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Noumenon of US Equity Market Structure

a Whitepaper on

- Tick Size/ Minimum Pricing Increment; Access Fees / Payment for Order Flow (PFOF)
- Odd Lots and New Round Lot Acceleration and impact on National Best Bid Offer (NBBO)
- Order-by-Order vs Venue-by-Venue Competition; Market Data Infrastructure Rule (MDIR)
- What if there is a SEC's version of Best Execution Rule; Modernize SEC Rule 605 disclosure

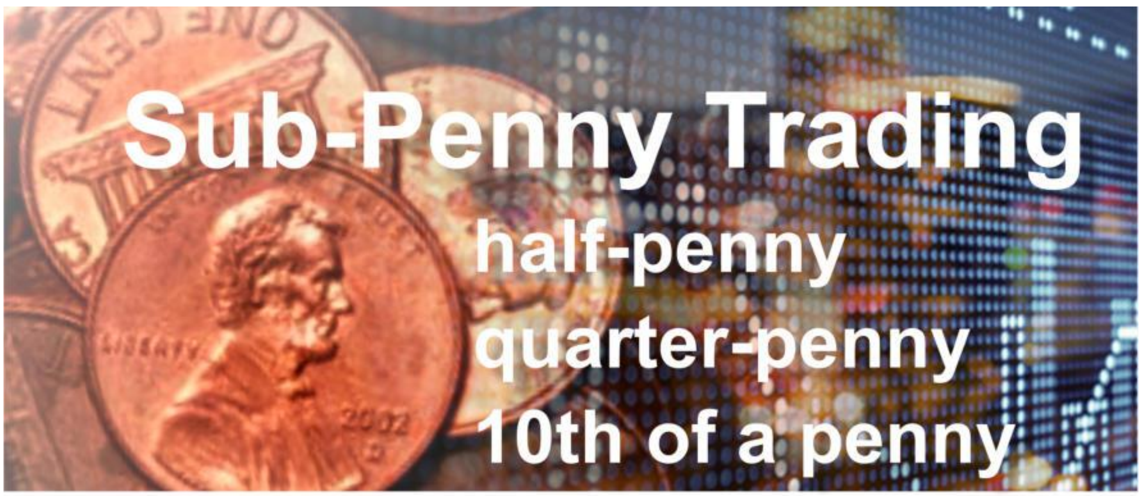
Noumenon of US Equity Market Structure to some extent resemblances the parable of "blind people and an elephant". Different people may use different phenomena that they experienced to describe the big picture differently. Yet, Laozi's Taoism said, "A semblance great, the shadow of a shade" (big picture is formless). So, people have debated about market designs, continuous trading versus auction, venue-by-venue versus order-by-order competition, tick size, BestEx, odd lot, round lot, and whatnot over-and-over again for decades. Using *takeaways* from recent SIFMA roundtable, this whitepaper analyzes what is the noumenon of National Market System (NMS) and where it should or is heading.

Exceeding well, extremely well and markets work well; the deepest and most liquid… is a competitive market with a lot of built-in protections, these are features that make the US equity markets being envy of the World!

Before Regulation NMS, the stock market was for the most part centralized and Exchanges were members' organizations (i.e., *clubs*). After Reg. NMS, stock Exchanges become for profit business, and the market no longer refers to only stock Exchanges, *market equals every place that is reasonable where* [investors] *can access so that includes seeking and hunting for better liquidity at ATSs, at single dealer platforms, at broker dealers networks, at ECNs and wholesalers.* The departure from *one-size fits all* and embracing of *venue-by-venue competition*; vigorous efforts were made to fabricate the highly fragmented US equity market to bear fruit for the economy. These prominent players at the SIFMA roundtable may feel underappreciated, yet they are indeed the pioneers of decentralized finance (DeFi), not the Blockchain DLT folks. So, in our opinion, their above statements are not complacency, but a pat on their back.

From the regulators' perspective, governing CeFi is straight forward. As markets evolved from CeFi to DeFi, the Commission adjusts and shares governance responsibilities with the Self-Regulatory Organizations (SROs), such as *FINRA occupying the space of broker-dealer policy*. [FINRA] *have a BestEx rule, have the bodies, the SEC was being inundated with investment advisors, and shifted resources.* The only way to regulate the highly fragmented equity market (DeFi) is via decentralized crowd intelligence.

For all fairness, DeFi does not have absolute advantage over CeFi, and vice versa. CeFi is superbly efficient up to the limit of 'big brother' deciding who gets what. Yet, 'big brother' does not always make the best decision and can be subjective, causing favoritism and possible corruption. Whereas DeFi replaces the 'big brother' with a network that consists of bilateral and/or multilateral agreements that are sometimes referred to as bureaucracy. Main Street's skepticism of Wall Street's bureaucracy is understandable. Rogue trading has caused chaos in the past and may still will.



What's the difference between quoting increment and trading … What are the implications of going to a finer quoting increment ... What are the tradeoffs of having too small minimum tick?

A quoting increment is a public price that a liquidity provider is willing to trade on anonymous basis with counterparty. Whereas trading from it reflects the additional customized pricing that someone is willing to trade at when one knows their counterparty. [Reg. NMS] *intentionally allowed for segmentation of counterparties. Therefore, trade prices should be different than the quoted price.* [That being said,] *for a penny on a $4 spread that's that basically two positioning trying to get ahead of everyone else rather than competition.*

Sub-penny trading [on Exchanges] *is basically just creating inside the minimum spread with executions that happens inside the quoted spread. Polluting the public markets with sub-penny quotes shrink the depth and size displayed.* [Whilst] *if Exchanges are allowed resting liquidity at narrower increments, using hypothetical scenario like a half penny increment and midpoint trading at quarter cents, marketable orders would benefit by about $7 million incremental price improvement a day.* The different perspectives here between the Exchanges and Internalizers may be a moot point. *Changing a quoting increment because of a constraint versus reacting to the fact that trades are* *going up at prices inside the quoted spread*, *should not be conflated together*. We agree that is a separate discussion of *capabilities* among the rivalry and complimentary roles of Exchanges, ATSs, and Internalizers.

If [Exchanges] *going to a finer quoting increment,* [e.g.] *tenth of a penny increment, the implication is liquidity would vanish, that's detriment to the institutional.* Note: Institutional asset managers are by large *liquidity takers*. Their core mission is to invest citizens' capital and savings into productive economic activity, allowing companies to grow by providing access to new sources of funding for their business. So, give them the deserving respects and space to operate. Many of them are indeed consolidating to withstand competition.

For low price stocks, the tick constrain tick sizes essentially lower bound on costs. For the high price stocks, liquidity essentially acts as a congregation point, where orders all que up at a particular instrument and that tick size constitutes a standard increment in the order book. When the number of price points is reduced, more liquidity gathering aggregate at those price points. But when the number of price points is increased, then it essentially fragmenting the quote and dispersing liquidity across multiple prices. So when [policy makers] *are thinking about changes to tick sizes, it is a balancing act between the high price securities and the low price securities.* We applaud the wisdom which emerges from these constructive discussions.

