suspension. Though the time series is noisy throughout the trading suspension, quoted spreads for NYSE-listed stocks are about the same as for the 90 minutes prior to the suspension. Over the same interval, mean relative quoted spread for large Nasdaq-listed stocks rises from 5.63 bp to 6.10 bp (an 8% increase). While also noisy, Nasdaq-listed stock spreads tend to decline for most of the remainder of the day.

Taken together, Figures 9, 10 and 11, along with their associated statistics, show mean relative quoted spreads for NYSE-listed stocks are more sensitive to the NYSE trading suspension than are mean spreads for Nasdaq-listed stocks, and, this differential sensitivity is most pronounced for stocks in the smallest three deciles of NYSE-listed market capitalization.

Impact on NYSE-listed and Nasdaq-listed Inside Depth

Inside depth is the sum of the dollar value (price * size) at the best ask and best bid for each stock taken from one-minute snapshots of the SIP feed. Figure 12 shows the mean equal-weighted inside depth in dollars for NYSE-listed corporate stocks (red line), Nasdaq-listed corporate stocks (orange line) and the NYSE/Nasdaq ratio. Inside depth appears to decline for NYSE-listed stocks a few minutes prior to 11:32 am and remains depressed until just before 3:10 pm. Nasdaq-listed stocks show a smaller decline immediately before and during the event window. Depth for NYSE-listed stocks improves dramatically after the resumption of trading. Depth improvement is less dramatic for Nasdaq-listed stocks. The difference between these two sets of stocks is evident in the NYSE/NDQ ratio (blue line). When all stocks are included in their respective listing bins, equal-weighted mean NYSE-listed depth is considerably larger than mean Nasdaq-listed depth. Inside depth differences are also apparent in Figures 13 and 14, charts of market cap and trading volume weighted average inside spreads. However, these weighting choices generate similar mean inside dollar depth for NYSE-listed and Nasdaq-listed stocks, suggesting that smaller stocks exert more influence on the overall level of the NYSE/NDQ ratio than on the time series behavior of the ratio.

