Finding Depth to Inform Markets of the Future

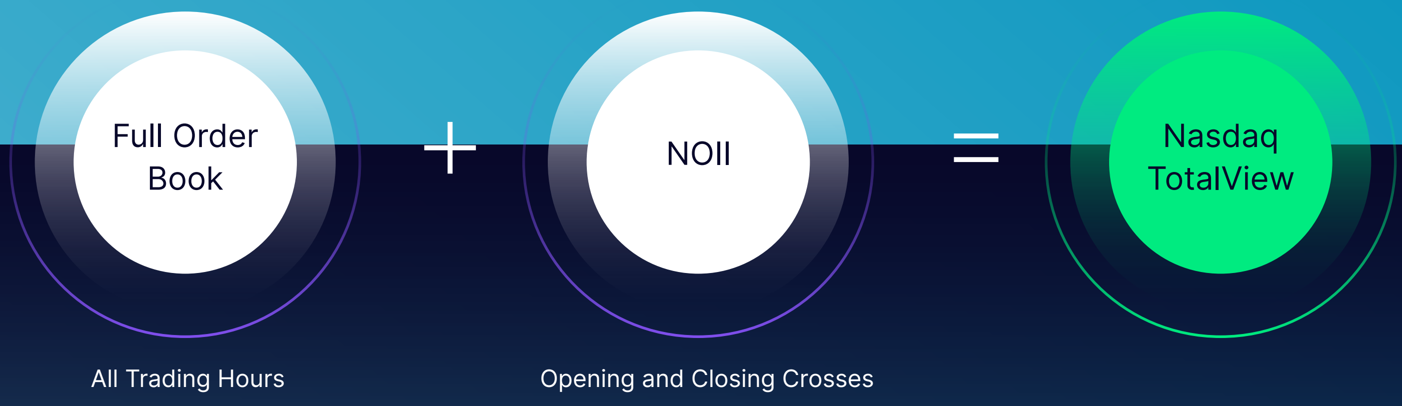
Introduction

When much of the world entered lockdown at the onset of the COVID-19 pandemic, an unexpected phenomenon began to take shape on Wall Street. The "rise of retail" was a moniker that emerged during this period to describe the unprecedented entrance of new retail participants into the stock market. In January 2021, approximately 6 million people downloaded trading apps in the U.S.[1], which contributed to record-high average daily volumes for equity and options trades. At multiple times during 2021, retail investors made up one-third of all U.S. stock market trading[2]. Interestingly, the rise of retail phenomena is a global trend, with an oversized impact across the APAC region.

Many retail investors trade through online brokerage firms, and more than ever, firms require access to data and insights that satisfy their retail clients' appetite for information. A previous white paper, Leveraging Insights to Empower Economies, explains the structure of the U.S. capital markets, how they function and why this is important to investors. A key takeaway is that the ability to interpret market data generated by the capital markets enables investors to make better informed trading decisions.

