Zicklin School of Business Financial Markets Series

Robert A. Schwartz
John Aidan Byrne
Eileen Stempel *Editors*

Equity Trading Round-Up

Proposals for Strengthening the Markets

Springer

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New York, NY, USA

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To our friend, R. Steven Wunsch

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Preface: Equity Trading Round-Up: Proposals for Strengthening the Markets

Robert A. Schwartz, Speiser Professor of Finance, Zicklin School of Business

The title of our conference this year is Equity Trading Round-Up: Proposals for Strengthening our Markets. I want to start by thanking Larry Tabb of the Tabb Group for his collaboration with this conference. I'm very pleased, Larry, to have your name listed next to mine on the program.

We have an excellent array of speakers, today. I am proud about our keynote speakers: Reto Francioni, CEO of Deutsche Börse; Kevan Cowan, president, TSX Markets and Group Head of Equities at TMX Group. I was just up there about a month ago in Toronto, looking at the Toronto Stock Exchange. Toronto was the first exchange globally to introduce electronic trading. I am also looking forward to another keynoter, Seth Merrin, founder and CEO of Liquidnet. Then, our closing keynote speaker is Tom Farley, President of the New York Stock Exchange.

We owe a huge debt of gratitude, as always, to our sponsors: BATS, BIDS, Bloomberg Tradebook, Canadian Securities Exchange, Deutsche Börse, Instinet, International Securities Exchange, ITG, Liquidnet, NASDAQ, NYSE, PDQ ATS, TABB Group, and TMX Group.

We have a most distinguished and diverse audience here today. It represents many countries and professions. The industry at large—the very backbone of our conference—is well represented. Professors from a sizeable number of academic institutions are here, as are numerous media reporters along with some of my students. Their presence is a great personal pleasure. I don't really recognize my students in suits, and they don't seem to recognize me either. But it's great to see them! [laughter]

Thanks are due also to the *Institutional Investor*. More specifically, to *The Journal of Trading* at *Institutional Investor,* for publishing a panel discussion from our October, 2011, conference.[1] It takes more than a year for us to finalize the editing and to publish the book, so every year we fall further behind. But we have a great record of accomplishment. And, as you sweep back over the 17 years of these

[1] *What Makes an Exchange a Unique Institution?* Robert A. Schwartz and John Aidan Byrne. *Journal of Trading, Institutional Investor.* Winter 2014. Vol 9. No 1: pp 22-23.

books, you are reviewing a very interesting documentary of how our markets have evolved and of how our discussions about them have also evolved.

From that 2011 conference, the aforementioned panel discussion moderated by Andy Brooks, "What Makes an Exchange a Unique Institution," was published in edited form, in the winter 2014 issue of *The Journal of Trading*.[2] And then, guess what? Ian Domowitz of ITG responded to our published piece in a subsequent issue. It was a magnificent exchange of ideas. Ian wrote a thought-provoking critique of the panel discussion. When we wrote a reply to his comment, that, too, was published in the summer 2014 issue of *The Journal of Trading*.[3]

Now let's cut to the chase: "Proposals for Strengthening the Markets." The very title of today's conference implies that something is not working well with our markets. This thought has been clearly and widely expressed by others. As we speak, a great deal of regulatory attention is being devoted to market structure issues. The industry has been most kind to me, and to us all here at Baruch, because the issues are never really resolved. There is always good substance for another Baruch conference.

I'm curious who here has read Flash Boys?[4] Would you raise your hands? I promise I will not ask what you think of it. Thanks, I would say that most of you have read the book. Well, that certainly has generated a lot more attention, a lot broader attention, and a lot more regulatory attention.

I'll take you back to 1975. The US government involvement in market structure issues firmly took hold that year with the enactment of the Securities Acts Amendments of 1975.[5] The government precluded Wall Street from ever returning to fixed commissions. But, for our purposes here, it was Congress's mandate for a National Market System, or NMS, that is most relevant.[6] Did Congress know in 1975 what an NMS is, or should be? I love the idea that, of course, we should have it, but we don't actually know what it is!

Do we know today what an NMS is? What the national market system should be? It's a great term. We have 13 exchanges, and over 40 Alternative Trading Systems (ATSs), all spouting electronic connectivity. Is this a good NMS? I predict that we will get into this issue in our discussions today.

Trading systems, as we know, are complex. Designing a system is far from simple. Interfacing these alternative markets to achieve a robust national marketplace is

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[2] Ibid.

[3] *What Makes an Exchange a Unique Institution?* A Response to Ian Domowitz, Robert A. Schwartz, John Aidan Byrne, and Andrew M. Brooks. Journal of Trading. Institutional Investor. Summer 2014, Vol. 9, No. 3: pp. 12-14.

[4] *Flash Boys: A Wall Street Revolt. Michael Lewis* (2015, WW Norton & Company, LLC).

[5] Federal legislation launched on June 4, 1975, to amend the Securities Exchange Act of 1934. The 1975 amendments instructed the Securities and Exchange Commission to cooperate with the industry in creating a National Market System (NMS) along with an ambitious system for the clearance and settlement of securities transactions nationwide. The amendments also provided for the prohibition of fixed commission rates, promulgated earlier by the SEC in its Rule 19b-3.

[6] Ibid.

not simple. In the face of this complexity, how much freedom should individual venues have to determine their own structure? How much freedom should the broader marketplace have to evolve naturally?

The complex issues that we're facing today put me in mind of the Gordian knot.[7] Remember, the Gordian knot that Alexander the Great slashed with his sword? How do we unravel that knot? What effect did Reg NMS with its trade-through rule have on the Gordian knot?[8] Has the 2005 regulation solved it, or has it further tightened the knot? Perhaps we should call it the government knot. Why not?

Back then, Paul Davis and I warned against the trade-through rule. Paul is with us today. We produced a Comment Letter filed with the Securities and Exchange Commission as part of the TIAA-CREF Comment Letter.[9] Almost a decade later, I have not changed my opinion on Reg NMS's trade-through rule as outlined in that Comment Letter. Paul, can I tell them that you haven't changed your mind either?

PAUL DAVIS: That's correct.

SCHWARTZ: Isn't that something. So, do we all agree that proposals are called for? Let me mention a few proposals that are high on my list. I have divided these proposals into two groups. The first concerns decision-oriented proposals, not specifically about what to do. This group involves how we might best formulate the problems that we are facing. In academic terms, what should our conceptual framework be?

First, it's widely believed that competition is good. Competition is certainly good. Sure, who would debate that? But what kind of competition should we be promoting? Attention always seems to be focused on competition between alternative trading venues. It's gotten the lion's share of our attention.

There's another form of competition that deserves more attention. It is competition within the order flow. Now, if you say that competition within the order flow is good, you are calling for consolidating the order flow and, by extension, for consolidating the markets. So, where do we stand on this competition front? Competition between multiple venues or competition within a venue?

Second, I propose that we focus more on the quality of price discovery. Where's my co-author, Sila Alan?[10] Some of the work Sila and I have done together suggests that the sharpness of price discovery is more important if on public policy discussions

[7] An extremely difficult problem, or "knot" to disentangle, often used as a metaphor for a challenging problem, which can be solved easily by finding a loophole or by thinking creatively.

[8] Reg NMS (Regulation National Market System) was adopted by the Securities and Exchange Commission in 2005 and introduced 2 years later to further advance the ideals of a national market system. The regulation includes the order protection or trade-through rule; access rule (fair access) to market data including quotations; and rules on sub-penny trading and on market data.

[9] Comments on SEC Reg NMS: The Trade-Through Rule. Paul L. Davis, Managing Director, TIAA-CREF Investment Management, LLC. Robert A. Schwartz, Marvin M. Speiser Professor of Finance, and University Distinguished Professor Zicklin School of Business Baruch College, CUNY. January 26. 2006. http://faculty.baruch.cuny.edu/rschwartz/SEC%20Comment%20Letter%5B1%5D.pdf

[10] Nazli Sila Alan, Ph.D., Assistant Professor of Finance, Fairfield University Dolan School of Business.

than the size of bid-ask spreads. So, why isn't it given sufficient attention? The reason: it's very hard to assess empirically the quality of price discovery. What do you contrast it to? Spreads you can see. And if you can see them, you can measure them. Of course, there are different ways of measuring spreads. Nevertheless, it's tangible. Now, if you can see it, if you can measure it, then you can have policy proposals to shrink it.

What about the stability of the quotes? Our approach to understanding price discovery is to look at the level of intraday volatility. What explains it? Is it bid-ask bounce? Is it market impact? Or is it noise in the price discovery process?

Here is a price discovery related thought. We should take into account the public goods attributes of price discovery. You want good price discovery, not just for the people who participate in a trade. You need it for the broader market. We've noted in a number of places what that broader market consists of. It's people who use exchange and/or market produced prices (for example, derivative pricing, mutual fund redemptions, and estate valuations).

We should explicitly recognize that the continuous trading environment will never be a fair and level-playing field. It's an inherent dynamic of the continuous market. If we keep trying to level the field, to make it fair, if we keep that as our goal, it can have what in medicine is called side effects. In our field, it's called unintended consequences. We should keep that in mind.

