HPS LEADING THINKING

The Implications Of IEX's 350 Microsecond Delay For Investors & Market Fairness

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With The Support Of Citadel LLC

Executive Summary

The U.S. Securities and Exchange Commission (SEC) has extended its decision to grant or deny exchange status to IEX by 90 days, simultaneously opening up a 21-day comment period on the definition of "immediate" under Regulation National Market System (Reg NMS). While IEX has fixed the anticompetitive issues related to its router, this presentation argues IEX's delay is not de minimis and hurts investors, damages market stability, and picks winners and losers among different types of investors. Key highlights include:

- **Under Reg NMS, Public Exchanges Are Afforded Protected Quote Status If They Provide Quotations That Are "Immediately" And "Automatically" Accessible.** IEX's 350 microsecond delay is undeniably an "intentional device that would delay the action taken with respect to a quotation," and therefore violates the principle of "immediately."
- **After Substantial Public Comment Demonstrating IEX's Proposed Exchange Violates Reg NMS, The SEC Has Initiated A 21-Day Comment Period To Consider Reinterpreting Reg NMS And The Definition Of "Immediate."** Specifically, the SEC preliminarily believes that sub-millisecond delays are de minimis.
- **IEX's Intentional, 350 Microsecond Delay Is Not De Minimis And Leads To Three Substantive Issues If IEX Is Afforded Protected Quote Status:**
    - **Stale Prices:** Broker-dealers must send orders to IEX if it displays the best price, even if it is stale. This leads to uncertainty about both the size and price of displayed liquidity, meaning less efficient markets and higher costs for investors.
    - **Market Transparency:** If the SEC reinterprets Reg NMS to allow intentional delays, other exchanges will implement their own intentional delays, resulting in a race to the bottom at the expense of a functional national market system.
    - **Regulatory-Granted Competitive Advantage:** IEX's 350 microsecond delay would enable one order type (hidden-pegged orders) to exploit a regulatory-granted advantage at the expense of all other order types. Research by a Columbia University professor estimated this advantage would cost other order types over $400 million per year.
- **Calculations Based On Public Data Show Executions On IEX Cost Investors, While IEX Has Not Been Able To Quantify Any Benefits.** If all market orders from Q4 2015 were executed by IEX with IEX Q4 2015 execution quality, retail investors would have incurred additional costs of approximately $290 million.
- **Giving IEX Protected Quote Status With An Intentional Delay Raises Broader Questions About The Intent Of Reg NMS That Go Far Beyond Reinterpreting A Single Word ("Immediate").** When changes to market structure and Reg NMS are needed, they should be done through the SEC's rulemaking process.

- **Overview: SEC Rulemaking And State Of Play**
- 350 Microseconds Is Not De Minimis
- Conclusion

The SEC's Primary Goal, Through Rules Like Reg NMS, Is To Protect Investors

SEC: The Investor's Advocate

- The SEC's primary mission in regulating equity markets is to create fair, efficient markets that serve the interests of investors
- To this end, the SEC enforces a number of market-related regulations, including the Exchange Act and Reg NMS
- Via the Exchange Act, the SEC approves applications to create public exchanges, known as national securities exchanges
- In evaluating exchange applications, the SEC considers its mission to protect investors and the application's compliance with existing rules

Reg NMS

- Reg NMS established the current equity market structure and rules of trading. All public exchanges must abide by Reg NMS
- It essentially provides a sanctioned utility, with attributes like protected quotes
- Three rules, Rules 600, 610, and 611, within Reg NMS are essential to understanding the debate over IEX:

600 *Requires protected quotes to be "immediately and automatically" accessible to investors*

610 *Prohibits publishing a price that would "lock or cross" (i.e., readily transact with) a protected quote*

611 *Mandates that trades be executed at or better than the best protected quote price*

Before Making A Determination On IEX's Application, The SEC Is Considering Reinterpreting Reg NMS