Figure 12: Equal-weighted Mean Inside Depth ($) for All Stocks

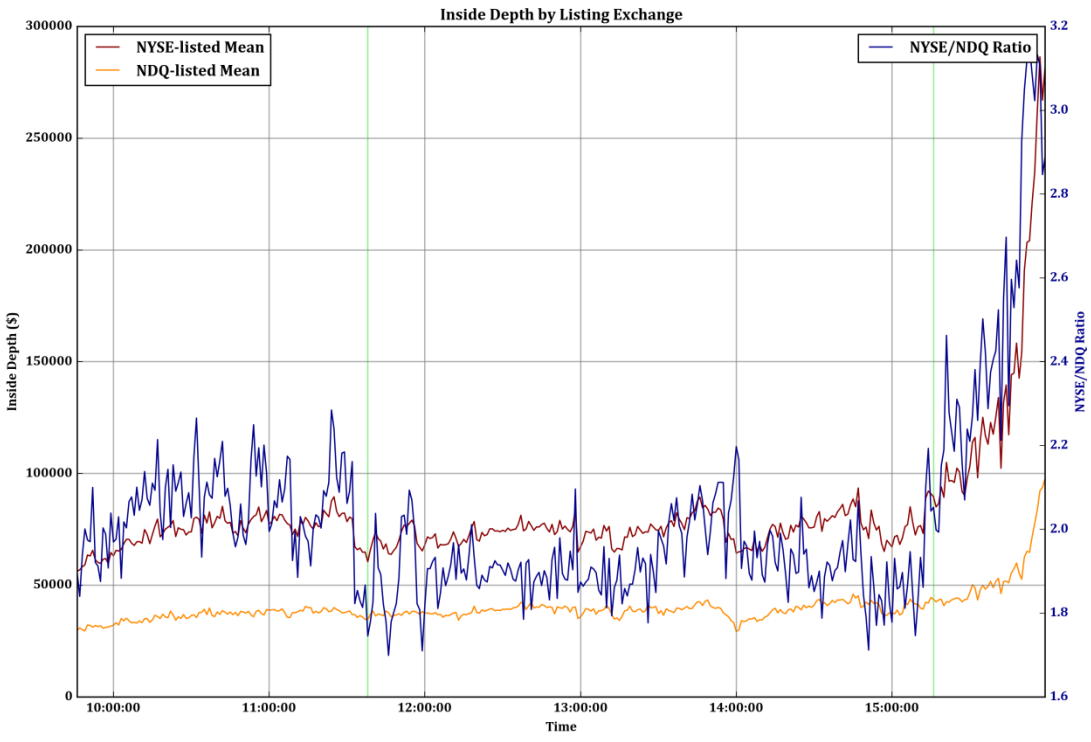


Figure 13: Market Cap-weighted Mean Inside