Access Fee Cap and Rebate

What are the current issues with the 30 mil access fee cap? What would be the potential impact to let passive liquidity on exchange if rebate limited to 1 or 2 mils, given the 3 mils access fee cap?

30 mils access fee cap (maximum of $0.003 per share that a marketplace can charge participant for access to its platform) *was established in 2005 with passage of Reg. NMS, which is no longer consistent with business practices. The reason for that happening during Reg. NMS versus Reg. ATS was something called the Order Protection Rule* (OPR). *Best price became the de facto at the time and the crossing mechanism. A reduction in the access fee cap had pretty broad-based consensus* [, admit] *the court ultimately struck down the access fee pilot.* [By] *bringing down access fee cap to in line with off Exchange trading costs, more marketable flows may make it way on Exchanges, but there is a point where the rebate comes down with it.* A grand bargaining was discussed in the past and did not provide resolution.

Access fee cap may effectively set a ceiling for rebates. Yet, some are more equal than others in animal farm. Empirical research supports a ban of rebate tiering. *Jumping tiers at end of the month* is one concern. *Get rid of tiers because it removes conflicts of interest that exists, I am all for that.* [Yet,] *it is difficult for institutions to be able to then go ahead and spread whether it is an additional fee or a rebate back to our customers. If that is the reason* [in recalibrating access fees and rebates, it] *ends up pushing potential conflicts upstream, from brokers if they exist currently with their routing to asset managers where now they are having to explain best execution obligations versus I am posting to collect a rebate on your behalf versus taking liquidity.*

The consideration factors include, but are not limited to, *absent improving the quality of the order flow that comes to public markets, market makers may consider the all in economics when they make a price* *and if that all in each calculation includes a smaller rebate they are going to widen their quotes. Where the rebate is too low,* [there may not be enough incentive for] *Market Makers,* [which they argued] *the models are very sensitive to pricing changes. If you look at the big macro pricing changes that have happened at the market, whether it is make-take, or take-make, there are different variations, have it is very difficult. Accurately predict the effect of those changes, how much market share different pricing regimes are going honor and there is a lot of unintended effects that will happen that you can't really predict in a science experiment without seeing it. It will make it more difficult for up starts to compete and that is not in anyone's interest at this table.* In our opinion, the noumenon of rebate incentives serve as royalty payment for the use of others' copyrighted material, see this.

Payment for Order Flow

The notion that PFOF arouses conflicts of interest and can distort routing decisions [is in questions, would] ***a ban on PFOF*** [address the issues] ***or do broker dealers mitigate conflicts today when accept PFOF?***

One academic research piece suggests "no evidence that PFOF harms price execution". *We* [a retail broker] *route the way we do because it leads to the best client outcome. If* [one] *worried that brokers are going to route based on payment levels, there is a pretty simple solution out there, which is just mandate that brokers level the payment across all their providers. Therefore there is no incentive to route to one player over another any reason other than execution quality.*

[PFOF] *creates an incentive for brokerages to encourage their clients to trade more, and we know that excessive trading as to point a phrase from Professor* [Brad M.] *Barber* (UC Davis) *and* [Professor Terrance] *Odeon* (UC Berkeley) *once said "excessive trading can be hazardous to wealth", so because of that conflict our firm does not accept PFOF.* We at Data Boiler are aware that some brokers do not take PFOF but still offer free trading. A question we have, why no one at the roundtable discussed FTX (a crypto exchange getting into stock trading space) working with NASDAQ's RTFY retail order router to source order book liquidity at the best possible prices without relying on PFOF?

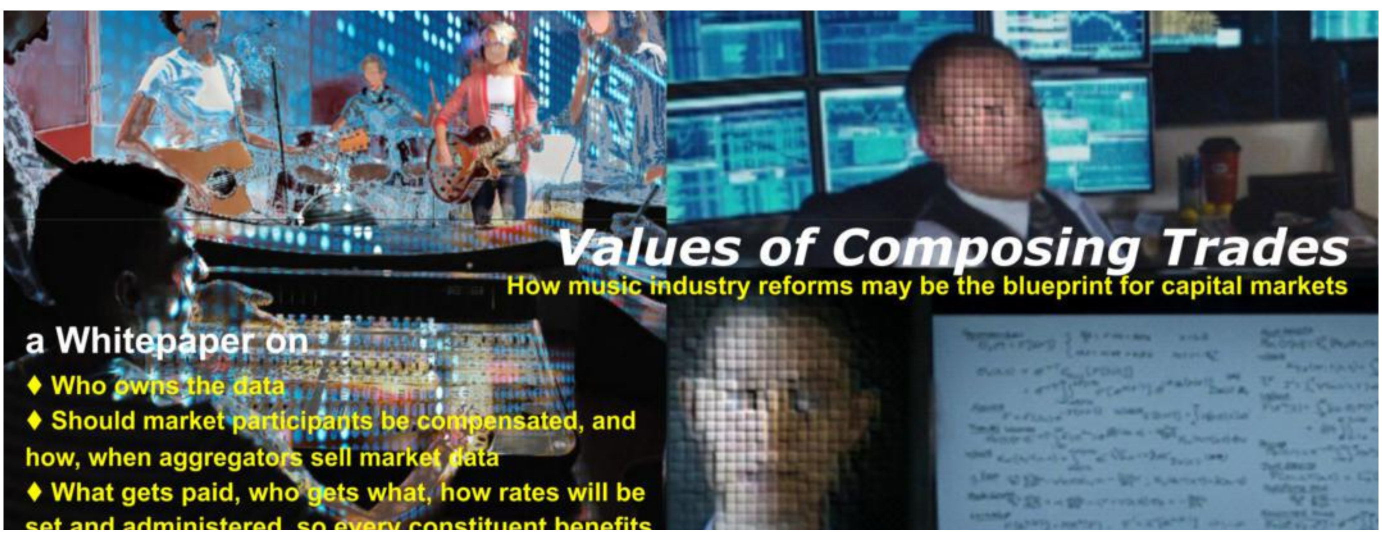
> **Note:** PFOF is not necessarily a payment per se; it can take the form of a discount or other privileges. As cited by the Financial News, *"Some of those brokers might do things like internalize orders, which can involve matching up customer bids and offers and earning the spread between them… Brokers can also make money by sending orders to exchanges that pay rebates… Ultimately, brokers' revenue has to come from somewhere, even if free trading is some kind of loss leader to other revenue streams. Brokers might start passing along more regulatory fees or charging new fees for heavy users or seek to earn more on customers' cash by paying minimal interest."*

Retail clients expect to receive the price they see on their screen or something better. They are accustomed to it 95+% of the time, that's what they see, that's what they experience. To hold market centers' feet to the fire [involves] *evaluation of execution quality, resiliency and appropriately route orders based on where we can get the best holistic execution quality.* [Retail brokers] *require and the competitive dynamic in the marketplace requires the wholesalers to take every order that we send them.* [Market Makers] *are not able to pick and choose which orders they want to interact. Let's use a real-life example,* [maker makers] *would love to step back from making the market in that security* *given the volatility that we have seen they are not to do that in the current model. And what happens is, our execution quality over the last 2 weeks in that name versus where it was 2 months ago, and it is nearly identical. So it shows that the market makers are standing behind the current model. They are executing for our clients where it needs to be done in every single name.* Yet, we are aware of a market maker being charged for failing to maintain 2-sided trading interest.