IEX Application Extension

- On March 18, the SEC extended the deadline to grant or deny IEX exchange status through a process known as "Disapproval Proceedings"
- Disapproval Proceedings afford the SEC another 90 days to evaluate the merits of IEX's application, ending June 18, 2016
- These proceedings include a comment period seeking input on whether IEX's router redesign sufficiently eliminates the anticompetitive features included in its original application
- Separately, the SEC is also requesting public comment on reinterpreting the definition of "immediate" within Reg NMS

Reg NMS Currently

- Reg NMS affords public exchanges protected quote status, which requires all market participants to respect the prices of those quotations
- But the exchange must abide by a requirement that protected quotes be "immediately and automatically" accessible
- The SEC explained when it adopted Reg NMS: "the term 'immediate' precludes any coding of automated systems or other type of intentional device that would delay the action taken with respect to a quotation"

SEC's Interpretive Release

- IEX's application has raised questions about whether the platform's intentional delay is compliant with the definition of "immediate" within Reg NMS
- As a result, the SEC is considering reinterpreting the definition of "immediate" to allow intentional delays
- To help answer this question, the SEC has initiated a 21-day comment period for the public to provide input on the implications of intentional delays for market stability and retail investors
- **Specifically, the SEC would like to understand if sub-millisecond delays implemented by exchanges are de minimis**

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IEX's 350 Microsecond Delay Hurts Investors, Damages Market Stability, And Picks Winners And Losers

1 Stale Prices For All Investors

- IEX intentionally delays inbound and outbound communications by 350 microseconds, creating a 700 microsecond round-trip delay
- Intentional delays of any length lead to less transparency and more uncertainty

Issue #1: Orders generally must respect the best displayed price, even if it's stale, leading to market confusion and worse execution quality

2 Market Instability

- If the SEC reinterprets Reg NMS to allow intentional delays, other exchanges will implement their own intentional delays, resulting in a race to the bottom at the expense of a functional national market system

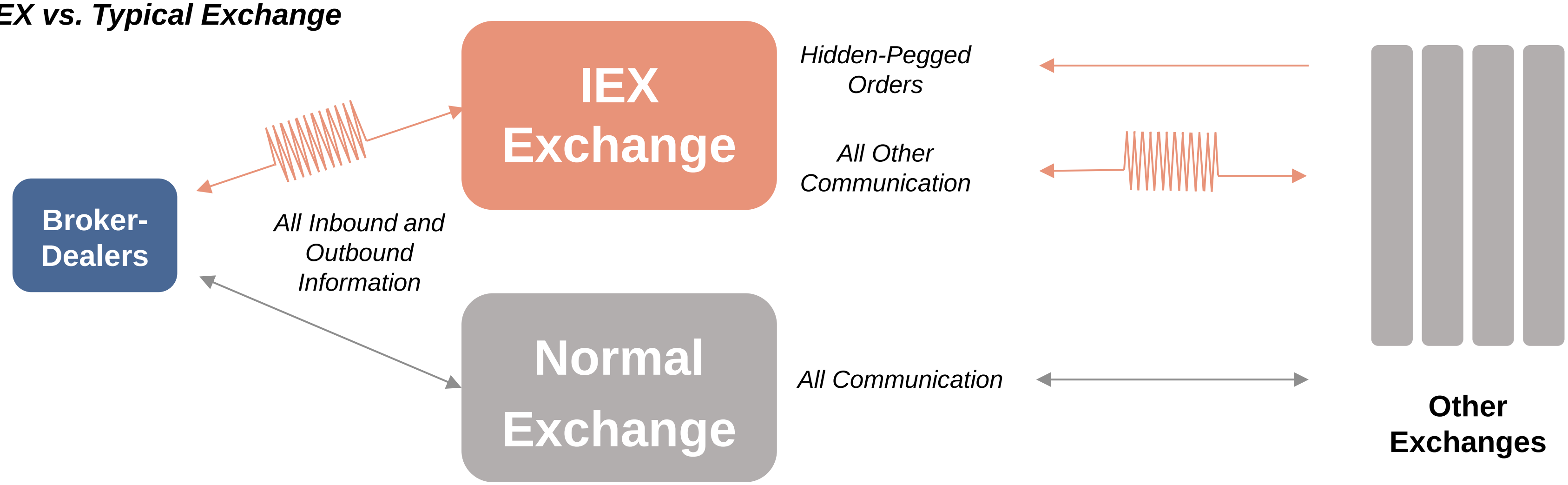
Issue #2: Other exchanges adopting delays increases the likelihood and frequency of stale prices, damaging market stability