Depth ($) for All Stocks

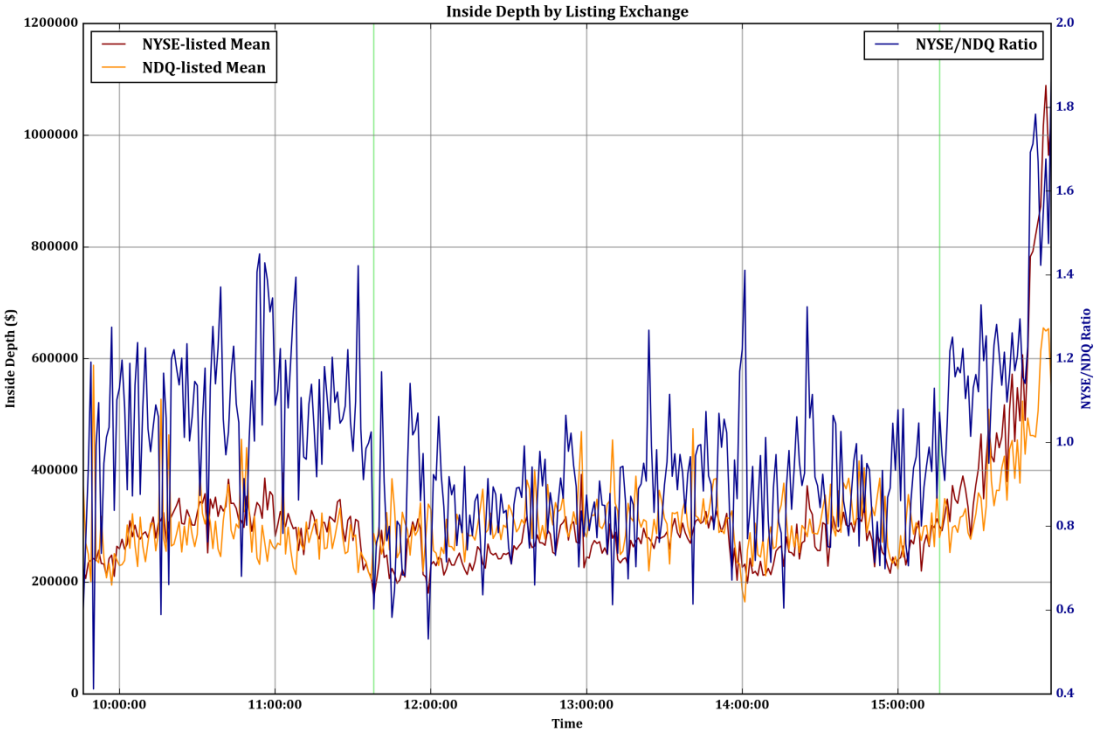
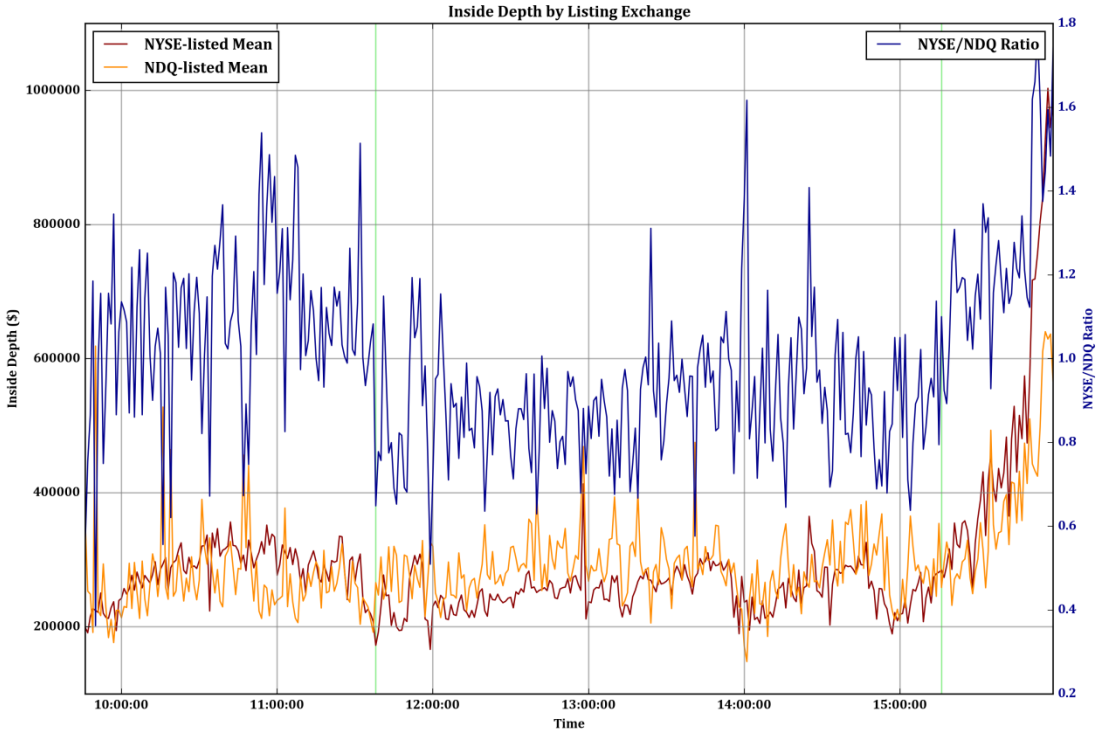
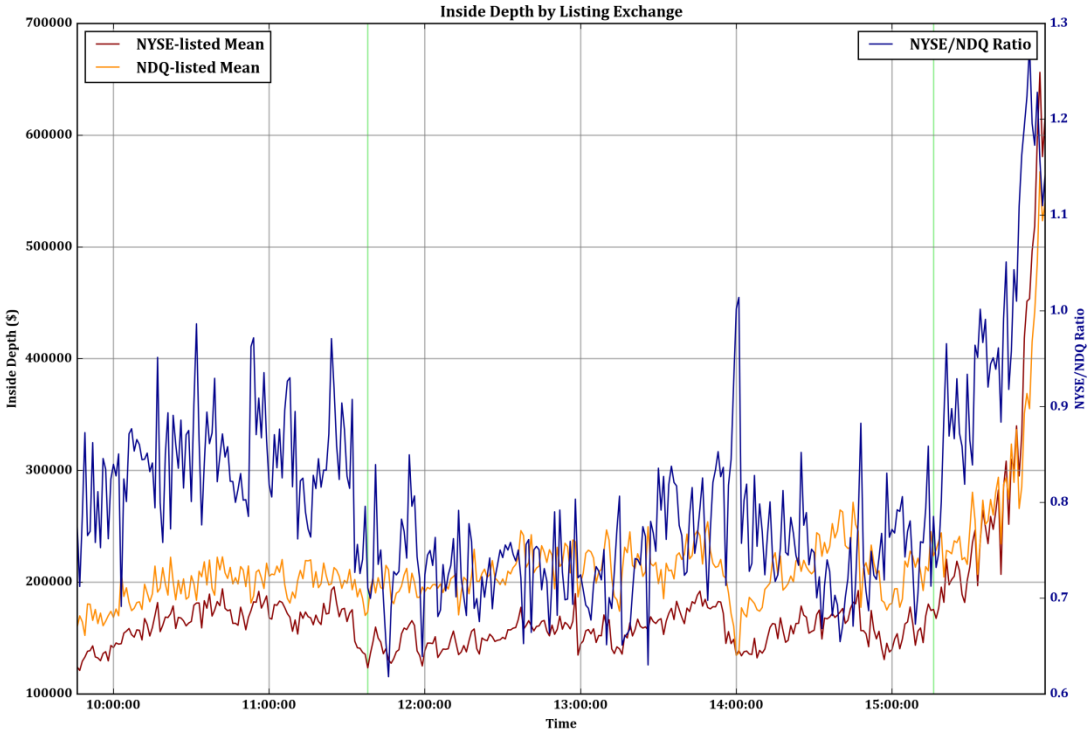