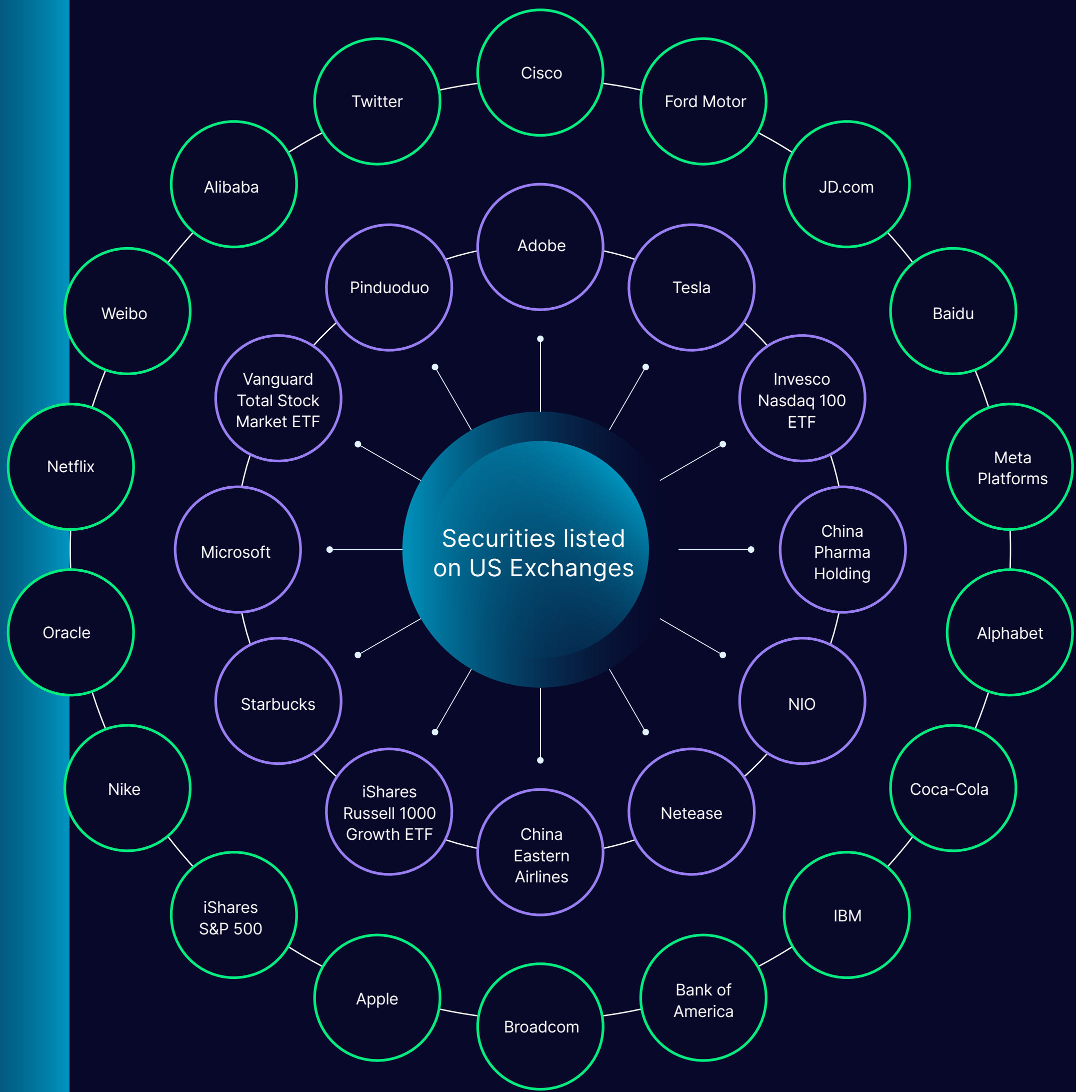
This white paper goes one step further. It provides some background on the market structure of the U.S. equity market for context. Then it discusses how the granular depth-of-book data in Nasdaq TotalView allows investors to take their decisions to the next level. Nasdaq TotalView – the premium depth data product for serious traders – displays the full order book depth on Nasdaq. It shows every quote and order at every price level in Nasdaq, NYSE and regional-listed securities on Nasdaq. TotalView also disseminates the Net Order Imbalance Indicator (NOII) for the Nasdaq opening and closing crosses and Nasdaq IPO/halt cross.

1. Source: The rise of newly empowered retail investors, Deloitte (https://www2.deloitte.com/us/en/pages/financial-services/articles/the-future-of-retail-brokerage.html)
2. Source: The rise of retail investing, United Fintech (https://unitedfintech.com/blog/the-rise-of-retail-investing/)



U.S. Market Structure

Nasdaq is the exchange with the largest liquidity pool and provides access to all U.S. listed equities



U.S. Equity Market Structure

An efficient market structure is the backbone of the capital markets. In U.S. equities, market structure refers to the structure of exchanges and trading venues, including their rule books, the price discovery process, determinants of spreads and quotes, intraday trading behavior, and transaction costs. The more investors understand the nuances of the market structure, the more effectively they can participate in equities markets.