3 Privileged Order Types

- Only hidden-pegged orders are exempt from the intentional delay
- These orders can automatically reprice based on bid/offer information from other exchanges without any delay, front-running incoming delayed orders

Issue #3: IEX's delay enables one order type to exploit a regulatory-granted advantage at the expense of all other order types

IEX vs. Typical Exchange



Issue 1: Stale Quotes From IEX's Intentional Delay Can Cost Retail Investors

Step 1	Step 2	Step 3	Step 4	Step 5
Retail investor places a market order to buy shares of stock X ↓ **Retail Broker** ↓ **Wholesale Broker**	**Wholesale Broker** What's the latest price? iex: $100.01 / Nasdaq: $100.02 / NYSE: $100.03 Wholesale Broker attempts to trade on IEX at $100.01	iex Sorry, current price on IEX is now $100.05 ↓ **Wholesale Broker** Wholesale Broker must now seek the best price at other exchanges	**Wholesale Broker** Nasdaq: $100.03 / NYSE: $100.04 Wholesale Broker goes back to other exchanges; sorry, the price is now higher	Retail investor is executed at a price of $100.03 **Wholesale Broker** ↓ **Retail Broker** ↓ Retail investor

Because IEX's quotes would be protected, Reg NMS mandates that the markets respect the best protected quote on IEX. Unfortunately, due to IEX's intentional delay, the quoted price of $100.01 was a stale price, causing the wholesale broker to restart the process. By that time, prices on other exchanges had risen. Ultimately, retail investors are left footing the bill for the hidden costs that IEX's intentional delay creates.

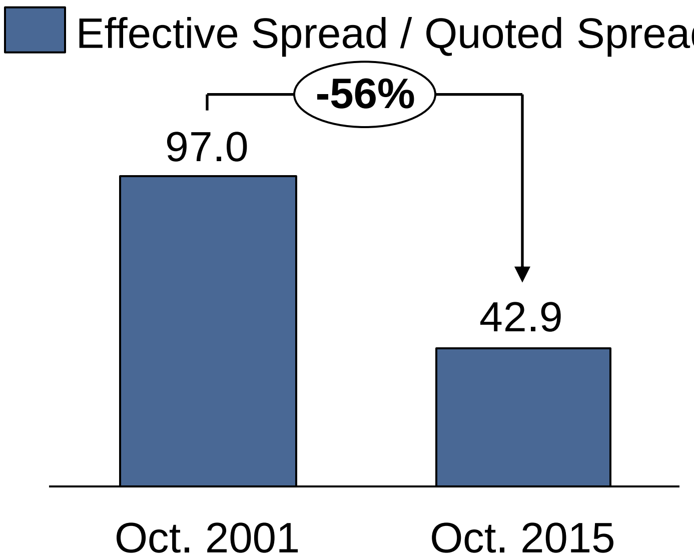
Issue 2: Allowing Delays Enables Exchanges To Chase Revenue At The Expense Of Market Transparency

Race To The Bottom

- Establishing a de minimis threshold for intentional delays will incentivize other exchanges to implement their own speed bumps to chase revenue at the expense of market transparency
- Additional speed bumps throughout the U.S.'s interconnected markets will only exacerbate the problems IEX's proposed exchange currently presents
- Other exchanges, including BATS and the NYSE, have already indicated they are considering their own speed bumps and new order types to compete with IEX