I suggest that we rethink the use of the time clock. Given our ability to measure time in miniscule fractions of a second and because we can track the actual sequence of events in milliseconds, the sequence of order arrivals matters in these extraordinarily small intervals of time. I will repeat: the sequence matters even when orders are separated by only microseconds. In the days of yore, when activity would really heat up by a specialist's post on the floor of the New York Stock Exchange, the specialist would say, "Whoa, whoa, whoa, there's a bunch of you. I don't know who is pairing off with whom, I don't know the price, we have to find it, we have to deal with it." So the specialist would deal with the crowd and find a price. I was there back in the day. I saw it happen. Back then, the market would effectively transition into a call auction. But with electronic trading, that doesn't happen today. With the super rapid time clock, you can separate orders according to their sequence of arrival. Does this make sense? Is it good to do this? Yes, if it's a horse race. In horse racing you want to declare a winner, and there's great economic value to being the winning horse. If trading is a horse race, wow, then my horse might be able to get there first—and win by a nose. Wow, I could win by a millisecond! I win, because the sequence of arrival matters, because the sequence has economic significance.

This puts me in mind of a story. It is about two campers in the woods of Maine. Two campers. Their names, Mike and Louis. They were in their tent when Louis heard a thrashing outside. He stuck his head out and saw a bear. "Mike," he shouted, "there's a bear out there, we'd better get out of here." Meanwhile, Mike was putting on his shoes. "Michael," Louis said, "why are you putting on your shoes, you'll never be able to outrun the bear!" And Michael responded, "I don't have to outrun the bear, Louis, I just have to outrun you."

Here is my last conceptual framework proposal: We need an environment that generates meaningful innovation. Two problems, in particular, still confront us: One, what is the best way to handle large orders for all stocks; and two, what is the best way to trade small caps? We all know about this. I am simply underlining them.

We now have over 40 ATSs and dark pools. How many of them represent truly different ways of trading? Is it competition? When you take microeconomics at Baruch or elsewhere, and you talk about competition, it is generally seen as a way to drive down prices. In the real world, in our world, competition should very much be in terms of product quality. Do we benefit because the number now is 40-plus instead of, let's say, 10 or 15? How many do we need for inter-market competition to be vibrant? I have three specific structural proposals. One I have advocated for a long time, and that is call auction trading. A call auction is a way of consolidating liquidity. It delivers temporal consolidation. I believe that attending that temporal consolidation will be spacial consolidation. When properly combined with continuous market trading, a call auction is a viable alternative that I'd like to see people use more.

Call auctions underscore two other proposals I have advanced. One is supported by my work with Liuren Wu; it involves what we call "staccato trading." How many of you were music majors? Do you know what staccato means? It's da-da-da-da-da instead of mmmmmmm. For us, it is point in time trading, not trading at any moment in continuous time that a buy and a sell order cross.

To illustrate, let's assume a 1 s interval. Every second, you batch the orders. All orders that arrive within the same second get the same timestamp. Then, within a 1 s interval, there is no significance attributed to the sequence of order arrival. All orders with the same second that match or cross are batched together, and executed at the same price according to standard call auction principles. It is in the same spirit of what specialists used to do.

Third is a proposal that I first thought of and put forth in 1988 and have resurrected again. Sila Alan is a partner in this project, so too is John Mask who was at Deutsche Borse during our collaboration.[11] In this proposal, I suggest corporate involvement in liquidity provision. I will not go into it any further now because I don't want to front run what Sila might say on her panel. And Sila, if you don't say enough about it, I promise I'll ask you a question.

However, I will say now that getting listed companies involved is a startling idea. The companies say, why us? That's not our job! Yet, it's their stock and, frankly, I think that they should care. They should care about the accentuation of intraday volatility. They should recognize that price discovery is a public good. And they should know that they are in the catbird seat. They are in the best position to guarantee optimal provision of something that is a public good.

Now I will do something that is a source of great pleasure for me. I will introduce my friend Reto Francioni of Deutsche Börse. Reto, I so very much appreciate your

[11] *A Liquidity Program to Stabilize Equity Markets*, *Journal of Portfolio Management*, August, 2014. Nazli Sila Alan, Fairfield University, John S Mask, Deutsche Börse AG, Robert A. Schwartz, Baruch College—CUNY https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2495819

presence here. I know you flew into New York on a late afternoon flight yesterday and are flying back to Frankfurt in an afternoon flight today. And Reto is here just because of us. This is Tuesday; he gets back into Frankfurt on Wednesday. He then goes to Berlin. I did not have the courage to ask him what he's doing on Thursday. Reto, please come up here, my friend.

New York, NY, USA Robert A. Schwartz
Rockaway, NJ, USA John Aidan Byrne
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List of Participants

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Contents

Chapter 1
Trading, Clearing, Custody, and the Worldwide Evolution of Exchanges as Unique Organizations

Reto Francioni

There is a singular battle among exchanges that never ends. This battle is an eternal fight for the lifeblood of any exchange—it is for liquidity and order flow! And, by the same token, institutional investors at the other end of the value chain—that is, hedge funds, mutual funds, and other big investors—are also fighting each other for the generation of order flow.[1]

Trading, and the creation and/or concentration of liquidity, is just the first link in this same value chain. Since we are also talking about regulation at our annual Baruch conferences, we have to remember some key developments. For instance, in Europe, you will see the vital role of central counterparties—pools of liquidity providers—as the second link in the value chain. If you want to trade in international markets, clearing services are a perquisite. Clearing is primarily about managing counterparty risk, usually on a state-of-the-art, real-time, online platform, so that the data on trades can be used by the markets for their risk management.

Clearing houses also deal with market risk. If you accept a specific product at your clearing house, you can sum it up, see the key players, and all the positions that have accumulated in that product. You can run stress tests to evaluate potential outcomes under different market conditions, and impose margin calls on clearing members accordingly. In other words, you can estimate the market risk associated with the product and the market players. At the end of the day, clearing houses play a major role in preventing the domino effects that can harm financial markets.

Custody is the third link and the third liquidity pool in the value chain, where this fight for liquidity takes place. And we are talking big volume. For instance, assets

[1] In the US markets, for example, brokers are clearly competing to capture the order flow of retail investors, either by matching transactions off exchange and capturing the spread, or else oftentimes by routing the flow to an exchange that pays the most competitive rebate within the regulatory rules.

R. Francioni (✉)
Deutsche Börse AG, Frankfurt, Germany

R. A. Schwartz et al. (eds.), *Equity Trading Round-Up*, Zicklin School of Business Financial Markets Series, https://doi.org/10.1007/978-3-030-51015-2_1

under custody at Deutsche Börse's Clearstream have a value of approximately $12.4 trillion.[2] So we are talking real money. Strategically, if you can mobilize at least part of this as collateral for pledging (for instance, for margin calls in the clearing house), that's a real next step for banks and investors within the exchange organization's value chain.

Finally, the active management of the value chain, including a response to market volatility, is part of the solution offered by exchange organizations to capital markets.

And that is basically the core of my speech today.

So what is the output of exchange organizations? The answer used to be simple: An exchange or exchanges organize and run regulated markets, full stop. Until relatively recently, this has remained the core competence of exchange organizations. Today, their task has become more complex. Along the entire value chain—and that includes every liquidity pool—risk management has become an essential part of the work of exchange organizations, not only for counterparty risk but also for market risk, liquidity risk, and operational risk. The increased emphasis on risk and the corresponding regulations have made collateral management through CSDs and ICSDs—that is, custodians—a strategic reality.[3]

For instance, Clearstream has developed offers for collateral management so that market participants can mobilize sufficient collateral at an acceptable risk and cost. In order to fulfill this complex task, or at least part of it, exchanges need to become exchange organizations.

Exhibit 1.1 shows the diversification of exchanges as a consequence of the increasing complexity of markets. Exchange organizations are committed to providing efficient markets as well as investor protection. But they also act to ensure a fair allocation of risk and responsibility for all market participants. This is why exchange organizations worldwide operate not only regulated markets for an increasing range of asset classes but also operate clearing houses, settlement and liquidity management engines, and market data providers. And, last but not least, the leading exchange organizations operate across the globe.

In the final analysis, this is also a sign of system protection through exchange organizations. This development can perhaps be summed up by using three Deutsche Börse claims, which are representative of three different stages of development of exchange organizations in general.

The next three slides explain these different stages.

Let's start with "just another company." That is how one former European exchange leader described exchange organizations in the middle of the "irrational exuberance" phase of the stock market of the 1990s, and the early years of the new

[2] http://www.clearstream.com/clearstream-en/

[3] A central securities depository, or CSD, is a special financial entity that keeps securities, such as shares, either in certificated or uncertificated, that is, so-called dematerialized form, so that ownership can be easily transferred through book entry, rather than by the transfer of physical certificates. An ICSD is an international securities depository.