It is important for investors to know that any stock can trade on any exchange. In 1994, the SEC amended the Exchange Act to introduce Unlisted Trading Privileges (UTP) under the UTP Act. UTP allows exchanges and other venues to compete for order flow in any security regardless of where the security is listed.

Nasdaq is the leading exchange in the U.S. Of the 17 active exchanges, Nasdaq owns and operates three: Nasdaq Stock Market, Boston Stock Exchange (BX) and Philadelphia Stock Exchange (PSX). The Intercontinental Exchange Group (ICE) owns five exchanges: New York Stock Exchange (NYSE), NYSE ARCA, NYSE National, NYSE American and NYSE Chicago. The Chicago Board Options Exchange (CBOE) owns four: BZX, BYX, EDGX and EDGA. Four other exchanges trade less than 5% of the volume: Investors Exchange (IEX), Members Exchange (MEMX), Long-Term Stock Exchange (LTSE) and Miami International Securities Exchange (MIAX). Across all listed U.S. securities, approximately 60% of all shares are matched through one of the 17 regulated exchanges[3]. The rest is traded off-exchange via Alternative Trading Systems (ATSs), single dealer platforms or other OTC brokers and systems.

Nasdaq is the largest single pool of on-exchange liquidity measured by volume market share, averaging over 15.7%. This is double the size of NYSE ARCA, at 8.8%[4].

3 Source: Leveraging insights to empower economies, Nasdaq https://www.nasdaq.com/docs/2022/07/07/US-Equity-Market-Data-Whitepaper-Datasales.pdf
4 Source: U.S. equities market volume summary on https://www.nasdaqtrader.com/trader.aspx?id=FullVolumeSummary for trade date on 1 July 2022

Trading Sessions in the U.S. Market

Market activity statistics show that most participation happens during the regular trading session – i.e. 9:30 am to 4:00 pm EST. The regular session is where most orders are executed and the bid-ask spreads are the tightest. This "tight market" indicates that there is a convergence between buyers and sellers on the value each party believes the security is worth. The likelihood of finding a mutually agreeable price is directly correlated to participation. Spreads in both the pre-opening and after-hours sessions are generally much wider, and, as a result, prices are harder to establish between buyers and sellers. Trading is often infrequent in the after-hours sessions as well. In fact, less than 2.2% of the trades in the full trading day are matched during the pre- or post-market sessions because participation is lowest at these times[5].

As the pre-opening session approaches the regular trading session, participation in the market begins to grow exponentially, and price formation begins. As more investors participate, spreads begin to tighten, eventually converging at the market open, signifying the start of regular trading.

The diagram below shows the average daily trade volume across all trading sessions, from 4:00 am to 8:00 pm EST. Over 96% of all trading occurs during regular trading hours.

5. SIP data from 25 April to 29 April 2022 across all securities. Pre-Opening and After-Hours trading activity represents those trades executed either before 9:30am or after 4:00pm.