Figure 14: Dollar Volume-weighted Mean Inside Depth ($) for All Stocks



Figures 15, 16 and 17 show mean equal-weighted inside dollar depth for stocks parsed by market capitalization. Again, three size bins are created from the 30th and 70th NYSE-listed market capitalization percentiles and these cutoffs are used to assign both Nasdaq-listed and NYSE-listed stocks to one of three size bins.

Figure 15: Equal-weighted Mean Inside Depth ($) for Large Stocks



The time series behavior of inside depth for large stocks in Figure 15 looks similar to that portrayed in Figure 12. Inside depth for NYSE-listed stocks declines just prior to 11:32 am and remains lower throughout the trading suspension. There is a brief decline in depth for large Nasdaq-listed stocks just before 11:32 am. However, inside depth for Nasdaq-listed stocks tends to rise throughout the remainder of the day (depth declines for both NYSE- and Nasdaq-listed stocks at 2:00 pm and again at 3:00 pm). Closer inspection reveals one important difference between Figures 12 and 15. In Figure 15, mean inside depth for large NYSE-listed stocks is lower than that for large Nasdaq-listed stocks until after the resumption of trading at 3:10 pm.

Figure 16: Equal-weighted Mean Inside Depth ($) for Mid Stocks

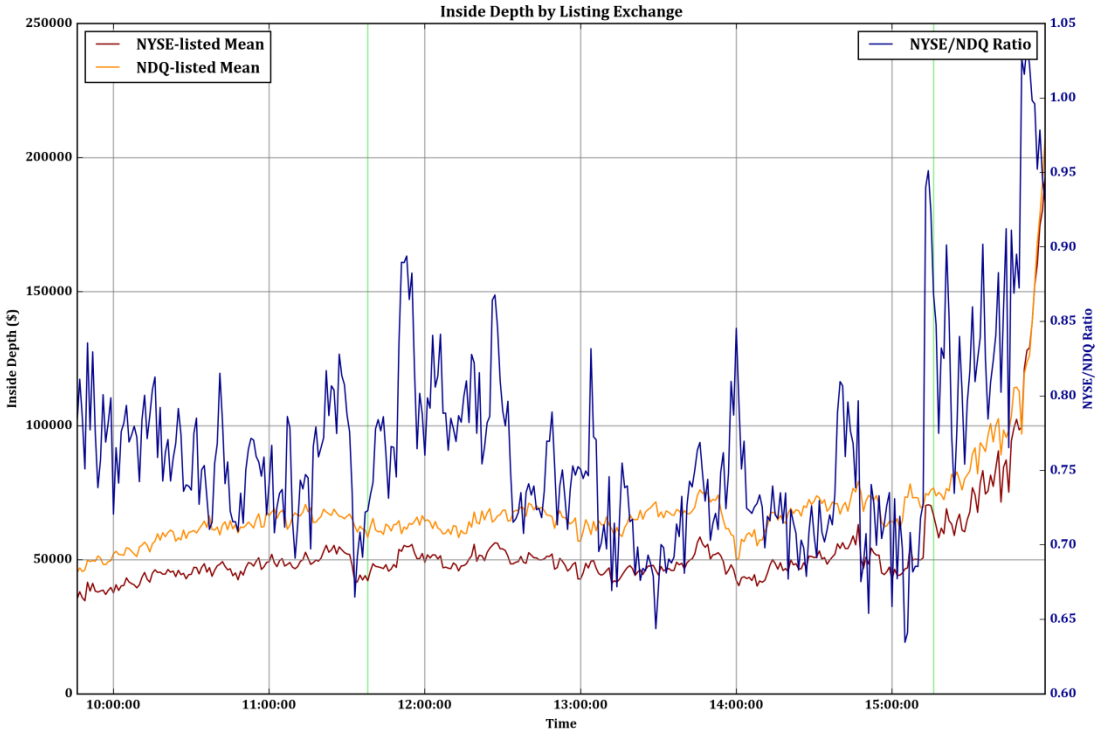


Figure 16 shows inside depth for both NYSE- and Nasdaq-listed mid-sized stocks declines in the minutes leading up to the trading suspension. However, by 12:30 pm depth regains the maximum levels attained in the morning and tends to remain at or near those levels until the resumption of trading at 3:10 pm.