[From wholesalers, market makers, liquidity sourcing, outsourced execution service providers' prospective, the matter is] *essentially principal agent consulate issue.* [It was argued that] *an agent-principal cost shouldn't be solved by government intervention. It should be solved through the free market. If you are not capable of providing that level of data* [to substantiate how your execution quality and price improvement are better than competition] *to your principal, you are not a great agent. You should be replaced.* [Market Markers] *are sourcing liquidity outside of the firm that comes with the cost… hundreds of millions of dollars a year to pick up those scraps in the marketplace. The wholesalers are subsidizing the industry by absorbing those costs … who is going to pay for that? There goes zero commission trading... retail investors don't like the word commission, that's what we are talking about. So, competitiveness of the wholesaling space is incredible, and underappreciated…we are attesting to that because we are a new entrance now.*

In our opinion, the wholesaling space has competition, yet the barrier of entry is too high. That exacerbates the gap between the 'haves' and 'have-not'. We are not sure the reliance on such "fire and replace the execution vendor" approach to hold market makers' feet to the fire as being effective. Controls maybe weakened or bypassed through transfers in-and-out of category between available-for-sale and hold-till-maturity and/or a flipping-switch between dealing with "client" versus "counterparty". Therefore, we do not buy the argument of alluding to the problem as a principal agent issue, which that big boss cited as *"price control. Why is it such a pernicious conflict if it is not just a political football?"* We do not think the SEC and the EU regulators are trying to impose or consider price control. Public confidence has been eroded by a series of cases related to the order routing enigma and blindsided of risks.

Access fee rebate, PFOF, and market data/ market structure issues are all intertwined. By boiling down the problems and what the industry's long-standing issues are – we arrive at '**who owns the data?**'



We suggest learning from the music industry's Copyright Licensing Mechanism for how best to delineate rights and obligations objectively and crossover applying what suitable in our capital markets. We believe the pie can be grown and everyone can get a bigger piece by adopting new innovations. We envisage a typical Broker-Dealer would yield up to 25% improvement to their bottom line, see this. In short, there will be opportunities to earn royalty payments, 2nd profit for unused algorithms, off-load certain staff costs while incurring minimal in royalty admin fees, payment for usage of others' algo IP, and subscription for pattern monitoring services. Featured traders/ algo developers would earn a fair cut of the royalties while subject to liabilities if their trade activities resulted in manipulations/ market chaos.

Odd lots, Round lot, NBBO

Is NBBO a good measurement or is it incomplete or weak? How would changing tick size impact the robustness of the NBBO? Does institutional flow interact with retail?

What good is the NBBO - it represents size that satisfies one single retail order. Having multiple NBBOs could be confusing to investors. There is an opportunity to potentially improve the NBBO by having odd lots publicly available for consumption. Obviously [that odd lot NBBO] *potentially create some ambiguity so there has to be some clarification around using those quotes and how you represent that from the BestEx perspective. We need the disclosure, but until we actually understand what changes will be in NBBO, pricing increments, best execution rules.*

If you are just showing a penny over NBBO [while] *client has no context in terms of where that midpoint is, or how far away that trade was executed* [,] *it reminds me of the Black Friday sales… there was only one available … is frustrating. Is that the feeling we want investors to have about our markets? There needs to be better clarity around execution prices and what customers are getting and use that but to disparage what the industry is producing by conflating what the NBBO is and what it is not, is totally inappropriate and again leads to more confusion and less certainty about what the marketplace is all about and the value that we are all providing.*

The NBBO doesn't work for execution quality because it doesn't include odd lots is a myth. Not for the reasons that has been laid out by others, [NBBO is an incomplete measurement because] *NBBO* [as a] *benchmark assumes there is this infinite size – it is just simply not true. People naïvely think well we narrow the NBBO by including Odd lot, somehow the retail brokers would get better execution, but if the NBBO got narrowed that may just reduce the price improvement that offer.* [From institutional perspective,] *we look at things from slippage versus NBBO and not price improvement with the NBBO. So when some says to me, hey a tenth of a penny increment it is going to be better for you because you are going to get better prices, I disagree with that completely.*

The common perception is that retail order flow and institutional order flows don't interact, but that is only partially accurate. When you look at the retail order flow, the large proportion of it may be 20-30% of it is not marketable orders, and those are all routed to exchanges orders for their publicly accessible. Now the balance of the activity that the marketable orders are the piece a lot less straight forward for institutions to interact with, they may be sent to other ATSs. [Whereas another wholesaler] take a lot of liquidity [via] *relationships with some of the largest wholesalers* [that] *allow* [them] *to engage with retail participants now in manners that maybe exclusive* [for valid reason of] *trying to limit impact* (move market price). [Their] *orders are significant size.* [They] *believe* [there is] *Alpha in* [their] *orders. It sometimes doesn't work that institutional activity or going to kind of blend together.* [If NBBO is] *narrowly defined …* [it] *would likely make both institutions and broker-dealers significantly less likely to engage in blocks* [trading] *that would be detrimental probability in our markets.*

Couple of points we would like to add. One, the tricky part of the odd lot proposal for the Securities Information Processor (SIP) is whether the expanded content under the MDIR, will be disseminated through a single, integrated feed, or through a segregated feed providing subscribers choice? Ingesting a lot of data raises the concern about bandwidth connectivity. Lacking depth-of-book data undermines the usefulness of Odd Lot data. Second, Competing Consolidators (CCs) under MDIR further complicates the problem. Unfortunately, the SEC dismissed the concern about benchmark reference price arbitrage due to multi-NBBOs. Let us be warned that eroding the NBBO de facto status is like the transition from LIBOR to SOFR.

How to enhance order-by-order competition which could be through open and transparent auctions or other means?

Come that auctions are very important part of market, but it does leave a lot of questions – Under the current trade tools would they be allowed to trade outside the NBBO? Who decides whatever to go to the auction, what are their incentives? How long are the auctions going to take? What happens if the NBBO moves during the auction? We affirm those are relevant questions in assessing whether such order-by-order competition or auction market design has any merit or not.