		DEUTSCHE BÖRSE GROUP	CME Group	ICE	London Stock Exchange	NASDAQ OMX
Cash	Xetra/Eurex	●	○	●	●	●
Derivatives	Xetra/Eurex	●	●	●	◔	◑
Clearing	Xetra/Eurex	●	●	●	◔ 1)	○
Settlement	Clearstream	●	○	○	◑ 2)	○
Custody	Clearstream	●	○	○	◑ 2)	○
Securities Financing	Clearstream	●	○	○	◑ 2)	○
Market Data	MD&S	●	●	●	●	●
Index business	MD&S	●	◔	○	●	○
External IT	MD&S	●	○	●	●	●

1) CC&G as CCP for Italian securities (planned acquisition of a majority stake in LCH.Clearnet not considered)
2) CSD only (Monte Titoli)

Exhibit 1.1 Service offering of exchange organizations worldwide

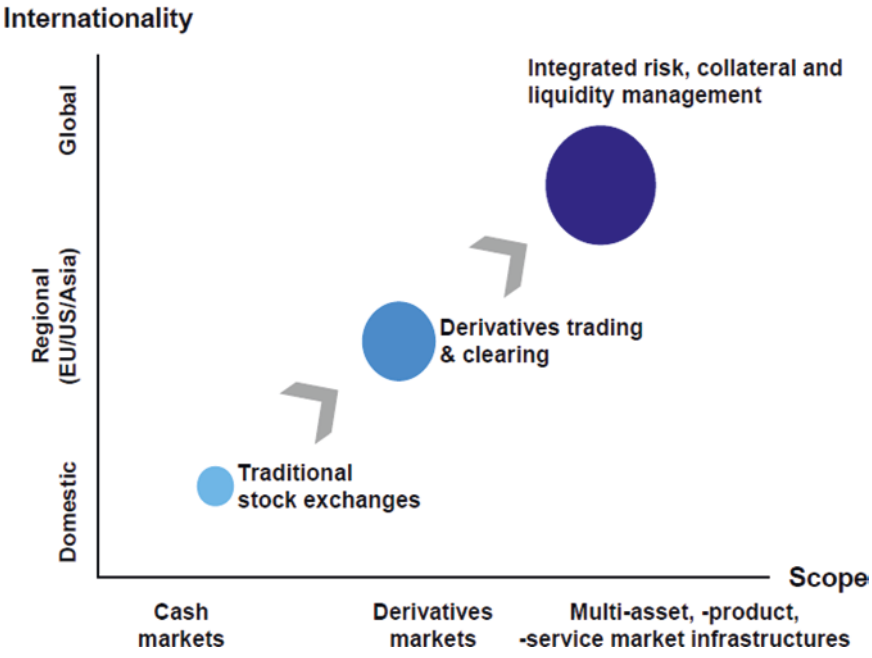

Exhibit 1.2 From, "just another company" to, "an other company"; second, "Not just another company"; and third, "Another company"

century, to quote from the title of Yale Professor Robert Schiller's book, and in an echo of Alan Greenspan's famous comment.[4]

The description reflected the development of exchange organizations from member-owned utilities to publicly listed IT companies, with a specialization in capital market services.[5] The 1990s completed the first electronic revolution for the world of exchange trading. Electronic order-driven markets allowing remote access and automatic price discovery at unprecedented levels of transparency, quickly replaced the old system of intermediation on trading floors.

The battle for the Bond Future, the interest rate derivative based on 10-year German government bonds, took place between London-based LIFFE—an exchange of the "old school" with a physical trading floor—and the predecessor of what is now EUREX, as the proponent of a fully fledged electronic trading platform. Eurex won because of its technological edge.[6] Apart from bringing about a massive increase in market efficiency, the electronic trading platform enabled Eurex to directly connect to American traders: The exchange put the front-end into the customer's office, or into the customer's office, wherever this office happened to be.[7] Between 1997 and 1999, its market share increased from 30% to nearly 100% of the German bond derivatives, with no liquidity fragmentation anymore.

Eurex is, of course, only one example of many. The pioneer was NASDAQ, with its electronic quotation system dating back to 1971. And in 1977, the Toronto Stock Exchange pioneered electronic trading among national stock exchanges.

Electronic trading also had massive consequences for the governance of exchanges. The old systems, which limited exchange participation to a presence on the trading floor, became obsolete. Trading and exchange ownership could be separated. This was the precondition for the demutualization phase: In the early 2000s, this paved the way for exchange organizations to become publicly listed entities, thus opening new dimensions in terms of leverage for global expansion, and better vertical integration. Therefore, in a way, the majority of exchange organizations in fact, became "just another company." And this internationalization, through cross-border transactions between the exchange members, made a central counterparty indispensable.

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[4] The description, "just another company" could also equally be applied in the plural form for exchange organizations.

The then-chairman, Alan Greenspan, in a speech at the American Enterprise Institute during the dot-com bubble of the 1990s, coined the phrase "irrational exuberance," as a clear warning of how the market might then be overvalued.

See, *Irrational Exuberance*, Robert J Shiller, Princeton University Press (2000).

[5] The speaker is referring to the transformation of exchanges into organizations with advanced technological capabilities alongside other services, as he goes on to explain in more detail.

[6] In the 1990s, LIFFE, the London Financial Futures Exchange, saw its dominance wane in the trading of German government bonds futures, or the Bund. LIFFE lost ground to the Frankfurt-based Deutsche Terminbörse. This shift became known as the "Battle of the Bund." Eurex, created in 1998, ultimately won in this grand market battle.

[7] The "front-end" is describing the electronic connectivity platforms, linking the exchanges with their customers for order routing, exchanges services and other functions.

Now we move on to, "not just another company," starting around 2005. A further paradigm shift took place in exchange strategies. This shift partly anticipated, and was partly intensified by the global political response to the financial crisis of 2007 and 2008.[8] This response amounted to nothing less than a U-turn in the policy approach to the financial sector, from deregulation to reregulation.

Regulated markets, embedded in diversified exchange organizations, form a significant part of the solution developed by policy makers and market practitioners worldwide. This is because central counterparty clearing (CCP) is identified as having the potential to substantially strengthen the systemic stability of capital markets.[9]

The bursting of the dot.com bubble in 2000, the accounting scandals of 2003, and last but not least, the financial crisis of 2007–2008, brought home an important message: We must stop seeing regulation and free markets as inimical to each other, or as a contradiction.[10] Simply stated, only regulated markets are free markets with the important proviso, however, that regulation needs to refrain from intervention. Unregulated markets, on the other hand, are "free" but only for those who have privileged access to either information, capital, manpower, or to all three combined.

Therefore, an exchange organization is not just another company. It is different from other companies, especially banks, by being a neutral arbiter—and risk manager—of conflicting interests. Also, creating and organizing capital market infrastructures on which safe and orderly trading, clearing, custody and settlement, and data distribution are possible. The connection/link between risk and responsibility is reestablished at an exchange organization.

This argument has one important implication—there must not be unfettered competition for regulated markets. The legal system of a democratic society is based on principles it cannot guarantee by itself. Likewise, the principles underlying a market-oriented economic system, such as equality of market access, full availability of price sensitive information, absence of market manipulation, freedom from distortion by the abuse of monopoly power, or undue government intervention, rest on foundations that do not just emerge spontaneously from the interaction of self-

[8] The well-documented global financial crisis of 2007 and 2008 was tied in the USA to subprime mortgage lending. As a reminder, the fall of Lehman Brothers, a global banking behemoth, in September 2008, almost brought the world's financial system to its knees. The worst recession in 80 years followed, but it took massive amounts of fiscal stimulus in the USA to avoid a downward economic spiral, according to financial historians.

[9] "A central counterparty clearing house (CCP) is an organization that exists in various European countries to help facilitate trading done in European derivatives and equities markets. These clearing houses are often operated by the major banks in the country to provide efficiency and stability to the financial markets in which they operate. CCPs bear most of the credit risk of buyers and sellers when clearing and settling market transactions." Source:Investopedia

[10] The dot.com bubble was an economic bubble of excessive speculation, roughly from 1997 to 2001, characterized by a period of extreme growth in the adaptation of *the* Internet by businesses and consumers. The bubble collapsed during the period 2000–2002.

See, *Top Accounting Scandals*. Consumer Finance Institute (CFI). https://corporatefinanceinstitute.com/resources/knowledge/other/top-accounting-scandals/

interested individuals. They need to be kept alive in public debate. They need to be secured by a market-friendly legal system; and they need to be implemented by institutions committed to organizing markets following these principles, by their legal setup and by their business model. In other words, by exchange organizations.

This does not mean that these exchange organizations should be completely exempted from competition. A dose of competition between globally operating exchange organizations, as well as supervised competition with other less regulated platforms, is helpful in keeping these organizations sensitive to customer needs. But opening up areas of opaque market structure in the well-lit transparent market will be self-destructive as the financial crisis of 2007, and the following years, should have abundantly demonstrated.[11]

The events of 2007 and 2008 unleashed a number of new regulatory initiatives. What is remarkable about them is that they harken back to a truly global initiative. It was at the 2009 G20 Pittsburgh Summit where governments of the leading economic powers worldwide came together and, among others, argued in favor of clear standards of transparency and risk management of the world's financial markets.[12]

In response, exchange organizations need to fulfill three things to cope with the new order and also to help the capital market participants to adjust. First, they need to diversify their business models—thereby lowering their exposure to now mature products subject to intense competition—and to expand instead into areas with higher potential for growth.

Second, exchange organizations should, apart from offering trading access to regulated markets, provide the market participants with systems and services, such as central counterparty clearing (CCP) and liquidity management, in the process increasing stability and lowering risk.[13]

And third, exchange organizations should exploit their in-house know-how in terms of IT.[14] Diversified exchange organizations are, therefore, particularly well qualified to support both regulators and customers in implementing and adapting to the new order.

Diversification has two dimensions: The horizontal dimension, which means stock exchanges with other stock exchanges, brought together for more efficiencies and better customer service under the same parent company. And that means first

[11] See, footnote 9.

For a comprehensive account of dark pools and there opposite in lit markets, see *Dark Pools: Fear of the Dark*. Third *W*ay. Lauren Oppenheimer, John Vahey. August 28, 2013. *http://www.thirdway.org/report/dark-pools-fear-of-the-dark*

As the authors explain: "Dark pools are private, electronic stock trading venues that allow buyers and sellers of a stock to be matched anonymously. In a dark pool, prices are not displayed to investors—stock prices are dark. Dark trading is an alternative to trading on a "lit" exchange, like the New York Stock Exchange (NYSE), where traders benefit from visible prices."