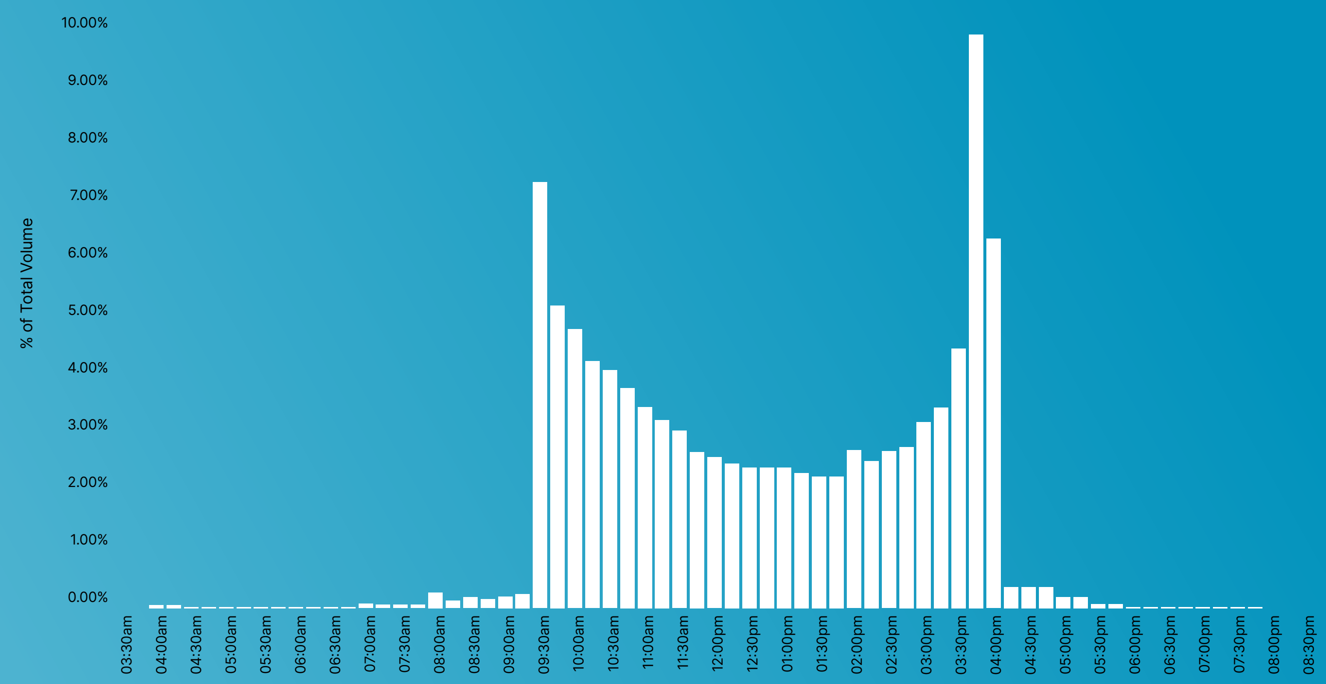
There are three separate trading sessions in the U.S. market:

Pre-Opening:
4:00 am – 9:30 am EST

Regular Trading:
9:30 am – 4:00 pm EST

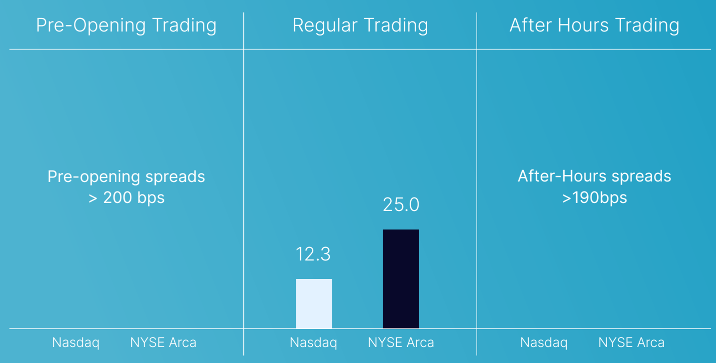
After Hours:
4:00 pm – 8:00 pm EST

Average Daily Industry Trade Volume by 15-minute Time Window

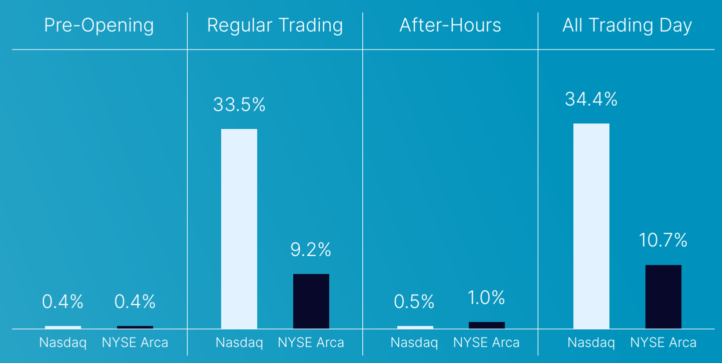


Source: Nasdaq Economic Research

Average Exchange Bid-Ask Spread (Basis Points) - Russell 1,000 Components



$ Volume Market Share (Excluding Trade Reporting Facility) Russell 1,000 Components