Figure 17: Equal-weighted Mean Inside Depth ($) for Small Stocks

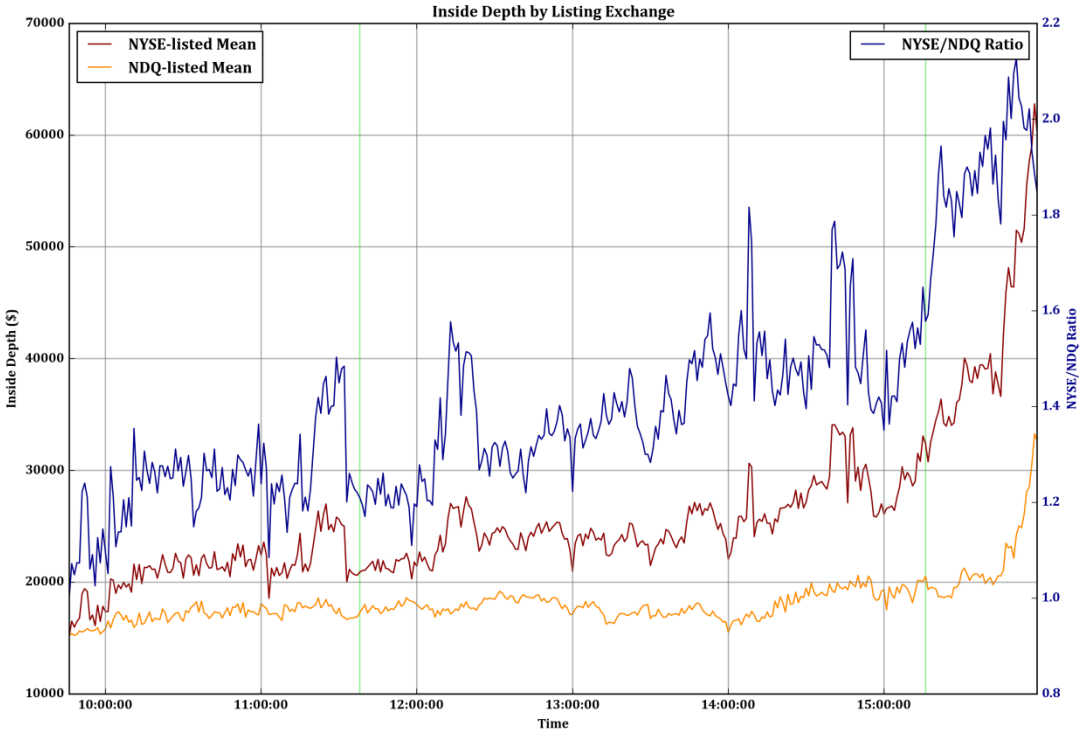
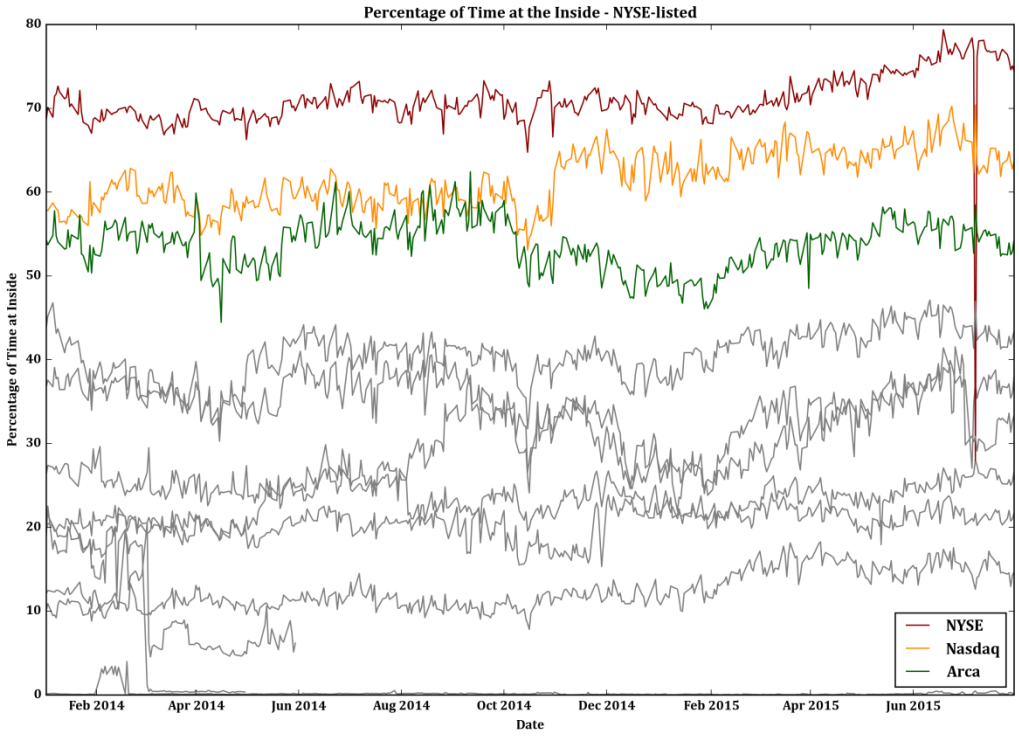