We did come across a paper that clearly benefits auction markets, such as Apex CODA. So, it is not like there is totally *no data, no study out there, supporting any of this theoretical order-by-order competition.* We, however, agree that, it is *hard to see how these things* [order-by-order competition, BestEx, etc.] *will just be not in fundamental conflict with each other. There is the best execution where we all have a duty to go to the venue where you get the best outcome.* [One cannot just] *say – forget that you have to go to this* [order-by-order] *thing, and what if* [it] *actually produces a worse result than what you otherwise might have done if you had the flexibility of the choice?*

We share the same concern about choice. Would retail investors survive in an Auction market where it is usually crowded with Specialists and Professional players moving blocks? Are they "Dim Sum" for many predators in a tough environment that is not suitable for them to swim in the first place? It is yet to be clarified who is defined as the "Professional" versus "non-Professional". If someone is only able to play a few "music notes" (individual orders) rather than compose a complete "song" (trade algo), then it is our opinion that they deserve the appropriate investor protection.

The average retail investor doesn't care if their order is executed in an auction or not. They just want an immediate execution that is better than the amount of liquidity available and at a better price and it is available. [Retail investors] *kind of rely on all of us in terms of figuring out what the right mechanism is to deliver them that outcome. If* [the market structure going to] *transition to an auction-based model where people are able to pick and choose what they interact with,* [it will] *go very close to ending up having a hundred names that trade very well and the rest will be very inconsistent retail trading experience.*

Auctions are really complicated animal - highly advanced and highly developed mechanism, which really are targeted towards that sophisticated audience who in a lot of cases, especially with the exchange auctions, is willing to trade at one point in time at the same price. If you get enough volume an auction can be really good. If you don't, there are all sorts of questions. In all the rules we have for the [market] *opening and closing, how do you get people to expose significant trading interest prior to actually trading? Or why are they going to expose their order unless they are confident is going to trade and this is a real issue in auction, and especially when they are coexisting with continuous trading. Will the investor has the option of trading at the NBBO or the Odd Lot NBBO, are they going to reveal willingness to trade at a worse price than the NBBO before they are actually sure they are going to execute? So auctions during the day will likely be most attractive for small trade that can get improved on over the NBBO.*

In a constantly moving market, especially if you have decentralized auction mechanism (*where things are happening in a fairly decentralized way, without a centralized place for liquidity and a centralized process*) *while the rest of the market is moving. It is hard to understand it'll produce a better outcome.* [So] *order-by-order, in particular on the wholesale side is problematic. Hope* [the SEC would] *recognize differences of retail execution and institutional execution and the demands there that are made by the client base.*

The concept that Reg. NMS promotes more venues competition and less order-by-order competition, and if [one] *looks at 605 execution quality* (*the average queue went from well over 100 to 50 over the last 10 years*)*, that is direct data evidence of the benefit that venues competition had on the retail investor. It is naïve to suggest somehow by destroying that ecosystem that liquidity which we measured would be over two billion dollars just from* [one Market Maker] *in terms of size improvement would somehow magically appear in an auction.*

We are not buying the hype of order-by-order competition (routing retail orders to auction). Yet, the noumenon of the so-called "venue-by-venue competition" is indeed a brutal Warring States Period. In racing to gain the edge over each other, venues offer different rebates (e.g. enhanced market making discount), introduce a speed bump (e.g. liquidity enhancing access delayed), proliferate order-types (e.g. midpoint-extend-life order), come up with new business models (e.g. market-on-close) and create other privileges (e.g. exclusive access to certain pegging orders). There are countless "innovations" (but are they the right kind of innovations or alleged exploitations) by Exchanges, ATSs, and Internalizers to redirect order flow is indeed a fairness issue over market division.

Today's markets are convoluted and because of that, corresponding technologies are invented. But everything has a cost to it – subscribing to proprietary data feeds, connecting to more trading venues, demonstrating best execution compliance, use of transaction cost analyzers, etc. These combine to create barriers for certain players. Per our 2018 comment letter to the SEC, "There may not be good or bad guys... but people jockey around trying to make money. Among them there could be formal or informal alliances, as well as possible collusion … there will be complaints about rules being skewed in favor of particular entities, as well as new way(s) to exploit or circumvent the rule."

Mercy to the ordinary market participants (the smaller plays in both institutional and retail), they jump through hoops and are subservient to the elites (*clubs* - quo pro quo) to stay in business. The gap between the 'haves' and 'have-not' is too wide, therefore the SEC should step-in and consider overhauling Reg. NMS. That said, we think the SEC's current focus is off target.

[Back to discuss more on auction,] *in the auction market the person who brings it has to guarantee* [if the NBBO moves during the auction], *and well that is a cost and then they get some benefits to encourage them to do that. Remember it is not exogenous that the auction is done. Somebody who has control of an order makes a decision about what it uses the auction and the initiator currently provides the ability to match this* [price]*, which in fact may be necessary. Price matching on an ex-ante basis is fundamentally anti-competitive. If that is kind of where the Commission and regulators think we need to go, it is a paramount importance that those auctions or whatever mechanism that they choose remains fair.*

After all the hype about routing retail orders to auctions generated more questions than anything. It would likely run into conflict with other rules, as well as raises fairness / anti-competitive issues. Reference to 79 FR 5592, footnote 711 regarding the Dodd-Frank Volcker Rule. It said

> *"The Agencies are not adopting a 'transaction-by-transaction' approach because the Agencies are concerned that such an approach would be unduly burdensome or impractical and inconsistent …"*

This cannot be more confusing regarding the Commission's policy direction.

Retail liquidity program

Thoughts on Exchanges' retail liquidity program (RLP)***?***

[Regarding the RLP,] *it allows Exchanges to segregate retail order flow by executing orders in increments as granular as a penny. It isn't significant today* [but] *could be improved with a very simple change – allowing the resting retail liquidity to be displayed. One of the handicaps of* [Exchanges'] *RLP today is not sure there is going to get a fill or not. And immediacy is something* [Market Makers] *provided to clients* [while] *at risk the minute the order hits our ecosystem. It is not like the exchanges are trading themselves early.* [Exchanges] *are never going to have a mechanism that's going to take priority over a bilateral interaction. So RLP does not meant to be competitive* [with market making internalizers, it] *tends to be complimentary* [i.e.,] *in favor of some type of displayed RLP at midpoint.* We found the frienemy relationships between Exchanges and Internalizers amusing.