Nasdaq NYSE ARCA

Source: BMLL Technologies Limited

For the purpose of this paper, we have made comparisons between Nasdaq data and NYSE ARCA depth data throughout the trading day. Nasdaq analyzed bid-ask spreads (including odd-lot quotes) of the components of the Russell 1000 to illustrate how spreads and trades are correlated throughout the trading sessions. Essentially, the spread is the cost of trading that security, so the tighter the spread, the lower the cost to individual investors. We chose the Russell 1000 for our analysis because it comprises about 92% of the total market cap of all listed stocks in the U.S. equity market. It is considered a bellwether index for large cap investing.

Spreads are typically wide during both the pre- and post-market sessions because the on-exchange dollar volume is relatively small on both Nasdaq and NYSE Arca: 0.8% for pre-market and 1.5% for post-market. However, spreads begin to narrow as regular trading hours approach, and over 96% of daily trading volume occurs during those hours. Based on this example, Nasdaq's market share is the largest in terms of trading volume.

In addition, trading in the pre- and post-market tends to be riskier because low participation and wide spreads cause price volatility. To this end, investors should understand that wider spreads in pre- and post-market trading is a real cost.

Market Data Empowers Investment Decisions

The National Best Bid and Offer (NBBO) is an extremely important piece of market data because it is the highest bid and lowest ask price for a security across all trading venues. Moreover, it is widely distributed to investors across the market. Exchanges and liquidity providers can route orders to the venue with the best quote represented in the NBBO or they can match or improve those prices and execute on their own market venue. Price improvement occurs when a buy order is executed at a price lower than the best offer or a sell order is executed at a price higher than the best bid.

Depth-of-book data refers to the robustness of an order book, which is a record of buy and sell orders that are waiting to be placed. Depth-of-book is important because it provides insight into the true supply and demand for a particular security. Three separate measures of price formation help investors understand depth-of-book data and the quality of the data feed they receive.

- Inside the NBBO
- Within 1% of the NBBO
- Within 10% of the NBBO

Price Formation – Inside the NBBO or Better

Level I data refers to the NBBO quote – i.e. the highest bid and lowest ask price along with order sizes for each security. It also shows trade-related information such as trade prices and volumes. But what does the "best price" mean?

In the U.S., to qualify as "best" the order must be a minimum of one round lot, which is generally 100 shares. Consider a stock that is trading at $20.00. A round lot would be $20.00 X 100 shares, or $2,000 for the minimum order value. If an investor only wants to buy or sell five shares, or in this case $100 in value, that order would not be sufficient to set a best bid or offer. Instead, it would be considered an odd lot, making it ineligible for Level 1 data.

Imagine a stock that trades at $2,000.   That price point is out of reach for most retail investors, but it does not mean they cannot participate. Recent research has found that odd lots or order data inside the best bid and offer has predictive power when forecasting future price movements. A recent research paper, The Market Inside the Market: Odd-Lot Quotes[6], provides more information on this topic.