[12] The Pittsburgh Summit 2009 was the third meeting of various heads of state and governments to discuss financial markets and global economics, this time gathering in Pittsburgh.

[13] See, footnote 10.

[14] IT, acronym for investment technology

adding new products in existing asset classes; second, expanding into new asset classes; and third, expanding geographically. The second dimension is on the vertical level, which means along the value chain.[15] It refers to first building integrated value chains, for example, to enhance the straight-through processing of a transaction; and second, making the elements "trading," "clearing" and "settlement"—including custody of these chains—interact together, and developing new and innovative services and products. In other words, exchange organizations need to realize the potential they have already built up by diversifying their business. By doing so, they become truly "other," or unique companies. The most important elements of what makes them unique are central clearing for OTC derivatives, and liquidity hubs developed by international post-trade service providers.

These two elements are complementary. OTC clearing aims at improving the systemic stability of markets by demanding collateral. Acting as liquidity hubs, CSDs and ICSDs support market participants in making effective and efficient use of this collateral.[16] Taken together, these two elements alleviate the increased pressure on banks' equity capital reserves, resulting from the regulatory response to the financial crisis.

They make markets safer, while at the same time allowing market participants sufficient leeway to make a profit. By fulfilling this task, we ultimately support the real economy, which is served by the financial sector.

According to the Bank of International Settlements, the volume of OTC derivatives markets, measured in notional amounts outstanding by the end of 2013, amounted to more than $710 trillion, or 12% higher than the year before. So far, the percentage traded on derivatives exchanges and cleared via central counterparty clearing houses, CCPs, is very small in overall trading.[17] This means that up to the present day, a huge amount of extremely complex financial instruments, allowing highly leveraged trading strategies, is unregulated, unsupervised, and opaque.

It is about time to change this. And the first steps to this end have already taken place, at least here in the US, with the implementation of the Dodd-Frank Act.[18]

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[15] A perfect textbook example outlining the scope of integration and diversification is the 2012 acquisition of NYSE Europe by Atlanta-based rival IntercontinentalExchange (ICE).

"Provides for diversification among multiple asset classes and expands ICE's reach into new markets, including the world's largest asset class—interest rates—at current cycle lows." Source: BusinessInsider. SOLD: NEW YORK STOCK EXCHANGE GETTING ACQUIRED FOR $8.2 BILLION. Linette Lopez.

http://www.businessinsider.com/new-york-stock-exchange-acquired-2012-12

[16] See, footnote 4.

[17] See, footnote 10.

[18] The Dodd–Frank Wall Street Reform and Consumer Protection Act (commonly referred to as Dodd–Frank ACT) was signed by President Barack Obama, on July 21, 2010, in response to the financial crisis of 2007–2008. "An Act to promote the financial stability of the United States by improving accountability and transparency in the financial system, to end 'too big to fail', to protect the American taxpayer by ending bailouts, to protect consumers from abusive financial services practices, and for other purposes," according to the long title of the Act.

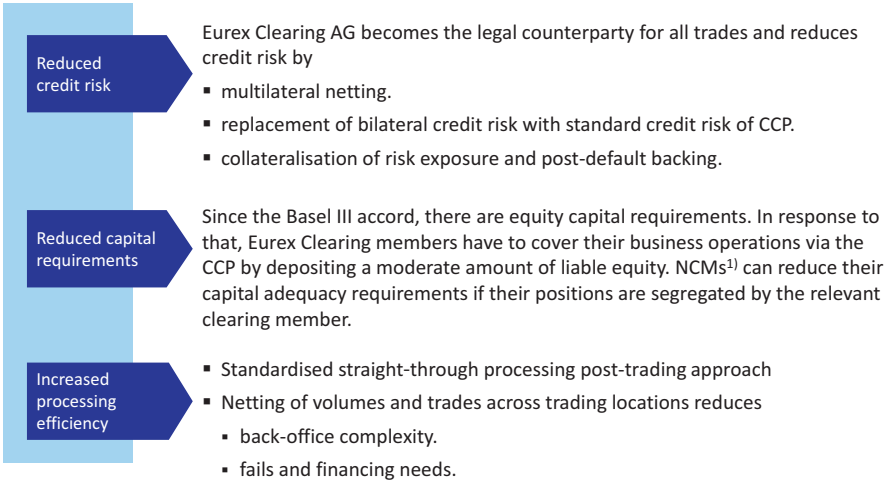

Exhibit 1.3 Central counterparty (CCP) clearing strengthens market integrity and increases processing efficiency

Europe, by contrast, is still in the process of catching up with a regulation, ominously called EMIR, which is short for European Market Infrastructure Regulation.[19]

The most notable difference between the US and the European approach is the scope of the proposed regulation. While Dodd-Frank covers trading and clearing, EMIR is set to regulate clearing only. Apart from that, due to the prevailing variety of national regulatory systems, its fulfillment is taking much longer in the European Union than it has in the USA. However, CCP clearing of OTC trading is at the center of both reforms.

CCP clearing changes the risk profile of capital markets and reduces the systemic risk. It changes the liability structure when we compare multilateral clearing with bilateral clearing. Multilateral clearing means every market participant with every market participant; bilateral clearing means every market participant with the clearing house. This dramatically changes the risk profile of a capital market. It changes and reduces the risks of OTC trading in three ways.[20]

First, for the lawyers or legally interested among you, the CCP, or central counterparty clearing, becomes a party to each cleared transaction through novation, replacing the contract between the two trading parties and the clearing house.[21]

[19] See, Financial Conduct Authority for more on EMIR. https://www.fca.org.uk/markets/emir

[20] For related material on the topic offering further insight and explanations, see, *Central Clearing of OTC Derivatives: bilateral vs multilateral netting*. Statistics & Risk Modelling. Roma Cont, Thomas Kokholm. Vol 31, No, 1, 3-22, March 2014. https://arxiv.org/abs/1304.5065

[21] "Novation is the act of replacing one party in a contract with another, or of placing one client or obligation with another. It extinguishes (cancels) the original contract and replaces it with another, requiring the consent of all parties involved." Source: Investopedia.

Novation does not build upon the existing contract, but rather replaces it by two new contracts. The counterparty risk is, in effect, reallocated.

Note that exchanges running cash or derivative markets have never been party to individual trades between trading members that take place on their trading platforms—the exchange is "just" a technology provider that ensures orderly functioning of the market. The CCP becomes the legal counterparty for all trades and every market participant (e.g., members) and, thus, reduces credit risk through multilateral netting effects, collateralization of risk exposure, and replacement of bilateral credit risk through the standard credit risk of CCP.

The credit risk of the CCP is substantially mitigated through clearing members' contributions to the clearing fund, which are based on their levels of risk exposure, and through clearing members' commitments to replenish the clearing fund should this be necessary. Essentially, there is a mutualization of risks across all clearing members, in proportion to their individual contributions to the CCP's overall risk position.

Second, capital adequacy requirements, according to Basel III, are reduced if trades are cleared via a CCP.[22] And third, the CCP increases processing efficiency through standardized straight-through processing and netting of volumes and trades across trading locations. This netting effect is enormous. The monthly average turnover at Eurex netted in 2013, was about €14.5 trillion, while residual outstanding positions of just €50 billion remained open after netting. That is the amount of margin calls with which a clearing house is managing the risk of the open positions.

CCPs do not take risks themselves. They manage risk on behalf of their members' trades.[23] And they calculate the risk of each open position, ideally in real time, and thus make the overall risk transparent to all participants. They ensure the matching of risk and responsibility for each individual clearing member by collecting collateral in the form of initial margins, and they build additional lines of defense by charging clearing fund contributions. They also substantially mitigate the potential domino effects resulting from the interconnectedness. That is because clearing also includes the legal stepping in between each trading party and is a result of novation.

This novation enables multilateral netting and vastly reduces the number of open positions which need to be managed. Thus, if a clearing member defaults, only the open positions of that clearing member with the CCP need to be wound down: Other clearing members would not be affected. I mentioned these big figures, reducing €14.5 trillion each month to around €50 billion.

So, all in all, clearing makes the markets both more efficient and more stable. And while this creates massive net benefits for the economy as a whole, it increases the pressure on scarce collateral. And thus, it adds to the pressure already on banks by regulatory reforms demanding increased capital requirements, which is key to better managing systemic risk in the future.

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[22] Basel 111, agreed in 2010–2011, is the worldwide voluntary regulatory structure on bank capital adequacy, stress testing, as well as on market quality risk.

[23] See, footnote 10.