Market Impact

- Stale prices from speed bumps reduce execution quality and increase risk for market participants
- This could reverse a decade long positive trend in execution quality

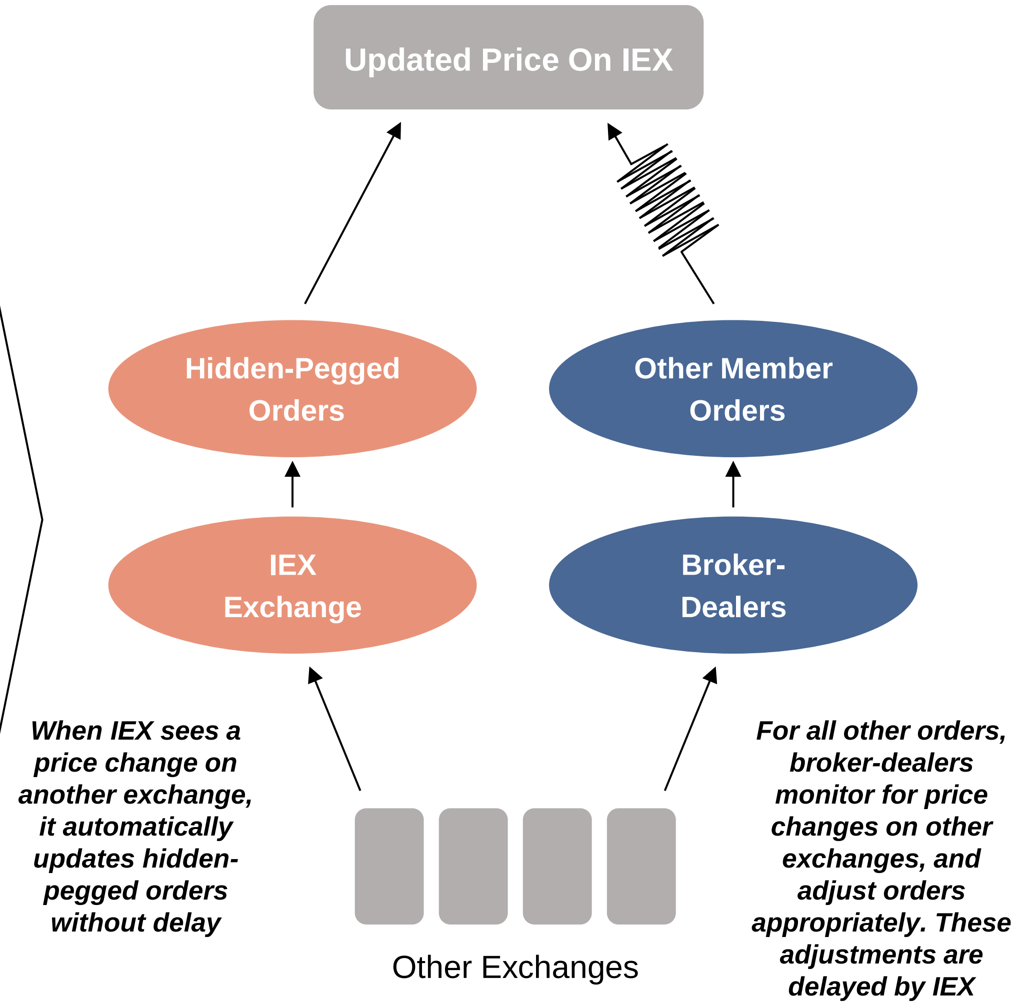


Source: TABB Group

Issue 3: IEX Lets Hidden-Pegged Orders Exploit The Delay At The Expense Of All Other Order Types

Hidden-Pegged Orders

- Hidden-pegged orders automatically reprice to a specific peg – the bid, ask, or mid-point – and cannot be seen until a trade is executed
- On IEX's proposed exchange, hidden-pegged orders will receive information from other exchanges without intentional delay
- This enables pegged orders to reprice based on market movements on other exchanges before other market participants have time to react
- IEX is encouraging the exact sort of latency arbitrage it purports to protect against