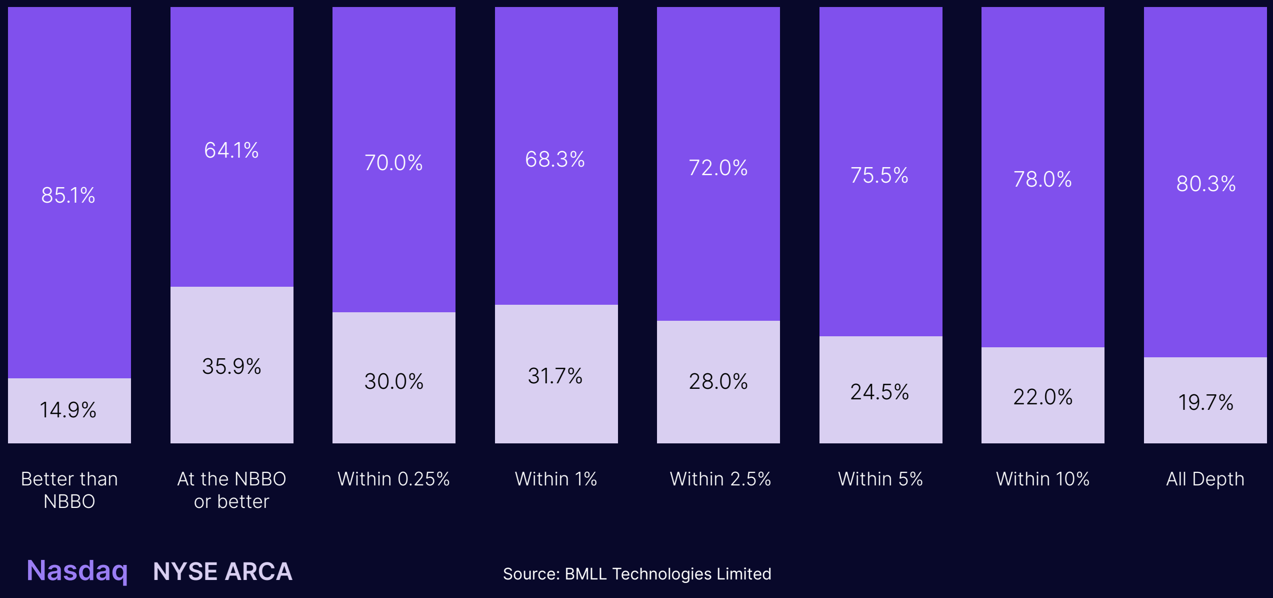
Market depth refers to the market liquidity for a security based on the number of standing orders to buy and sell at various price levels. It also considers the order size, or volume, at each price level. The greater the market depth, the less likely large trades will impact the price of a security.

Using both Nasdaq and NYSE ARCA cumulative depth share data as the universe of depth data for the market, the chart below shows that on Nasdaq, the Russell 1000 Index has 85.1% of depth share better than the NBBO, compared to 14.9% on NYSE Arca. At the NBBO or better, Nasdaq's depth share is 64.1% compared to 35.9% on NYSE ARCA. Why are these data on depth share important? It is evident that the price formation for prices better than the NBBO are contributed mainly from Nasdaq market depth.

6. The Market Inside the Market: Odd-Lot Quotes written by Robert P. Bartlett, Justin McCrary & Maureen O'Hara from SSRN papers

Cumulative Depth Share by Distance from the NBBO

Russell 1000 components from 25 April 2022 to 29 April 2022. Depth is calculated based on minute-by-minute snapshots of each order book between 9:40am and 3:50pm.



Source: BMLL Technologies Limited

Price Formation – Within 1% of the NBBO

The above-mentioned research paper suggests that understanding the supply and demand profile of an instrument in detail is informative to price discovery. Nasdaq TotalView data not only provides unprecedented insight into the orders smaller than the NBBO, but, being the largest single exchange in the U.S., Nasdaq also provides benefits across other measures of depth data as well.

Liquidity on exchanges is generally provided by market participants such as banks and broker-dealers, market makers, hedge funds, asset managers, retail investors and corporates. These entities typically route their orders to the exchange that shows the best depth of liquidity because that is where they can achieve best execution. Nasdaq TotalView is the most comprehensive depth-of-book solution, providing insight into price formation during trading sessions.