How do we move forward the implementation of the Market Data Infrastructure Rule (MDIR) ***so that it includes all of the additional data sets that are going to be required, and the introduction of Competing Consolidators*** (CCs)***?***

MDIR is in plan and it went through the proposal, the comment period and it survived in gun proof by unanimously ... and it survives litigation. So that is a sign of something that you know is worthy of us to kind of focus on and kind of move that forward as quickly as we can, [but] *on CT-Plan relation such as that, but this is a really controversial.* The US Court of Appeals struck down the SEC's CT-Plan on July 5, 2022. Without the CT-Plan to "outsource" certain SEC authority to the operating committee (2/3 SROs and 1/3 Non-SROs), *we are sort of at a standstill now.*

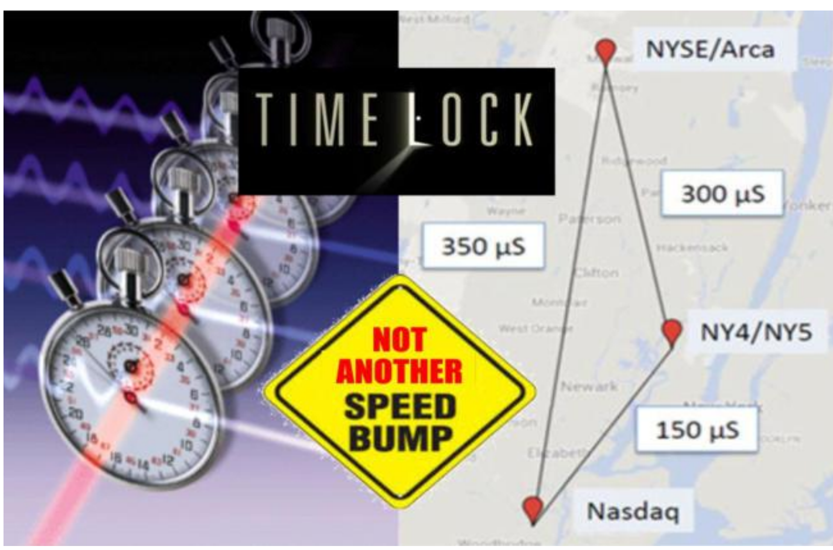
The piece that survived the court challenge essentially would require a new method of allocating votes among the SROs and that all action requires a majority. The real gating issue for that point people don't know what fees are going to be applied to, thoughts of the effect, nobody is going to get into that [CC] *business* [according to one SRO]. How sad that the industry has no say over market data (contents) that they owned. The phenomenon is like the Jukebox era where these Jukebox operators kept collecting coins without paying the record labels and artists. I believe the Facebook case that the contents should belong to authors rather than the platform.

We think there are more troubles with MDIR than just governance/ voting issue on fees. What problem is MDIR trying to solve? Right from the start, it has always been about aggregation distance/ location differential issues. "Same manner and methods" may merely be a standard price list offered by Exchanges under the MDIR. Neither is it equivalent to Latency Equalization, nor can it achieve the same results as using time-lock encryption to make Market data available Securely in Synchronized time. The SIP significantly underperforms as compared to Proprietary Products (PP) sold by 'for-profit' stock exchanges with monopoly power.

Many welcomed the MDIR because of the expanded contents of core data (including odd lots, depth-of-book, auction information, and more). Are they naïvely believing the SROs would give away the expanded contents for FREE or are they hoping to spread the fixed cost across the wider industry, so there will be potential savings than their current subscriptions to PP? Everyone will likely or are already getting a piece of the heighten cost. Don't bet on the SEC to have the upper hand against the Exchanges' power-play, given the Court ruling overturned the SEC's decision to reject fee-increases for Exchanges data feeds. The SEC also did not hold back two newer exchanges from charging fees on real-time market data, effective July 1, 2022, which used to be FREE. Connecting to more venues for BestEx compliance is an additional cost to market participants.

We agree with MDIR *round lot definition in particular for those high price stocks* but recommended being vigilant of those who wanted to *bring forward the odd lot quote on the tape*. The tricky part is whether Odd-Lot Quotations under the SIP proposal, and/or other expanded content under the MDIR, will be disseminated through a single integrated feed, or through a segregated feed providing subscribers choice? Ingesting a lot of data raises the concern about bandwidth connectivity. Lacking depth-of-book data undermines the usefulness of Odd-Lot data.

Nevertheless, compilation of protected quotes is complicated. *That's going to be kind of complex as we work though computer stuff working in parallel system interesting to see how it all plays out. Having odd lots being distributed on the SIP, I don't think there are many retail investors download the SIP directly that buy a T1 line.* What you see may not be what you get. One will need to upgrade to higher bandwidths and add depth-of-book data, or else face being disadvantaged to PP subscribers. *Should we be showing odd lots to the actual investors and I am sort of puzzle by this. You don't advertise one and two* [or else] *you are going to wind up having investors say – I don't know what this number here is that seems to be unattainable? Yes, there may be someone who actually goes into supermarket and just wants to buy one egg. So maybe that would help them, but I think the average investor see an odd lot of 3 shares and you have 10 shares you want to buy, that's still 7 more shares and you are going to get. How BestEx rule interrelates with the odd lot piece on the tape, it is important that we just respect, these are odd lots and not require that these become part of the NBBO.*



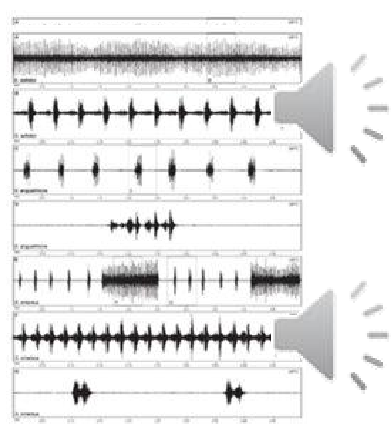
All calling for it, behold the last year and half [that] *it is all figured out, and the solutions have been ordained*, yet circumstances have changed (market data reform without CT-Plan) and the MDIR violated the "fairer, reasonable and non-discriminatory" (FRAND) principles. The assumption of the SEC's MDIR that is based on 10G speed is fundamentally flawed. The SEC allowed the NYSE to implement 100G connections for their proprietary feed in April 2020. Denying the need to enforce a Speed Limit is either naïve or disrespect to the wisdom of former SEC Chair Mary Jo White who famously said, "deemphasize speed as a key to trading success…" Widening the latency gap with overly frequent upgrades and exploiting any residual data disparity exacerbate inequalities between the "haves" and "have-nots".