Academic Research Shows A "Selectively Applied Speed Bump Is Not A De Minimis Delay"

Charles M. Jones, Columbia University's Robert W. Lear Professor of Finance and Economics, modeled the impact of a 350 microsecond speedbump on market participants

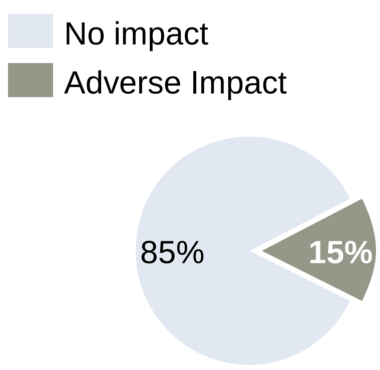
The Study

- Professor Jones's research sought to quantify the possible impact of selectively applying a 350 microsecond speed bump to certain order types
- To do this, Jones evaluated how often the National Best Bid & Offer (NBBO) moved adversely to passive liquidity providers within 350 microseconds of a transaction, and then calculated the losses that would have been avoided by not trading at the soon-to-change NBBO
- Based on his research, Jones concluded that a 350 microsecond speed bump is "far from de minimis"

Prevalence

- Jones found a 350 microsecond delay would benefit a market participant at the expense of another participant in approximately 15.07% of the transactions studied

Percent Of Transactions A 350 Microsecond Delay Would Impact In Week-Long Nasdaq Sample



Total Cost

- For the 15% of transactions where the NBBO moves within 350 microseconds, Jones estimates disadvantaged order types would incur costs of 1.67 cents per share. Or in aggregate, $8 million per week, or over $400 million per year

Total Cost Of 350 Microsecond Speed Bump To Disadvantaged Order Types

1.67 Cents Per Share

113 Shares Per Transaction * 28 Million Transactions Per Week * 15.07 Percent

$8 Million In Costs Per Week

Over $400 Million In Costs Per Year

Source: Charles M. Jones, "Letter To Brent Fields, SEC Secretary," 3/2/16

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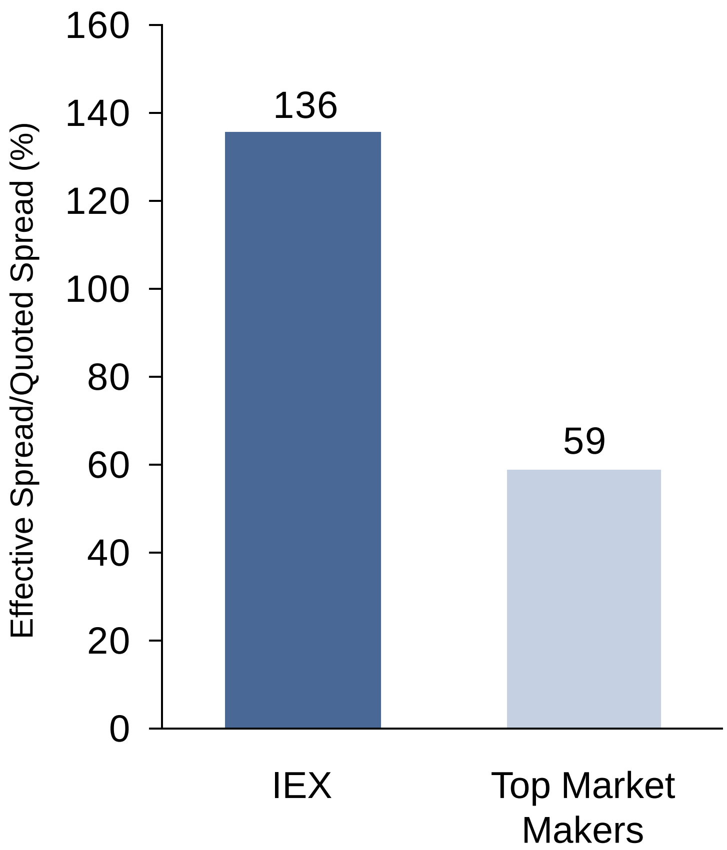
Calculations Based On SEC Data Show IEX's Exchange Costs Investors, While IEX Has Not Quantified Benefits