Depth share within 1% of the NBBO is a leading metric that indicates the quality of the depth data. During regular trading hours, a comparison of the depth share within 1% of the NBBO, using component stocks of the Russell 1000, shows that Nasdaq TotalView has over 68.3% depth share based on volume of the depth orders. NYSE ARCA has only 31.7% depth share within 1% of the NBBO. The density of orders within 1% of the NBBO means that there is more participation at price levels that are more likely to get executed. This indicates higher “market quality”, a marketplace’s ability to meet its dual goals of liquidity and price discovery.

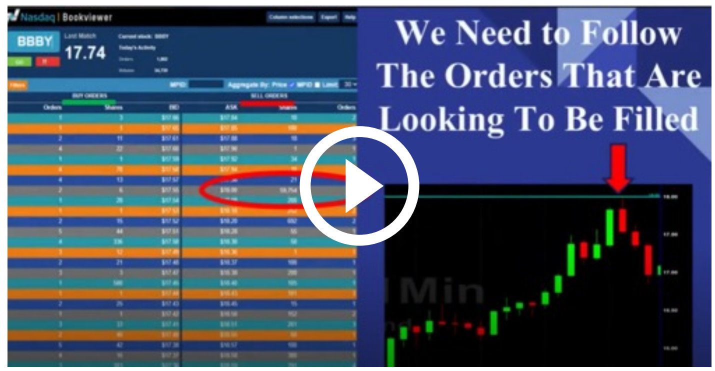
Price Formation – Within 10% of the NBBO

It is important to have access to data showing the orders that are better than or within 1% of the NBBO. But what about depth of book data that is farther away from the prevailing price? What value can depth-of-book data provide an investor if those orders are less likely to get executed?

Technical analysis is a trading discipline employed to evaluate investments and identify trading opportunities by analyzing statistical trends gathered from trading activity, such as price movement and volume. Technical analysts look at charts to determine key support and resistance levels within the order book. Support and resistance levels within an order book are typically large orders that act as major indictors of supply and demand. They can also indicate a trend reversal.

To illustrate, assume the price of a security is falling, and there is a buy order in the order book for 10,000 shares below the current market. That large order could serve as a price floor, where the price is more than or less than the equilibrium price determined by market forces of supply and demand. This level of granularity in the market data provides insight into the prices away from the NBBO as well as what the market may do in the future. Most of the liquidity within 5% or 10% of the NBBO exists on Nasdaq TotalView, not NYSE ARCA.

Ultimately, there is no crystal ball to forecast market performance. However, harnessing the insights within depth-of-book data can provide a more complete perspective on the supply and demand in U.S. equities and help take active trading to the next level.



Nasdaq TotalView

Nasdaq TotalView is a premium data feed that provides the full depth-of-book of bids and asks for all Nasdaq, NYSE and regional-listed stocks on the Nasdaq Market Center. It includes the prices and quantities of displayed quotes and orders, allowing investors to better determine the supply and demand for a stock at a certain price.

This full depth-of-book product gives traders a comprehensive view of all activity because it includes every quote regardless of whether a trade is executed. These granular details allow for more nuanced and competitive trading without cutting into already narrow margins. Given its detailed depth, Nasdaq TotalView provides advantages over any other book feed because traders can:

- Follow pockets of liquidity over time.
- Get a better understanding of how orders are distributed throughout the market.
- Pursue unique trading strategies and identify new trading opportunities.
- Forecast market patterns.

Efficient Price Discovery in Nasdaq's Auction and IPO Cross Processes

The Nasdaq opening and closing cross are the price discovery facilities that cross orders at a single auction price. The crosses enable market participants to execute on-open and on-close interest and allow for unparalleled transparency into the market. All nationally-listed securities are eligible for the crosses. Nasdaq TotalView provides a forward indication of where the opening and closing price may be before the market opens or closes.

The Net Order Imbalance Indicator (NOII), available through Nasdaq TotalView, gives auction participants an early look at the supply and demand for a stock prior to the opening and closing crosses. Participants who incorporate the NOII into their workflow can enhance their decision making and place orders more intelligently. In addition, the analysis of order imbalances allows participants to be better prepared to offset liquidity demands.