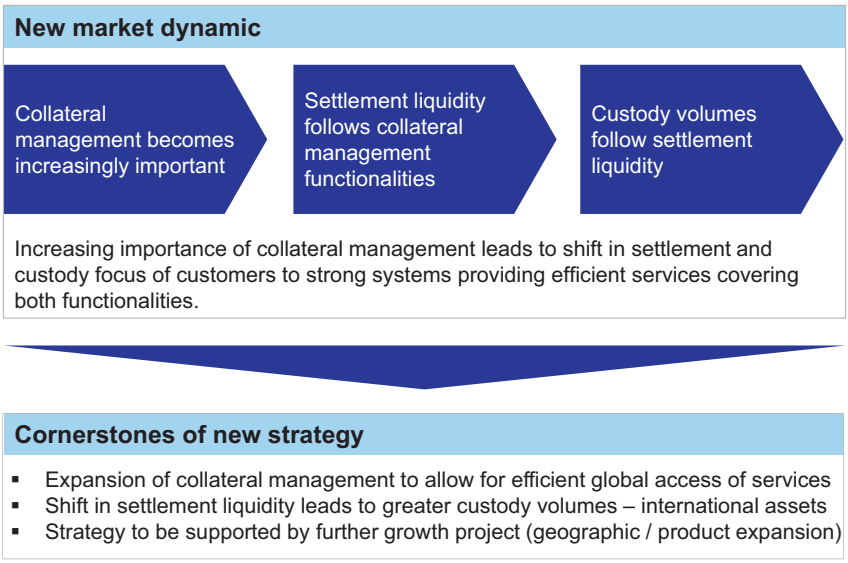

Exhibit 1.4 Global collateral and liquidity management services

The burdens falling upon banks as a consequence of new capital rules are significant: According to estimates by the Basel Committee on Banking Supervision from April, 2012, banks worldwide are facing an aggregate shortfall of stable funding of €2.8 trillion in fulfilling the additional liquidity requirements of Basel III. This creates massive pressure on the liquidity of the financial sector as a whole, and thus, the real economy as well. Collateral cannot be created out of thin air, it's a limited resource, and central banks have been buying a lot of the best collateral as part of their QE programs in recent years.[24] Therefore, the only solution for managing the shortfall is making its use more effective and efficient.

Once again, well-diversified exchange organizations have in recent years developed new services helping banks, but also buy-side firms, such as insurance companies, and even central banks in facing this new challenge. The solution consists in access to a broad range of diverse assets, process management across the full value chain, and global reach in making this available to one's customers. Therefore, the increasing importance of collateral management leads to a shift in the settlement and custody focus of customers, to strong systems providing efficient services covering both functionalities.

Exchange organizations must play to their strengths to respond to these challenges, by expanding their collateral management for efficient global access of

[24] Quantitative Easing, or QE programs adapted by governments worldwide in the wake of financial crisis, and achieved through bond purchase and liquidity programs to stimulate economic growth.

services. This shift in settlement liquidity leads to greater custody volumes, containing a wider variety and greater volume of international assets. This strategy in turn needs to be supported by further growth, in terms of geographic and product coverage.

The use of collateral is still massively hampered by a lack of integration, both on a functional and on a regional level. Solutions for making collateral and liquidity management more efficient and effective require organizations that bring together assets from various sources and various regions. That allows them to be used in ways most suitable for the client needing to collateralize risk and capital requirements, while bonding as little liquidity as possible. This is an area in which exchange organizations can add value to their customer's business

As a first step, such solutions need to create transparency. That is to say, transparency about assets available across functions and regions, and transparency about the level of risk appetite. Secondly, they need to set up processes for bonding assets of various types and quality levels. And thirdly, these processes need to be leveraged by building global liquidity management networks.

Exchange organizations are champions of intelligent markets. However, such markets will only stand the test of time, if the freedom they offer is wisely regulated. In today's world, the thrust of solutions for such wisely regulated freedoms is increasingly shifting from trading, a focus of the last century, to CCPs and ICSDs. This is why exchange organizations with a diversified value chain are best able to fulfill the demands of today for their customers, for their owners, for the regulators, for the real economy, and for society at large. The priority, therefore, must be to bring technological innovation and entrepreneurial zest to the fore, in strengthening and extending these markets in the spirit of fairness and trust.

SCHWARTZ: Any questions?

ATTENDEE: Where is the synergy from integrating financing functions, custody functions, and the collateral functions into the exchange? Many of the exchanges have it—they outsource effectively, and you integrate it. I don't see where the synergy is.

FRANCIONI: This gets to the core of the value chain. If you think trading purely, I'm with you. But if you say trading and clearing, then you missed something. I can explain exactly where the synergies are. The synergies are in mobilizing collateral for the margin calls in the clearing house, immediately when necessary, and that's huge money at stake. If you have huge collateral at a CSD or ICSD, and you can at least partly mobilize this collateral for the margin calls in the clearing house, on a global level, this is the real money.

Trading combined with clearing means much better and cheaper risk management for the customer and for the whole market. Operating market structure on the run within one company is already an asset in monitoring the regular market under regular market conditions. But it is an inestimable asset for steering markets in turmoil because of financial shocks and volatility. In other words, we have quantitative and qualitative synergies.

ALLAN GRODY [Financial InterGroup]. As you become more diversified and integrated, you talked about wise regulation. The regulators, as you're obviously

aware, are thinking about separating the component parts, or giving market participants a better opportunity to clear through different organizations, and to trade through different organizations. How do you deal with "wise or unwise regulators and regulation," in regard to their view regarding you becoming a too big to fail organization?[25]

FRANCIONI: First, the clearing example: This was a discussion in Europe, interoperability was the name, and it's out there.[26] Whereas we in Europe discuss, or used to discuss it, I have to be fair. The interoperability issue in the USA—to separate trading from the clearing house, for example—was not even a discussion at the Chicago Mercantile Exchange. Every clearing house has the potential to become of systemic relevance and, therefore, to become a too big to fail organization. This has to be checked and permanently decided by the regulators and supervisory authorities, and it must be done on a case by case basis.

Second, regulation: One, we at Deutsche Börse like regulation because it makes the markets more transparent and fairer, and it enhances or increases market quality and integrity as a whole. Therefore, good regulation is an asset. Two, regulation for us as an exchange organization is not just a threat, there are also opportunities. The whole strategy I put forward in terms of collateral management, mobilizing collateral, passing it around the globe, passing it along the value chain, is enabled and supported through this regulation.

So let's just say we like good regulation. But there is not always good regulation. This would be a topic for another conference. What is good regulation, and what is not good regulation?

SCHWARTZ: Well, thank you, Reto, for your most interesting and provocative talk for the suggestion you just made.

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[25] Some of the drive for this industry change described by Allan Grody came from the Financial Stability Board. *http://www.fsb.org/*

For further background, see, *Nondiscriminatory Access to Market Infrastructures and Benchmarks*. Association for Financial Markets in Europe (AFME). September 2012. *https://www.afme.eu/globalassets/downloads/briefing-notes/briefing-note-mifir-openaccess.pdf*

Market structure developments in the clearing industry: Implications for financial stability Report of the Working Group on Post-trade Services. Bank for International Settlements, Committee on Payment and Settlement Systems. November 2010 *https://www.bis.org/cpmi/publ/d92.pdf*

[26] CCP "Interoperability" is described thus:

"Where a trade is made/matched between two parties on a trade platform and each party chooses a different CCP to clear their trade then a balance contract automatically arises between the two CCPs on the same terms to ensure that each party retains a balanced book. The two CCPs are therefore said to 'interoperate' in managing the risk and settlement obligations arising between them." Source: LCH.

Chapter 2
Coping with Liquidity Provision

Larry Tabb, Nazli Sila Alan, Jonathan Clark, Frank Hatheway, George Hessler, Adam Inzirillo, and Timothy J. Mahoney

LARRY TABB: This panel, Coping with Liquidity Provision, sums up, to a certain extent, what our industry is all about. That is, trying to find the other side of the trade; trying to find liquidity; trying to find how we price liquidity; and about how we interact with liquidity.

Has the world really changed, despite all of the HFT issues and the hype surrounding books, such as Michael Lewis' Flash Boys?[1] Is liquidity, and/or finding the other side of the trade, really a challenge? Is it any more difficult today to trade an illiquid stock now than it was on the floor of the exchange, 20 years ago? These are some of the issues we will debate and explore.

On the panel is Sila Alan, a professor at Fairfield University who has collaborated and worked with Bob Schwartz; Jon (Jonathan) Clark, head equity trader at Blackrock; Frank Hatheway, chief economist at NASDAQ; George Hessler from

[1] See *Flash Boys: A Wall Street Revolt. Michael Lewis* (2015, WW Norton & Company, LLC).

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Deep Liquidity; Adam Inzirillo, the director of electronic trading at Bank of America Merrill Lynch; and Tim (Timothy) Mahoney, CEO of BIDS. Many of our panelists have either researched or engaged in building products to find the other side of the trade, or else trade in this space.

Jon, is this a real problem? Is liquidity a challenge? Is finding a small-cap stock more of a challenge today than in the past, going as far back as the days of the floor?

JONATHAN CLARK: As it relates to sourcing liquidity, if you're accessing the market in the same way you did 10 or 20 years ago, then finding liquidity will be a challenge. Accessing liquidity, and the tools for which we find that liquidity, has certainly changed and evolved. Despite the complexities embedded in our marketplace, I'm here to say, generally speaking, that liquidity has improved. The costs for us as an asset manager, buying and selling securities, including the implicit costs, and frictional costs, have declined over time.

So is the market overly complex? Possibly. But the fact is, we all have the tools such as TCA, to engage the marketplace and to get strong results.[2] I would add this caveat of sorts: Costs are up because of the recent market moves over the last week or so. And that's not because the marketplace, itself, has changed. The structure has changed, but volatility, which is a major contributor to costs, is higher today than a week or so ago.[3] And it's a very good reminder to me and other traders that one of our highest costs in doing business really is volatility. Because of volatility, the bid and offer spread that Bob Schwartz has spoken about, widens a tad, and the depth gets a little more shallow and the volatility, or the potential outcomes obviously are significantly different.[4] It results, indeed, in differing outcomes. Then you throw into it the emotion that comes with these market conditions. And we have seen costs go up over the last few days. I'm not surprised. I wish there was a way we could dampen that a bit more, but that's a fact.