Figure 17 shows inside depth for both NYSE- and Nasdaq-listed small stocks is nearly the same at 11:32 am as it was at 11:05 am. There is a noticeable sharp jump and reversal in NYSE-listed depth during the 11:00 hour, but the overall trend throughout the day is *increasing* NYSE-listed inside depth. Inside depth for small Nasdaq-listed stocks remains nearly constant until after 2:00 pm and increases sharply just before the close.

Taken together, Figures 15, 16 and 17 show mean inside depth for NYSE-listed stocks is more sensitive to the NYSE trading suspension than is mean depth for Nasdaq-listed stocks, and, this differential sensitivity is most pronounced for stocks in the largest three deciles of NYSE-listed market capitalization.

Liquidity Provision on the NYSE

Figure 18: Time at the Inside – NYSE-listed Stocks – Jan 2014 to July 2015



On average, NYSE, Nasdaq and Arca all quote at the inside spread for NYSE-listed stocks over half of the day. Figure 18 shows on average NYSE spends over 70% of the day at the inside prices, Nasdaq spends over 60% of the day at the inside and Arca spends over 50% of the day at the inside.[8] The remaining exchanges (gray lines) all spend less than half of the day at the inside prices for NYSE-listed stocks, on average. Overall, Figure 18 shows that while NYSE provides liquidity at the best prices for NYSE-listed stocks most of the day, they are not the only exchange to do so.

[8] Time spent at the inside is computed as the midpoint of time spent at the inside ask price and time spent at the inside bid price.