Nasdaq has been disseminating the NOII widely for about 15 years, but the rules and processes have been enhanced over time. In the last four years, the exchange changed the time and frequency at which the data is disseminated in the opening and closing auction process to further increase transparency, efficiency and flexibility.

The NOII includes the number of opening or closing shares that are paired off as well as imbalance shares that would remain unexecuted at the current reference price. It also includes the current indicative price of the auction that would satisfy all eligible demand. The NOII is calculated and updated continuously, beginning five minutes before the market opens and 10 minutes before the market closes. It is also used to disseminate indicative auction information for both the quote-only period of an IPO cross and a regulatory halt cross re-opening.

The largest liquidity events of the day on The Nasdaq Stock Market typically occur during the opening and closing auctions. The activity in the opening represents about 2% of Nasdaq volume and the activity in the close represents almost 12% of Nasdaq volume. In other words, about a seventh of the volume on the exchange happens in an opening or closing auction. The NOII provides users with invaluable details about the opening and closing orders and the likely opening and closing prices of a security. As such, it can have a positive impact on participants' ability to perform effectively in a highly competitive environment.

Let's say over the weekend, traders learn some positive news about a company, and they submit opening buy orders on Monday morning to establish positions in that security. Those orders may result in a temporary supply and demand imbalance during the auction. In this case, the NOII makes participants aware that there are more buyers than sellers in the market. Contra-side parties then have an opportunity to enter the auction process and provide liquidity to those who demand it and help balance the book, which improves overall auction outcomes. Participants who do not incorporate the NOII data may miss an opportunity to transact at prices they deem favorable.

To increase transparency and efficiency in auction price discovery, Nasdaq decided to disseminate the NOII earlier for both crosses, implementing the change in two stages. In Q4 2018, the time at which the NOII is disseminated on the close was moved five minutes earlier, from 3:55 pm to 3:50 pm. Then in Spring 2021, the time at which the NOII is disseminated on the open was moved three minutes earlier, from 9:28 am to 9:25 am. In addition to the earlier dissemination of information, the frequency of the dissemination was increased from five seconds to every second. Having more information earlier allows traders to participate in auctions more effectively.

Nasdaq also strives to provide fair executions for investors through an open and transparent process that creates a single price for Initial Public Offerings (IPOs) based on supply and demand. While retail investors may or may not participate directly in the IPO crosses, they can gain insight into the opening price of the IPO once it starts trading in the regular market.

The Nasdaq IPO Cross is designed to:

- Provide fair executions at a single price that maximizes volume and is reflective of supply and demand in the market.
- Maximize transparency at IPO opens by disseminating timely imbalance information to investors.
- Create an open process in which all investors can enter orders and participate in price discovery.

Conclusion

Active retail investors in the U.S. equities market are demanding access to more granular information. Nasdaq TotalView offers the most complete information investors need to bring their active trading to the next level. Nasdaq TotalView allows investors to see the depth of book at all levels to determine liquidity and uncover valuable insights into the true supply and demand of a security at each price point. They can follow pockets of liquidity, refine strategies, identify potential opportunities and analyze patterns in the market.

The NOII serves as a supply and demand monitor leading up to key liquidity events such as the open, close, halt resumptions and IPOs. It provides the anticipated cross price so investors can understand the interest in a specific stock relative to the prevailing market price. Moreover, it gives deeper insight into the market sentiment during earnings announcements, displaying imbalance data used to determine the buying and selling opportunities of a security. In addition, the IPO indicator shows details of all orders for an IPO during the pre-IPO quoting period and the number of shares and orders that would execute if the cross were to occur at an indicative price and time.

The combination of depth of book, NOII and IPO cross data empowers investors to make more informed trading decisions and achieve their investment goals.

Connect with us to get started

If you have any questions around our data offerings, please reach out to our Account Management team.

Contact your market data representative

datasales@nasdaq.com

https://nasdaq.com/solutions/nasdaq-totalview

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