TABB: Tim, you guys have one of the premier block platforms. Before building out BIDS, you actually sat in the seat that Jon, who is head equity trader at Blackrock, has right now.

We have 40 dark pools, 11 exchanges, and everybody complains, "Oh, I have to buy shares one at a time, it seems like." Your platform is certainly a counter to that. But is the competition to create venues real, is it helpful? Are you seeing liquidity issues? Is finding the other side a real problem?

MAHONEY: First, I think that liquidity has adapted, and the nature of liquidity has changed as the marketplace has changed. Our friends at Rosenblatt Securities

[2] Transaction Cost Analysis

[3] In a follow-up interview, Jonathan Clark said the biggest "tax" on his trade executions was directly related to volatility. His costs rose as volatility went higher. He noted, as an aside, that being on the buy-side, his firm could not play both sides of the market in the same way as the sell-side could play it. Volatility is often widely viewed as an opportunity for sell-side practitioners, such as market makers or liquidity providers.

[4] The speaker explained that stock prices might rise or fall, a situation that is not always a positive sign for a liquidity "demander" on the buy-side, when that participant is buying or selling stocks in the most cost-effective way.

have a piece out on exchange-traded products, ETPs. Since 2008, twice as much new money has gone into exchange-traded products as has gone into actively managed products, according to the report. That's transformed what liquidity looks like. People who traded these exchange-traded products actually work well with high-frequency electronic market makers.

So, all this new liquidity is migrating toward that type of business. And trading in US-listed ETPs today make up some 16% of US equity trading by share volume. Yet ETPs don't get spoken about as much, even though they also account for some 25% of US equity trading by dollar volume.[5] For another thing, the economics of our industry have changed dramatically over the last 15 years. When we talk about liquidity, let's talk about market making, and how hard it is to find the contra side of a trade. A couple of factors have affected that. One is explicit commission rates. Jon very eloquently spoke about his lower total cost. And part of that can be attributed to declining commission rates. As late as 2000, they were probably 5-1/2 to 6 cents a share, and now they're 2-something cents a share.

But the model on the market maker side is broken. Consequently, nobody wants to be a market maker for block trading. It's not a good business model any longer for a market maker. Yet, for years, that's what the broker dealer community did; they traded against the buy-side. Because there was excess commission dollars that subsidized the losses they received in some of the more difficult to trade stocks. So it's not surprising that these small illiquid stocks are difficult to trade. They have always been difficult to trade. But there was this subsidization going in there in former times.

The Research Settlements actually broke another piece of the model, if you were a listed block trader, or a NASDAQ trader.[6] Previously, it was really important that you owned, so to speak, a particular stock, in other words you wanted to be the number one guy in the related sector.[7] For example, you wanted to be the number one in REITs or waste management stocks, so that the research professionals on your staff could get a banking deal, and then your investment banker could go out and say, "Look at our Autex ranking, we're number one."[8]

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[5] In a follow-up note, the speaker noted, referring to the time period of the conference: "The point is that exchange-traded products are a fast growing segment of the market, and they need the type of liquidity [support] that high-frequency trading (HFT) provides. Traditional buy-side firm may not find HFT liquidity valuable, but the newer, faster growing asset management[ETP-related] businesses do."

[6] See *Fact Sheet on Global Analyst Research Settlements. Securities and Exchange Commission*. April 28, 2003. https://www.sec.gov/news/speech/factsheet.htm

[7] Ibid.

Prior to the Research Settlement, a market maker was effectively incented to be number one in a stock, even if this market maker took a loss as a result. New investment banking deals with lucrative fees could follow if a firm was a dominant market maker in a stock. The "settlement" aimed to eliminate that business model, a model rife with at least the perception of a conflict of interest.

[8] Refers to the platform, Autex, operated by Thomas Financial, for the dissemination of block trading data, and the rankings of firms, via Autex BlockDATA, by the size of their block shares traded.

So with all that gone, people have performed a remarkable job of adapting to today's liquidity. People like Jon are faced with a decision, to either participate where the new liquidity is in small size trades using an algorithm, and using products that Adam might do, and trading against all this new liquidity. In other words, it means that Jon has to slice his order into small pieces if the new liquidity today is predicated on small trades and ETPs. And then he has this other opportunity. He can trade in BIDS or ITG or Liquidnet, or any of our other venues where there are natural counterparties.

Now, to be fair, if you add up all the block liquidity traded in all Alternative Trading Systems, ATSs—some 40, 50 million shares, single counted a day, of the overall market of some six billion shares traded—the natural and natural block business is not going to satisfy Jon's desire for liquidity. But, at the same time, he can adapt and take advantage of the new liquidity, which is where the new money is coming into. And he can trade in that marketplace using algorithms.

TABB: Frank, you're one of the respected professionals who measure transaction cost and liquidity daily. What's your take on liquidity? What's your take on having to build out a platform that aggregates liquidity? Can liquidity on a trading venue be built? Is it just about developing the appropriate incentives? How should we think about creating a mechanism that centralizes liquidity?

FRANK HATHEWAY: In many ways, it is an issue about incentives. If we think of liquidity as a product like other products, you start with the question, "Should we try and enhance liquidity in the market?" In a free market, you kind of say "no," because the market will take care of itself. We operate in a highly regulated industry, and the regulation has various priorities. This is true here in the USA, in Europe, and wherever else you happen to be operating. Sometimes those priorities aren't necessarily around liquidity.

Yes, we should try to achieve our goals with the flexibility allowed under the regulatory model and then change the regulatory model as appropriate to increase liquidity where it is in undersupply. That may be the case in inactive stocks. It might also be in certain situations in the market and in high-volatility settings. In some contexts where the reward for providing liquidity relative to the risk of providing liquidity is inadequate, so you don't provide liquidity.

Speaking now as an exchange operator, creating incentives to provide liquidity requires some flexibility that perhaps we're only offering occasionally.[9] In the past, it was quite common in the industry to halt trading for unusual market conditions.[10] In a way, that was done to protect liquidity providers. It was also done to allow information to be disseminated in the industry. Then we stopped doing it in the USA

[9] "We're" refers to the exchanges collectively.

[10] For more on trading halts in US markets, see backgrounder on Securities and Exchange Commission: https://www.sec.gov/fast-answers/answerstradinghalthtm.html

for about 8 years. And then came the Flash Crash.[11] Eventually, we started doing it again.[12] So that's one example of how we can enhance liquidity.

Does incenting liquidity have to be done with a mechanism structured as limit up, limit down?[13] No, there are other ways to do this. For example, the exchanges, collectively speaking, essentially introduce short pauses in the market, so a buyer and seller can find each other.[14] Another example is from Europe where the issuer pays liquidity providers in an active stock.[15] A liquidity provider typically can't be paid in the USA; it's a conflict of interest. Paying liquidity providers is something we've been advocating, and others have been interested in.

Finally, incenting liquidity provision is simply about the mechanisms in the market that serve as compensation for providing liquidity, be it maker taker fees, tick sizes, and all these other things that we have.[16] I would note that many of the mechanisms are structured in a way that reflects how the world operated for active stocks, circa 2004.[17] That is probably not the ideal way to incent liquidity in 2014. Not if we're thinking about creating changes in the market that would enhance liquidity where it is not available at any particular time, or in any particular security.

TABB: George, you're trying to create a platform for folks to find each other. What are your thoughts on how we can drive and generate more liquidity in the market, and build a better market??

GEORGE HESSLER: I essentially agree with Frank. It may not necessarily be our job to build liquidity. If you have an illiquid stock that's basically a roach motel:

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[11] Flash Crash of May 6, 2010, lasted about 36 min, erasing 998.5 points in the Dow Jones Industrial Average and then quickly recouped much of the losses as the various indexes rapidly rebounded in this high-speed, electronic trading phenomena.

[12] See *Has Wall Street Employed Enough Tech to Protect Against Another Black Monday? Circuit breakers and tech can safeguard against market meltdowns, but cannot completely prevent market crashes. TheStreet examines the technology of the era and the technology of today as part of its Black Monday special report*. Chris Nolter. The Street.com https://www.thestreet.com/story/14345945/1/rebooting-wall-street-technology-after-black-monday.html

[13] NASDAQ Frequently Asked Questions: https://www.nasdaqtrader.com/content/MarketRegulation/LULD_FAQ.pdf

[14] Under the rules of the Securities and Exchange Commission, individual exchanges cannot add their own short pauses.

[15] See Liquidity Provider. NASDAQ. *http://business.nasdaq.com/list/listing-options/European-Markets/liquidity-provider/index.html*.

[16] Referring to the essential ideas on the panel in the incenting of liquidity. In maker taker, an exchange pays a participant a rebate for posting liquidity, charges a fee for taking liquidity.

[17] Referring to the various changes in US market structure around this time period of the conference which reflect the response of the marketplace to an earlier phase, circa 2004. The changes are many and varied and can be traced back many decades. For the purposes of the speaker's comment, it is worth nothing that in 1997, the Order Handling Rules were introduced by the Securities and Exchange Commission. In 2001, the trading of stocks in the USA switched from fractional to decimal increments. The maker taker model followed in the high-speed trading markets that emerged. As previously noted, in a competitive program to encourage trading on exchanges, maker-taker fees offer a transaction rebate to trading participants who provide liquidity, charging customers who take liquidity.

you can get into it, but you just can't get out.[18] With those kind of stocks you're not going to flip on a light switch, and then all of a sudden get liquidity out of it.