Figure 19: Time Alone at the Inside – NYSE-listed Stocks – Jan 2014 to July 2015

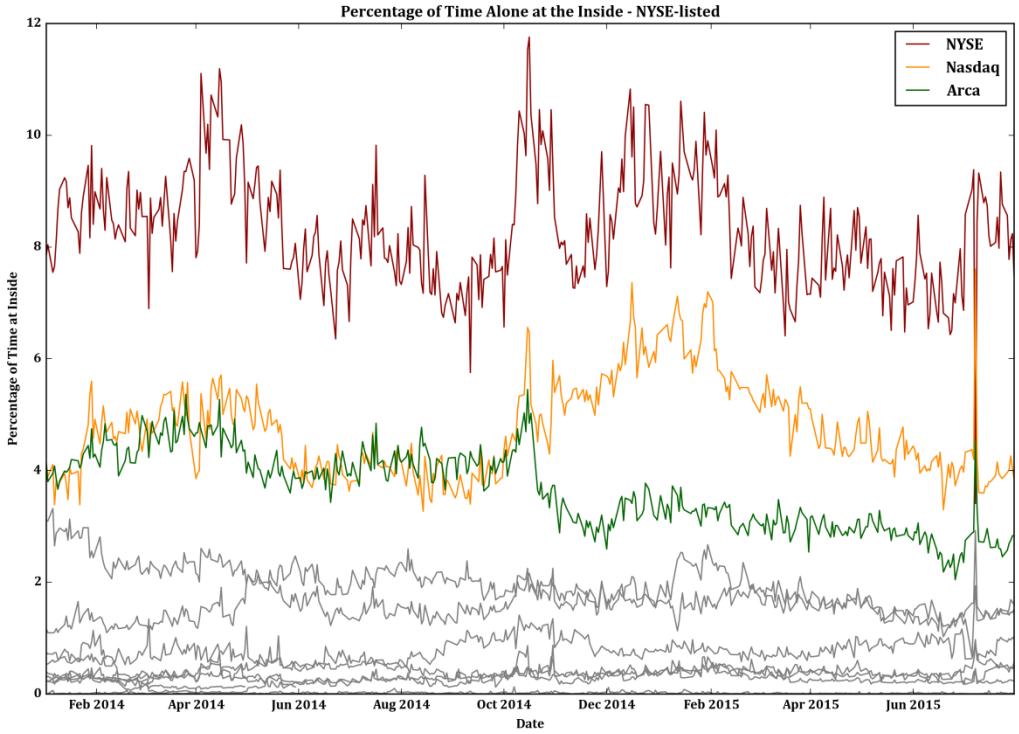


Figure 19 shows that NYSE is the sole provider of liquidity at the inside prices between 6% and 12% of the day for the average NYSE-listed stock. Nasdaq and Arca are the sole providers at the inside between 3% and 7% of the day, and the remaining exchanges are solely at the inside for less than 2% of the day. Taken together, Figures 18 and 19 suggest that NYSE plays an important role in liquidity provision for NYSE-listed stocks for at least part of the day. For some of the day, NYSE is the sole provider of liquidity for the average stock. At other times, NYSE liquidity supplements liquidity from other exchanges.

Figure 20: Time Alone at the Inside on NYSE – Jan 2014 to July 2015
Select Share Volume Deciles