It is not like *more clarity to the public* regarding acceleration of odd-lot and round-lot would make the inequity MDIR justified. Again, benchmark reference price arbitrage due to multi-NBBOs under decentralized competing consolidator model is something that ought to be addressed. The SEC should not deny the voice of those who said, *there should be one NBBO quote and that quote should be protected.* No denial that *this* [market data infrastructure] *rule in just short of 900 pages covered a lot of ground* [and appeared to be] *holistic*, the bigger problem for Market Date Reform is indeed

who owns the data

If the noumenon of Regulation NMS is venue-by-venue competition, then the root of the problem is trading venue perimeter allows for assorted incentives and business models. Elite players are getting 32 mils super tier rebates and other privileges, while others may get nothing. For the right reason, the SEC should not impose one-size fits all rules that detriment trading venues' private rights. Also, the SEC should not force the comingling of order flows between institutional wholesalers and retail order flows. Regulators should avoid any perceived interference or price control of markets. To overcome these challenges, we learn from history of Qin dynasty ending the warring states period in China and consider different trading venues as a variety of streaming platforms. The key is alignment and making values transferable across these platforms without subjective judgement on what should be the equivalent value of price versus size improvement.

For that, the copyright licensing mechanism from the music industry has shown us a roadmap, where the data ownership/ intellectual property right is the only thing that can contemplate across all the access fee rebates, PFOF, BestEx, order protection and other issues. It achieves equilibrium and is time tested against decades of lawsuits and disputes. There is the "willing buyer willing seller standard". Rate setting will be market driven, and objectivity would be preserved in something similar to the "Four-Part Test". Trading platforms would be based on who they want to serve, how many subscriptions they are going to get and determine whether to carry a broader or narrower "catalog". The broader the "catalog", the platform would pay a wider range of broker-dealers, featured traders, algo developers in royalties. Existing vested interests, other encumbrances, and new entrants can all flourish under this recommended approach regardless of interactive or non-interactive subscription services they choose.



We envisage a typical Broker-Dealer would yield up to 25% improvement to bottom line, as a result of earning royalties payments, 2nd profit for unused algo, off-load certain staff cost while incur minimal in royalties admin fee, payment for usage of others' algo IP, and subscription for pattern monitoring service. Featured traders/ algo developers would earn a fair cut of the royalties while subject to liabilities if their trade activities resulted in manipulations/ market chaos. Top streamers (trade venues) would be on par with what they currently make to ensure a smooth transition to new equilibrium.

While consideration is given to firms turning their unused algo into a second profit opportunity, underpinning the concept of a "sound library", those who lack resources for A.I. machine learning and/or other sophisticated techniques can benefit from obtaining license rights to use algorithms, from the library, to accelerate their own algo development lifecycle. A "community library" can gradually be built using trade patterns from past prosecuted cases as a start. Average investors may leverage any 'music editors' to mix-and-match different patterns to form a new algo and have it back-test in simulated environments. Creativity to discover unknown unknowns will be anybody's game. It will minimize the gaps between the 'haves' and have-not.

Sending out a request for quotes or streaming market data technically costs little to almost nothing. Yet, one ought to pay for royalties in streaming copyrighted materials published by others. There is tremendous value in composing trades and publishing quote and trade algorithms. Allowing it to stream freely at no cost is like a pirate copy of an MP3 song. By transforming quotes and trades into music, with the appropriate obfuscation to preserve confidentiality of strategies, the rights to claim ownership of the data by broker-dealers can be asserted.

The SEC and policy makers around the World should welcome this approach, whereby the 'sound library' and 'catalogs' improve transparency and address concerns about Black Box Algo. The mechanism would better help identify rogues based on the source of earned royalties and intelligence of whose order flow may be interacting with whom to effectively curb desk hopping behavior that dodge regulatory oversights. Nevertheless, we believe the crowds' intelligence in real-time is substantially superior to finding a needle in the haystack, i.e. the Consolidated Audit Trail (CAT), to address and prevent future flash crashes. The inevitable force of crowd driven technology would spur new economic opportunities and derive customer values accordingly. We believe the pie can be grown and everyone can get a bigger piece by adopting new innovations.

BestEx Rule(s) SEC/ FINRA

The current [FINRA] ***Best Execution*** (BestEx) ***rule*** (5310) ***serves the marketplace well over the years had done really good job of walking the line between putting up guard rails without being over prescriptive. If any other*** [BestEx] ***rules that the SEC might come out,*** [what are] ***the potential implications?***

Firms take the [BestEx] *responsibilities very seriously and devoted considerable research resources in house to best execution committee, best execution analysis,* [whilst an Internalizer pointed out that] *FINRA Rule 5310 requires that broker-dealers to exercise reasonable diligence execute customer orders in the best "markets" – market does not equal exchange. Market equals every place that is reasonable where you can access so that includes seeking and hunting for better liquidity at ATSs at single dealer platforms, at broker dealers' networks, at ECNs and wholesalers.* This Internalizer *hopes the SEC wouldn't inadvertently create some sort of safe harbor that says if you get an order and it is from retail, what you do is have to send it to an exchange and then you are done. That would be opposite of BestEx from especially from a FINRA standpoint.* It is non-novel to hear brokers' claim that since off-exchange does not have lit quotes, there is no way to determine ex-ante whether routing would satisfy BestEx. Most frequent best execution issues cited in adviser exams are:

- Not performing best execution review;
- Not considering relevant factors during best execution review;
- Not seeking comparisons from other brokers;

- Not fully disclosing best execution practices;
- Not disclosing soft dollar arrangements; and
- Inadequate and/or not following best execution policies and procedures.

Brokers must examine key characteristics (nature of the market – volatility, communication availability, price, and relative liquidity; the number of markets examined; transaction type and size; and how easily a quote can be obtained), and prove that they utilized "reasonable diligence" in choosing how to route the order for execution (note: MiFID II calls for "sufficient steps" to ensure favorable execution of client orders as opposed to "reasonable steps"). Mercy to the brokerage community for their regulatory burdens! Everything has a cost to it – subscribing to proprietary feeds, connecting to more trading venues, demonstrating best execution compliance, use of transaction cost analyzers, etc.

We agree *institutional orders trade significantly differently and their orders have significantly different characteristics compared to retailers. Measures of success are highly varies from Institution to institution and in order to order. Defining in the executing the optimal solution is highly situational and it is very difficult to operate under a predetermined set of rules or metrics. Take an example of an institution that own 25% of a company was called 2 million shares of stock to trade and millions day if they were to execute at a fairly moderate percentage of the volume, ... would take that 20 days complete that order for a variety of reasons that tie frame might be unacceptable to give an institutional investor, it might be too risky for them to hold the stock over that period or they might need to redeploy the cash somewhere else to name one of many possible reasons. So in circumstances like that institutions frequently look to trade the buyer sells of stock with a broker-dealer, to achieve certainty of price and/or best execution both, those considerations often outweigh solely price at the NBBO. So such blocks typically occurred at a premium or discount the last sale and the ability to trade in that manner is a key component of liquidity in US listed stocks and one that institutions depend on importantly even for institutional investors that don't frequently engage in block form, the distance of the block market service an important backstop to more passive execution styles. So the last sale in itself carries a lot of spread if an institutional BestEx rule to find blocks that trade away from the NBBO for executions before we executed that would likely make both institutions and broker-dealers significantly less likely to engage in block forms, we worry that could constrain liquidity and US equity market.*

