



January 14, 2016

*Department of  
Economics and  
Finance*

Brent J. Fields  
Secretary  
U.S. Securities and Exchange Commission  
100 F Street, N.E.  
Washington, D.C. 20549-1090

Re: Investors' Exchange LLC Exchange Application (File No: 10-222)

Dear Mr. Fields,

As an academic researcher with a focus on market microstructure research I would like to make several comments regarding the application of Investors' Exchange LLC, IEX henceforth, for exchange status. Based on current and past research I support the approval of exchange status of IEX.

My past research, for example McNish, T. H. and Upson, J. (2013), *The Quote Exception Rule: Giving High Frequency Traders an Unintended Advantage*. *Financial Management*, 42: 481–501. doi: 10.1111/fima.12017, finds that latency differences between low latency and high latency traders materially disadvantages the high latency traders. The unique design of the IEX system, with the inclusion of a 350 microsecond delay will help mitigate this disadvantage to high latency traders.

The 350 microsecond delay, or POP, to use the IEX terminology, will have little impact on the NBBO calculations of the consolidated tape. Ding, S., Hanna, J. and Hendershott, T. (2014), *How Slow Is the NBBO? A Comparison with Direct Exchange Feeds*. *Financial Review*, 49: 313–332. doi: 10.1111/fire.12037 show that the NBBO typically runs 1 to 2 milliseconds behind the proprietary data feeds. The speeds of the proprietary data feeds are limited by current technology and by the wired distance between the market centers. 350 microseconds represents only a fraction of the overall latency required for an NBBO calculation. Comparing NASDAQ ITCH data and Daily Trade and Quote data from 2014, I find a 2 to 3 millisecond delay between the time stamp of the best prices in the ITCH data and the prevailing quote from NASDAQ in the Daily Trade and Quote data. In short, a precise definition of the NBBO is not possible with the relative latencies between the exchanges and the consolidated tape. The SEC recognized this point in adopting the 'Flickering Quotes Exception' to the order protection rule. This exception allows for a 1 second look back for quoted price to evaluate a trade through. This again swamps the 350 microsecond POP from IEX.

With the current speed of the market, the NBBO is subject to Heisenberg's Uncertainty Principle. This principle of quantum physics states that you can know where you are or when you are, but you cannot know both at the same time. In the context of the NBBO, we can know the price, but not the time, or the time, but not the price, but not both time and price due to the relative latencies between market centers and the consolidated tape. For example, if Exchange A issues an NBBO improving quote, Exchange B will not know of the NBBO price until the new information has been transmitted to Exchange B from Exchange A. Thus the NBBO price is unknown at exchange B. Conversely, Exchange A knows the NBBO price, but not the NBBO time since the 'time' of the NBBO will not be known until it is posted on the consolidated tape, a time that is impacted by the latencies of information transmission. An effective definition of the NBBO must consider the uncertainty of both the NBBO price and NBBO time relative to market latencies.

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Rule 600 of Reg NMS stipulates effectively that no 'intentional device' can be used to delay the dissemination of a quotation. Such a device must materially increase the uncertainty about the contemporaneous NBBO price and NBBO time in the context of the existing market latencies. While the POP does add a 350 microsecond delay to incoming orders, there is, to my knowledge, no delay of quote dissemination from IEX. Thus the POP does not increase the uncertainty of the NBBO, relative to current latencies and, in my view, does not meet the definition of an 'intentional device' based on physics.

As a final comment I would like to state that I have never received financial support or data from exchange participants. My research is based only on publically available databases. The comments presented in this letter are based only on my academic research.

Yours respectfully,

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