For the first half of my career, I was actually on the bond side, trading treasuries and mortgage-backed securities. I ended up building an electronic platform which is a big change from over the phone-based trading. That became ICAP's main trading platform.[19] After that, I was drafted over to what I then called the dark side of equities. Many people know me for being the first head of the business side for Lava Trading. Lava basically took the liquidity that was out here, not necessarily creating new liquidity, but it aggregated it. It's the first aggregator of liquidity. And I think that, since that time, as the market has evolved, we've all adapted to it. That's really what Tim was talking about. With the advent of decimalization, electronification, and Reg NMS, new ways emerged to provide liquidity.[20]

Right now, high-frequency trading is very helpful in providing small amounts of liquidity at all times. That happens to fit hand in glove with algos, which is to say, buying and selling small pieces that add up to big pieces. That's great, and it tends to work better for bigger stocks than for smaller ones. But, back to Frank's point. When you take these high-frequency traders, and you aggregate their liquidity, you don't necessarily create new liquidity. In this regard, all you are really looking to do is to describe ways to access all the liquidity that's out there. Incidentally, after Lava, I went to work for Lime Brokerage.[21]

If you have a free and open market, you have lots of liquidity. When you start to curb things and say, for example, we don't want high-frequency traders in the market, we only want naturals to trade against each other, and then you are going to restrict liquidity. A question for the regulators is, how much do they want to allow trading to be free, and how much liquidity are we going to have there? But the question really is how much can we aggregate the liquidity that's there? And that's what our platform, Deep Liquidity, is about. It's about taking the liquidity that's out there (sort of like a Lava trading for exchanges), taking the liquidity that's on all the exchanges, and aggregating this liquidity that's across the exchanges, in an anonymous central environment to handle larger size trades.

TABB: Tim, you were talking a little while ago about blocks. Adam, how are you seeing demand for blocks? Tim, are you are seeing a little bit higher volume in blocks? Adam, are you guys getting more requests for capital? Are you trying to do

[18] The metaphor takes the image of a brand product for catching roaches. In the same way, an illiquid stock posted on some trading platforms may have a challenge finding the other side of the trade for an execution.

[19] Liberty Direct was the predecessor company of, and then became Tullet Liberty, and subsequently it was purchased by ICAP.

[20] See The Clock For Market Structure Change Is Ticking. Wall Street & Technology. Ivy Schmerken. *http://www.wallstreetandtech.com/trading-technology/the-clock-for-market-structure-change-is-ticking/d/d-id/1318135*. Ivy Schmerken. 1/7/2015.

[21] At Lime Brokerage, George Hessler was executive vice president, head of sales, marketing, and strategy.

blocks? Are people a little tired of the slice and dice phenomena, of little tiny algo trades, and of trying to think about how to get a bigger aggregated position?

ADAM INZIRILLO: Some participants just want immediate liquidity and are willing to trade via an algorithm and get very aggressive, and access any part of the market. That's whether it's a non-display market, or a public market.[22] But there is some level of concern. I hear that a lot, particularly from the buy-side. If I go back in time, pre-2007, when I traded on the New York Stock Exchange, I was able to find liquidity in large blocks.[23]

So there has been a little bit of a shift. How can I aggregate that liquidity today? (which George mentioned before). Here's a couple of ways you could do it: through your trusted advisor, go to the high-touch channel; a traditional block trader, which understands the stocks, how they move, compare it versus the sector.[24] Or, if you want to do it electronically, conditionals have come in the last 18 months.[25] Conditionals are an electronic way to generate a large block. The problem is this—a lot of times it is off—exchange trading. So the reality is, your hit rates will be relatively low, unless you can find the natural other side.

BIDS has done a good job in doing that. The buy-side connects directly.[26] They can control their interaction. And the sell-side can then participate there via an algorithm.[27]

CLARK: To echo your points, Adam, we like the variety. We like accessing liquidity through a variety of means, for example, whether it's through an algo or whether it's lit or dark. We love all that.[28] We like the opportunity to have these crossing networks that bulk liquidity together when it hits. We like the optionality. And then there's the IOIs. Everyone remembers the IOI. These are the traditional

[22] By the same token, "displayed" data refers to data the market participant can see, the opposite of the non-displayed market data fed directly into trading algorithms.

[23] In 2008, the New York Stock Exchange had abolished specialists on the floor, replacing them with Designated Market Makers. This was preceded by Regulation NMS (National Market System) in 2005, the regulation which spurred the NYSE to become more fully electronic, and fostering the rise of competing ECNs and exchanges. Consequently, the block trading of shares soon became challenging, if not problematic.

[24] See *Block traders prefer the human touch*. Philip Stafford. Financial Times. September 17, 2014. *https://www.ft.com/content/44841008-3cf7-11e4-a2ab-00144feabdc0*

[25] A conditional order is a type of order that will be submitted or canceled if set criteria are met, which are defined by the trader/investor entering the order. This allows for a greater customization of the order to meet the specific needs of the investor. Source: Investopedia

[26] Referring to BIDS.

[27] Ibid.

[28] For a comprehensive account of dark pools and there opposite in lit markets, see *Dark Pools: Fear of the Dark*. Third Way. Lauren Oppenheimer, John Vahey. August 28, 2013. *http://www.thirdway.org/report/dark-pools-fear-of-the-dark*

As the authors explain: "Dark pools are private, electronic stock trading venues that allow buyers and sellers of a stock to be matched anonymously. In a dark pool, prices are not displayed to investors—stock prices are dark. Dark trading is an alternative to trading on a "lit" exchange, like the New York Stock Exchange (NYSE), where traders benefit from visible prices."

indications of interest.[29] The opportunity that you would somehow or another send a message through your Bloomberg terminal was a clever way of getting the attention of the trader on our own desk.

That has since evolved. We now have a handful of large broker dealers who are providing actionable IOIs.[30] And we're finding that the quality of these blue IOIs—that's the color of the actionable IOIs on our terminal screen—is a clever way of getting our attention. We may not interact; we may ask to see what the story is behind that. But it's another means of getting our attention. So, when we access liquidity, we like the variety of options. We think that gives us a good overall result.

MAHONEY: Here is one of the great opportunities Jon has now, and why his costs are so low. I think you are able to make more discreet decisions. Go back to the heyday of block trading. You talked about this era of 20, 30 years ago, and I probably am one of a few people who can talk directly about this era. I was doing block trading back then. You had no choice. If you think about the heyday of block trading (let's put it at 1995) everything was manual. Consider if you had to buy 500,000 shares of a stock back then. You would have had wanted to get two prints of 250,000 shares each, because you were literally writing down the information and manually putting in tickets. You also had big spreads back then.[31] So there was an enormous structural need for big blocks all the time, even in liquid stocks. And there was no electronic trading like we have today.

Then advanced electronic trading, and TR FIX protocol came in, making it more efficient to trade in smaller sizes.[32] It was not a terrible thing. So if you had to trade a million shares, you could do a virtual block.[33]

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[29] In equities trading, an IOI is an Indication of Interest, usually disseminated by an electronic signal by a sell-side broker to various other market players, usually the customers of the broker dealer, indicating to them the positions he is currently dealing in and looking for interest in those positions from his clients. An IOI is an indication, and not a commitment.

[30] Actionable IOIs are bids or offers for a stock that are in effect, available for execution.

[31] 250,000 share prints would have been the ideal objective in this example. As the speaker explained in a follow-up, the thinking back then is that when you had quarter point spreads in this era, and everything was traded in a "manual" manner, a block trader would prefer to write say one or two price points down rather than a multiple of price points, for a total of two trades so as to complete the full block. That compares with today's reality of potentially thousands of smaller trades.

There was a "perverse incentive," Mahoney said, to trade larger stocks in this aforementioned manual environment. "If you were manually trading stocks and had to record and write every trade you executed, you certainly did not want to have to write down a 100-shares order a thousand times over for a large 100,000 share block," he explained. "Each one of those trades could have come at different price points; each one of those trades could have had a different counterparty. There was a structural impediment that led you to want to trade larger share sizes." Today, the markets are "fully electronic" which, in effect, eliminates that kind of "bias" to complete a block in larger share sizes.

[32] The Financial Information eXchange (FIX) protocol is an electronic communications protocol launched in 1992 for the real-time exchange of information in securities transactions and markets.

[33] The term "virtual block" was popular at the time of this conference. It refers to the idea of electronically executing a block trade, even a million share order, however challenging, given the need to break up large orders, on a computerized network.

I think about my business, about the potential for natural blocks. It makes sense to me that it's a piece of the business, but it's never going to be a dominant piece. If block trading was 50% of blocks at one point, it's going to be a subset of that today. It's where a portfolio manager's instructions are such that it makes sense to control your liquidity. Only the portfolio manager knows this; Do you want to do this trade right away because the value of the short-term information content is such that I want to get ahead of everyone else? Or do you want to do it anonymously? So if you could trade in BIDS in a single 500,000 share print, and only one counterparty is aware before it hits the tape, that's really good. If the information content is relatively small, and you could trade, for example, 500 times 1000-share trades and each one of those give a little information away, well that's fine. Because if it's informationless or low information, that's an appropriate way to trade.