We think the industry should do a better job demonstrating that conflicts of interest do not exist and have appropriate controls to prevent it. Sharing with regulators on a quarterly basis data on "where" customers' orders are routed is relatively easy for broker-dealers. The hard part is "when" routing should happen in order to qualify for the "best market-timing" for order execution. Per this empirical research, "Market makers are willing to reduce or eliminate execution advantage to exploit the information advantage". Hence, raising additional concerns for "selective timing" to get in-and-out of market, or if firms may classify a trade as dealing with "counter-parties" when they want to escape the fiduciary responsibilities, and classify a trade as dealing with "clients" for the ease of Volcker Rule compliance. *So now we have third parties to review all of the 605. We have to check them because it is still our responsibilities.* Somehow banks outsource trading to execution service vendors, and these vendors have another set of third parties to review order routing and execution quality. How bureaucratic rules became a cottage industry. God knows if rubber stamping on 605 reports is any good as compared to thorough assessment of market makers' risk profile and market timing.

We despise subjective rules that focus on how well a firm or their consultant articulates about their internal controls, policies, and procedures. It is easy to raise the alarms about corporate governance and risk culture improvements. However, what good is this when top bosses may just be paying lip service or bragging about its control strengths, as in this $7.2 billion loss case. After all, *this BestEx concept that we could have a BestEx rule from the SEC seemed extremely nebulous. Absence of more clarity about where this is, what the intention is of clarifying BestEx, it is really hard to say where we should go with that. The SEC is going to need to consider how their potential BestEx rule will interact with* [SEC rule] *605, with OPR* [order protection rule], *with FINRA* [to make available certain order execution information, facilitating the uniform public disclosure of order execution information by all market center] *and MSRB* [G-18 requirements tailored to the characteristics of the municipal securities market] *rules because if these rules are conflicting in any way that would obviously present significant challenges.*

Modernize 605 Disclosure

Rule 605 has not been updated since 2000. We need to modernize the disclosure, but until we understand what changes will be in NBBO right pricing increments, best execution rules, [and] ***who is really the intended audience?***

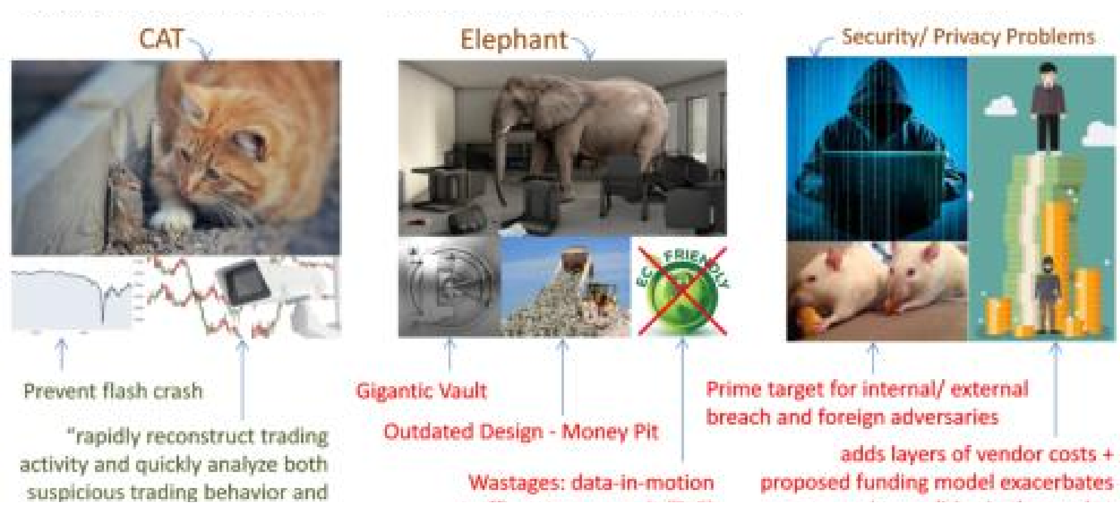
Current 605 reports are complex, even to some of the people in this room. Part of the problem is the terminology, [such as:] *effective over quoted spread, spread capture, liquidity enhancement. If you suddenly add odd lot or we change tick sizes significantly, liquidity fragments it exacerbates that problem. You wind up in getting even more distortions in 605. If we don't have a good yardstick, we need to fix the yard stick first and then may be after you spend a lot of time looking at what the new measurements are; you can be more informed about the tool making as opposed to cutting first and then measuring and seeing whether or not the cut is where you want to be.*

Follow a standardize template to report on summarize metrics across all client's marketable orders grouped by order size and liquidity [and give] *client context of how far away that trade was executed for midpoint,* [are easier said than done]. *It is hard drive for consensus. Give it a shot to download a 605 then tell us what you are able to decipher* [amid] *retail clients* [meant to be] *the intended audience. In my 20 years of interact with retail clients, never one ask about 605 or 606 ever, so who is it for? Primarily, broker dealers, routing firms, wholesale market makers and exchanges,* [and] *the other audiences are the press, regulators, and academics. Keep in mind whatever is out there always something that comes back* [to] *tell a story that might not see the intended purpose.* How is it possible that a disclosure rule was developed in 2000 and people are still questioning for whom this information is prepared?!

Some said *the SEC is a disclosure agency... Leave the best way to address this conflict it is really through better transparency holistic trade execution quality… let's not make the perfect enemy of the very good… wouldn't under estimate the ability once that information is out there in the public,* [and] *believe individual investors should have the same level information to compare standardized reporting across different brokerage.* We said, Metrics are rarely effective to deal with rapidly evolving issues proliferated by hidden problems and silos. Recall the one firm who invented the most widely used Value-at-Risk metric, also failed in 2012. Good luck catching irregularities through the use of flawed metric reports. Heighten disclosures in the beautified name of "improve transparency" may indeed be bad policies for an uneven playing field hurting the smaller players, increase costs to operate and deter new entrants into the markets.

Let us replace the current 605 reporting with some sort of annual inspection sticker mechanism. As an analogy, one does not need to know the technical details of a smog test, while everyone knows that car without proper sticker should not be on the road. Data Boiler would be happy to become one the designated inspection stations to conduct the necessary tests. Besides, this can even be a 2-for-1 deal, saving broker-dealers' effort in submitting data to Consolidated Audit Trail (CAT).

The CAT's technical design since 2012 as a golden-source while well intended (or a "gigantic data-vault") is out-of-date. It will take "forever" to produce a "golden" unified "single source of truth". All the non-essential data 'at-rest' and 'in-motion' makes CAT more vulnerable to security threats than modernized Real-time analytical platform (RTAP). At Data Boiler, we advocate for a decentralized approach to market surveillance. Data should be analyzed directly at its source to minimize data-in-motion. Besides, why should one who is doing things fairly and squarely be subjected to regulatory scrutiny and CAT cost burden?