IEX's executions for market orders are on average much more costly to retail investors…



…which would have created ~$290 million in total retail investor costs for Q4 2015

- The execution quality of an exchange can be measured by evaluating the spread an investor receives versus the best spread publicly available (NBBO)
- If an investor receives better (worse) than the NBBO, they, in effect, save (lose) money
- Contrary to top market makers, market orders on IEX execute at spreads, on average, worse than the NBBO
- If all market orders were executed on IEX during Q4 2015 at IEX Q4 2015 market order spreads, IEX's higher spreads would have resulted in an additional $290 million in retail costs, or over $1 billion per year

Notably, IEX has not been able to quantify any benefits to retail investors

Source: Calculations based on publicly available SEC data; assumes all market orders are retail orders

If The SEC Wants To Open Reg NMS, It Should Be Done Through The Rulemaking Process

Depending On The Scope, The SEC Has Two Processes To Update Rules

Interpretive Release	Rulemaking Process
• The SEC has currently chosen to address the issue of intentional delays through an "interpretive release" • Interpretive releases allow the SEC to provide interpretive guidance of preexisting regulatory language and can include a notice and comment period; the SEC has put its interpretive release out for notice and comment • The interpretive rule or policy statement must not set new legal standards or impose new requirements • Opening up a decade-old regulation in ways that will have profound implications for market structure is not suitable for an interpretive release	• The SEC can evaluate and amend market structure regulations through the rulemaking process • Per the SEC: "The Commission's rulemaking process, like that of other Federal government agencies, is intended to ensure that aspects of regulatory changes are analyzed before a change takes effect." • The SEC is also required to conduct a cost/benefit analysis when amending existing rules • The rulemaking process affords the SEC and the general public a more thorough basis to fully evaluate the implications of proposed rulemaking

If the SEC would like to implement a new view of how U.S. equity markets should function, it should not be done through an interpretive release. Even those that generally support IEX's exchange application, like Healthy Markets, have expressed concern about the implications of the SEC's interpretive release: "An unrestricted, sub-millisecond 'de minimis' interpretation would leave the door open for a myriad of time delay and order type combinations, leading to excessive complexity, segmentation, and exchanges selectively advantaging certain groups of clients over others." (Healthy Markets Association Comment Letter, 4/1/16)

In Response To Criticism, IEX Has Made Claims About Public Exchanges That Are Factually Wrong

IEX CLAIMS	FACTS
1 *A coil that equalizes access for market participants using colocation services is no different than what IEX is implementing*	Colocation coils are typically 30 meters, not 38 miles, and equalize immediate access and information. Meanwhile, IEX's coil is meant to intentionally delay access and information
2 *Markets already experience geographic delays, so IEX's delay shouldn't be an issue*	Geographic delays are unintentional and unavoidable. IEX’s delay is intentional, and it’s effect will be less efficient markets, particularly if other exchanges adopt intentional delays
3 *IEX's intentional delay favors retail investors over short-term traders*	Calculations based on SEC data show IEX's exchange would create additional costs for retail investors, while IEX hasn't quantified any benefits
4 *Allowing hidden-pegged orders to reprice without the delay protects against latency arbitrage*	Allowing hidden-pegged orders to reprice without being subject to the delay enables the exact sort of latency arbitrage IEX claims to protect against
5 *IEX critics won't say what amount of delay is acceptable*	No amount of *intentional* delay is acceptable under Reg NMS. While there will always be some inherent latency, intentional delays hurt markets. Even IEX supporters acknowledge allowing 1 millisecond (1000 microsecond) delays are dangerous