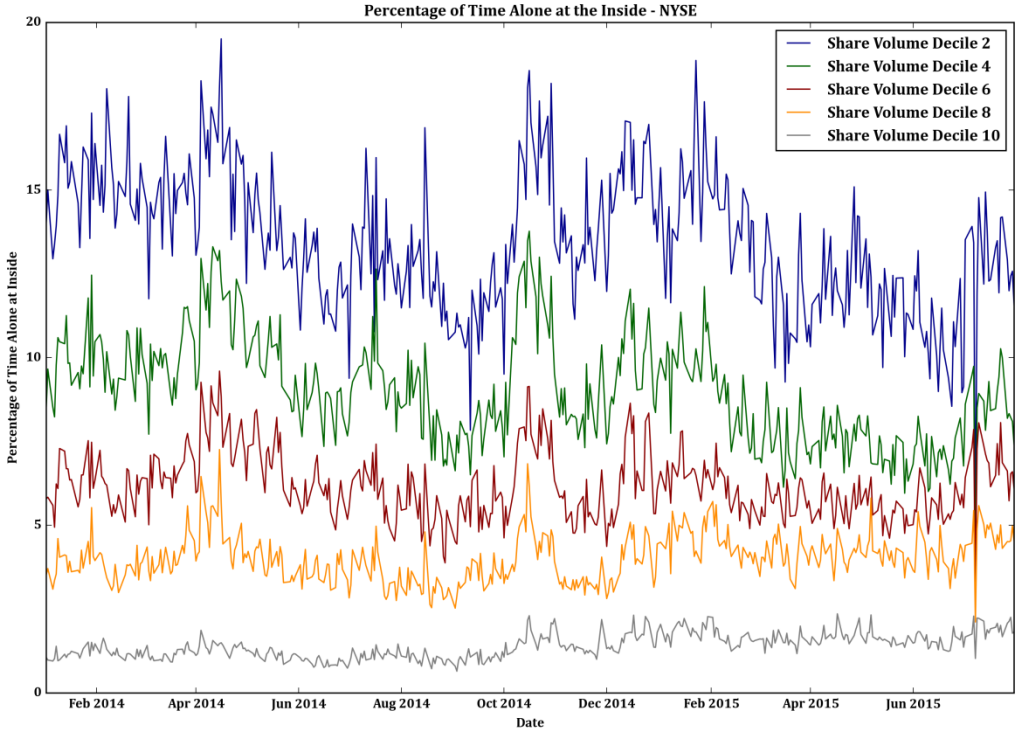


Figure 20 shows that NYSE's importance in liquidity provision increases for less actively traded stocks. Each line in the chart represents the mean percentage of the day that NYSE spends alone at the inside prices for NYSE-listed stocks parsed into deciles by the daily share volume traded during the normal continuous market. NYSE is alone at the inside between 10% and 20% of the day for stocks in the second least-frequently traded decile (Share Volume Decile 2 – blue line) and is alone at the inside less than 3% of the day for the most-frequently traded decile (Share Volume Decile 10 – gray line).[9]

Putting It Together

Figures 1 and 2 show that while trading volume in NYSE-listed corporate stocks could have been higher throughout the day on July 8, it was well within the daily range for 2015. Figures 3 – 5 show that trading in NYSE-listed corporate stocks appears to have migrated to the remaining market centers, especially other exchanges. In short, it appears that traders migrated to other exchanges when the NYSE suspended trading on July 8.

[9] Weighting by market capitalization and dollar volume traded yields similar results: NYSE is more often alone at the inside for smaller, less actively traded stocks.

Figures 6 – 8 show that, on average, relative quoted spreads for NYSE-listed stocks increase immediately prior to the suspension of trading and remain elevated for the next 75 minutes. When compared to mean spreads for Nasdaq-listed stocks, mean NYSE-listed spreads remain higher throughout the event window and decline (relative to Nasdaq-listed spreads) only after trading resumes in the afternoon. Figures 9 – 11 show that while this differential behavior between NYSE-listed and Nasdaq-listed stocks is evident in small, mid and large capitalization stocks, the starkest contrast is in the smallest stocks, suggesting that the trading suspension had the greatest impact on smaller and less actively traded NYSE stock spreads.

Figures 12 – 14 show that, on average, inside dollar depth declines for NYSE-listed stocks a few minutes before the suspension of trading while the impact on Nasdaq-listed stocks is less noticeable. The sharp increase in depth for NYSE-listed stocks (both nominal and relative to Nasdaq-listed stocks) after trading resumed in the afternoon is also evident in most charts. Figures 15 – 17 show that large cap stocks are most responsible for the declining average depth of NYSE-listed stocks. Mid-cap stocks do not show declining depth throughout the event window for either NYSE- or Nasdaq-listed stocks and small stocks show NYSE-listed depth increasing for most of the event window. In contrast to the spread results, the trading suspension did not exert a negative impact on smaller and less actively traded NYSE stock depths.

Figures 18 – 20 show that NYSE spends about 70% of the day at the inside for the average NYSE-listed stock, more than Nasdaq (60%) and Arca (50%). NYSE also spends about 12% of the day alone at the inside for the average NYSE-listed stock, again, more than any other exchange. Not all stocks are the same. NYSE is alone at the inside more frequently for stocks that don't trade as much.

NYSE tends to provide more sole liquidity to less actively traded and smaller stocks. These stocks experience the greatest increase in spreads (on a relative basis) but least decrease in inside depth during the trading suspension. For larger and more actively traded stocks (the stocks NYSE has the least influence on), spreads widened a little and depth decreased a lot. NYSE's absence reduced quoted inside depth but had less of an impact on price because presence at the inside was maintained at other exchanges.

For smaller and less actively traded stocks (the stocks NYSE has the most influence on), spreads widened but depth did not decrease. In fact, it appears to have increased throughout the trading suspension. In other words, other exchanges not only quoted the same depth as before the NYSE absence, but also made up for the absence of NYSE depth. But at wider average spreads than typically available when NYSE is functioning normally. Wider than usual spreads during the NYSE trading suspension appears to have attracted more depth to NYSE-listed stocks at other exchanges. This competition in liquidity provision among the remaining exchanges could explain the steady decline in average small capitalization NYSE-listed spreads throughout the afternoon of July 8.