We question the motives of those trying to *use CAT data to produce consistent reports from the SEC and FINRA repository data.* The CAT project is outsized and is a Money Pit. Referencing to 2022 CAT Budget , $118.7M (73.8% of total technology cost or 69% of operating cost) goes to (Amazon AWS) Cloud hosting services. Another $10.4M (93% of 2022 General and Administrative budget) is allocated to Legal, Consulting, and Insurance cost. How lucrative! The entire industry footing the bill for these CAT vendors, while only $2.67M (1.5% of Total Expenditures) is capitalized by FINRA CAT. Such a low capitalization rate tech project would never get approved in the private sector unless it being a state-run monopoly. Section 31 like fees should be discouraged and avoided wherever possible. If the CAT project funding is a "pay to play" bundled cost to participate in a market, then this "tax" or "Financial Transaction Tax" (FTT) is a barrier of entry inconsistent with the competition, capital formation, and other goals of the Exchange Act.

DATA BOILER TECHNOLOGIES, LLC

BIG DATA | BIG PICTURE | BIG OPPORTUNITIES

We see big to continuously boil down the essential improvements until you achieve sustainable growth!

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Noumenon of US Equity Market Structure

Other Remarks and Conclusions

A semblance great – the US equity market being envy of the World. Keep in mind that the US trading ecosystem is both in competition and compliment to over 250 trading venues around the World, of which many represent the sovereign interest of foreign nations. Complacency may lead us to forget the noumenon of Reg. NMS, or the so-called "venue-by-venue competition" is indeed a brutal Warring States Period.

Mercy to the ordinary market participants (the smaller players in both institutional and retail), they have to jump through hoops and be subservient to the elites (*clubs* - quo pro quo) to stay in business. The gap between the 'haves' and 'have-not' is too wide.

- Trading venue perimeter allows for assorted incentives and business models. Elites are getting 32 mils super tier rebates and other privileges, while others may get nothing.
- The assumption of the SEC's market data infrastructure rule (MDIR) that is based on 10G speed is fundamentally flawed. The SEC allowed the NYSE to implement 100G connections for their proprietary feed in April 2020. Denying the need to enforce a Speed Limit is either naïve or disrespect to the wisdom of former SEC Chair Mary Jo White who notably said, *"deemphasize speed as a key to trading success..."* We advocate the use of time-lock encryption (TLE) to make market data available securely in synchronized time. Rest assured that TLE is not another speed bump.

Therefore the SEC should step-in and consider overhauling Reg. NMS. Yet do not fall for the trap in becoming the elephant in the room. The SEC should refrain from playing the role of field supervisors to micromanage others. Contemplating tick size/ minimum pricing increment, redefining NBBO, accelerating odd-lot/ round lot, and favoring auctions could well be a separate discussion about different market centers' capabilities. It is importance to have positive tensions among constituents and strive for an appropriate balance in a DeFi ecosystem. Let us not deviate from the fundamental functions of a stock market:

- Market is a place where diverse parties come together to discover price.
- By having an efficient and effective way to delineate rights through stock trading, resources are pulled together and deployed, rather than withheld by mistrusted parties.

- Markets should be an open system allowing participants to trade under 'free will', with the belief that it will yield better productivity, GDP growth and wealth creation than 'planned economy'.

The shadow of a shade – Access fee rebate, PFOF, and market data/ market structure issues are all intertwined. What Gets Paid and Who Gets What must base on clear delineation of rights and obligations. Think about what gives rise to arbitrage or pick off on price. Anyone would have done it if they do not have to bear the corresponding cost in using others' copyrighted materials. BestEx, order protection and ways to curb conflicts of interest all boiled down to tweaking incentives causing it to be economically not viable for a constituent to exploit its economy of scope, scale, or engage in other misbehavior acts.

The US equity market never lacks competition. Indeed, we have more than enough markets but insufficient "Farmers" (see this value chain smile curve) and diversity to work in the field to bear fruit. Healthy markets need both "Hunters" (Performance Optimizers and Asset Gathering) and "Farmers" (Asset Maximizers and Customer Service); don't shoot the messengers (Principal Trading Firms). Market operators make more money selling "opioids" (TCA, liquidity sourcing, outsourced execution tools to fabricate fragmented markets are like addictive drugs) than "fruit".

Warlords are staking claims everywhere in DeFi division of the markets. If the SEC does not want to be perceived as price control interference of markets (big picture is formless), the only way to drive orderly function of markets is by aligning and making values transferable across different trading platforms. For that, copyright licensing mechanism from the music industry has shown us a roadmap. Data ownership/ intellectual property right is the only thing that can address the issues across the access fee rebates, PFOF, market data and whatnot. Rest assured it is market driven, and not subjective judgement on what should be the equivalent value of price versus size improvement.

- The approach is simple – trading platforms would be based on who they want to serve, how many subscriptions they are going to get and determine whether to carry a broader or narrower "catalog". The broader the "catalog", the platform would pay a wider range of broker-dealers, featured traders, algo developers in royalties.
- Best of all, it is time tested against decades of lawsuits in other industries to assert data ownership claims, as well as effective to deal with bilateral and multilateral agreements embedded in formal and informal networks.
- This copyright mechanism and our suggestion of a "sound library" would allow for creative discovery of unknown unknowns, which can be anybody's game. It will minimize the gaps between the 'haves' and have-not.
- There will be opportunities to earn royalty's payments, 2nd profit for unused algorithms, off-loading of certain staff costs while incurring minimal in royalty admin fees, payment for usage of others' algo IP, and subscription for pattern monitoring services. Existing vested interests, other encumbrances, and new entrants can all flourish under this recommended approach regardless of interactive or non-interactive subscription services they choose.
- Policy makers should welcome this approach because the only way to regulate the decentralized equity markets is via decentralized crowd intelligence.

At Data Boiler, we see big to continuously boil down the essential improvements that fit for your purpose. We are about finding rare but high-impact values in controversial matters, straight talk of control flaws, leading innovation and change, and creating viable paths toward sustainable growth of the overall pie.

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Kelvin brings over 25 years of big data experience to FinTech innovations. His patented invention has earned him a nomination for the FinTech Person of the Year Award in 2015. In his prior career, he was VP at Broadridge, Functional Head at Citigroup, and Examiner at the Institute of Bankers. His proven successes include formulation of a 500+% growth model, products and e-banking platform development, and led M&A research. He has spoken at various professional organizations, and served as Tech Advisory Council committee for the Financial Services Roundtable/ BITS (Banking Policy Institute). He holds an MSc degree in Banking from City University, a Master of Management from Macquarie, and a BSc degree from Bentley University.

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