We've talked about competition. I disagree a little bit with Dr. Bob Schwartz. I don't like to do that! I won't be invited back next year I guess, having done that! [laughter]

Let me ask: How do you curb participants coming into the marketplace?[34] How do you let new, innovative venues come into the marketplace unless you let the free market decide who wins and loses, and who fails? And if you're an Alternative Trading System, an ATS, and you don't have a protected quote, and don't offer a value added component, you're going to go out of business.[35] Indeed, if you are an ATS, you have to keep your expenses lower than your revenues, and you have to find a way to make it work, to succeed as a business. And every innovative guy who comes along is a new guy coming into the marketplace. And competition does what microeconomics says. That is, this innovation drives prices down. In this environment, you're either more competitive than your rival or you're not competitive. If we had said, let's not have any new venues; then we're going to have a very interesting conversation. With this mindset, IEX wouldn't have been introduced.[36] More competition in the marketplace is great. It makes everyone else better, it drives all your costs down, and it makes for a more robust marketplace.

TABB: Sila, you worked together on a project with Professor Schwartz, thinking about ways to bring liquidity in from a different source. Please talk about your paper and your ideas of trying to bring capital in from the corporate side.[37]

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[34] The speaker is talking in broad terms about free-market competition and is defending the idea that the competitive markets should "select" what venues and platforms fail and succeed, a concept that harkens back to the "invisible hand" introduced by Adam Smith in his book, The Wealth of Nations.

[35] See Reg NMS (Regulation National Market System) adopted by the Securities and Exchange Commission in 2005 and introduced 2 years later to further advance the ideals of a national market system. The regulation includes the order protection, or trade-through rule; access rule (fair access) to market data including quotations; and rules on sub-penny trading and on market data.

[36] IEX (also known as the Investors Exchange). The much publicized US-based stock exchange was founded in 2012 and is the subject of Michael Lewis' bestseller, Flashboys.

[37] For additional information, see Nazli Sila Alan, , John S. Mask, Robert A. Schwartz, "A Liquidity Program to Stabilize Equity Markets, The Journal of Portfolio Management Winter 2015, 41 (2) 113-125; DOI: *https://doi.org/10.3905/jpm.2015.41.2.113* (Reprinted in this book on page __).

NAZLI SILA ALAN: The idea, as described in the paper, is to get the listed companies involved in the secondary market trading of their own stock. This is actually an idea based on a 1988 Journal of Portfolio Management paper by Bob [Schwartz]. By bringing the corporations, the listed companies, into the secondary market themselves, to trade their own stock, we believe they can provide supplemental liquidity for their own stocks.

It is a rather unconventional proposal. The point is, we are proposing this supplemental liquidity program that we call the SL. Basically, companies set up an SL fund to trade their own stocks based on a very transparent mechanism. It's sort of like when the markets are falling down—they have standing buy orders to slow down that fall. And, when the prices are increasing, they have a standing sell order to reduce the chance of a bubble. As a result, they are able to make their prices more stable in the secondary market.

The purpose of all this? For one thing, corporations will be bringing in additional liquidity for their own stocks. By doing so, they will be able to stabilize their stock price. And, as Jon mentioned, we don't actually talk as much about liquidity, because we talk more about the volatility of prices. Intraday, accentuated volatility is really one of the main things that's probably hurting liquidity in the market. Price instability and illiquidity are sort of driving each other in the same direction. By getting listed companies involved in their own stock trading, we believe they are in a position to be the most beneficial participants in the markets, when they trade their own stocks.

TABB: Is this a kind of market maker-type program? Or, is this kind of a little bit of a broader way of providing liquidity? Is this in penny increments, or are we talking more like dollars? Say, $10? $20? Is it a granulated approach to trading?

ALAN: It is somewhat similar to the market maker model of providing liquidity. Market makers, however, will need additional incentives to be attracted into making these trades, because we are talking about buying the stock in a falling market and selling the stock in an increasing market. The listed company has the incentive to stabilize its own stock price. That's why we are saying that the listed companies, themselves, are in the best position to be invested in this sort of mechanism.

And we're also saying everything is transparent. In other words, at which price points they will be buying and selling is transparent, so the public knows when there will be an SL order to buy or an SL order to sell.

TABB: If I knew that there was a stock available for $10, wouldn't I be pushing the stock to that price? Is this game-able?

ALAN: First, because it's transparent, I believe that reduces the possibility of gaming the system. But moreover, we suggest that these orders only be entered into the call auctions, not the continuous market. In the call auction, whatever the clearing market price will to be at the end, the SL order will execute at that price.

TABB: So this process is a corporate treasury process, and not a market-making process?

ALAN: No, definitely not. Everything will be based on an algorithmic process. Whenever there is an execution, the new benchmark price will be set to that. The orders will be placed let's say, 5% above and below the last trade price.

TABB: Guys, your thoughts?

MAHONEY: I actually think that's brilliant. Does that help me out, Bob? It is the best idea I've ever heard!

ALAN: We welcome your thoughts.

MAHONEY: All kidding aside, if you think about it, the one thing I find interesting is the people involved. When you talk about price discovery, they forget that Jon's obligation is not to the marketplace grader, it's to his shareholders. So, effectively, Jon is trying to be un-price discovery, if you will—like he wants to buy stuff for as cheap as he can get it, and sell it for as much as he can.[38]

Here is where I think the sell-side is out of that game to some extent. The only entity that truly should care, along with having a fiduciary obligation probably to their shareholders, is the company. Insofar as the company can try to come up with the right, fair price, it should be involved in some way. We could discuss the mechanics, and whether you could game it, if you know, the company is coming in at $10. The company's presence is critical.[39]

If we're going to have a big philosophical debate on price discovery, it can't be Jon on the buy-side because that is not their obligation, unless you want to change the law.[40] The sell-side probably can't do it because there is not enough money in it for the sell-side. The company is the entity with the responsibility for their stock, and it has a reason to be involved.

HESSLER: I wouldn't disagree. It's a very interesting proposal. The more market participants that are involved, the better. When you look at the Flash Crash, there would have been a lot of bids higher than one penny, if they had had these sort of standing bids in there.[41]

If you look at to the previous crash, Black Monday, way back on October 19, 1987, it really was the corporations that came in the next day and backstopped the market.[42] If the specialists weren't going to do it, the view back then is that the

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[38] In follow-up, Mahoney explained that Jonathon was running a buy-side trading desk at the time of the conference, and so his aim would have been to buy at below fair market price. He had no obligation, so to speak, to ensure the market was priced appropriately. However, he could leverage his knowledge of the market to ensure that he did better in terms of executions for his clients than they could potentially do on their own.

[39] For additional information, see Nazli Sila Alan, Timothy Mahoney, and Robert A. Schwartz, "Combating Turbulence in the Equity Markets: Get the Listed Companies on Board," The Journal of Portfolio Management Invited Editorial, Summer 2015, 41 (4) 8-11; DOI: *https://doi.org/10.3905/jpm.2015.41.4.008*. (Reprinted in this book on page __).

[40] Referring to the buy-side generally and more specifically to Jonathan Clark on the buy-side.

[41] Referring to the paper outlined by Professor Nazli Sila Alan.

Flash Crash of May 6, 2010, lasted about 36 min, erasing 998.5 points in the Dow Jones Industrial Average. It then quickly recouped much of the losses as the various indexes rapidly rebounded during this high-speed, electronic trading phenomena.

[42] "The first contemporary global financial crisis unfolded in the autumn of 1987 on a day known infamously as "Black Monday." A chain reaction of market distress sent global stock exchanges plummeting in a matter of hours. In the USA, the Dow Jones Industrial Average (DJIA) dropped 22.6% in a single trading session, a loss that remains the largest 1-day stock market decline in history. At the time, it also marked the sharpest market downturn in the United States since the Great Depression." Source: Stock Market Crash of 1987. Federal Reserve History. Donald Bernhardt and Marshall Eckblad, Federal Reserve Bank of Chicago. *https://www.federalreservehistory.org/essays/stock_market_crash_of_1987*

corporations were going to support their own stock with their own stock buybacks.[43] There were IBM buyback, and GE buyback programs, for example, back then in connection with the Crash. It took a little time, but it kind of worked out, and it stabilized the market. Even just by announcing these buybacks, the market came back significantly. That being said, the implementation is fraught with peril.[44] This is a potential minefield, so much so it requires you to work very carefully on it with the regulators.

For example, you don't want somebody spoofing the market in its own stock. Nor do you want someone who has inside information making a call that they're now going to be more forthright in pushing up their stock. In most cases, you're talking about companies backstopping their stock on the bid side, probably not flipping shares out when it gets a little too frothy. In any event, it would be interesting to see how this plays out.

HATHEWAY: I'm going to get myself uninvited! There is obviously a lot of regulatory issues, and a lot of accounting issues, on how this would work. Would the company know what the company stock is worth? Market makers don't know what the value is of what they are trading. They just know the balance of buying and selling.

Put all that aside, companies can do stock buybacks, as George just noted, when they think the price of their stock is cheap.[45] Indeed, every quarter, we at NASDAQ are asked by analysts for the status of our buyback program. A buyback is essentially a signal to analysts. A buyback also gives analysts information about future supply and demand characteristics of stocks. Similarly, if a stock gets frothy and overpriced, a company can issue shares. Empirically, we see periods where there are high levels of corporate issuance. Right now, high levels of issuance happen to be on the debt side, not on the equity side.[46] So you have these two backstops, a buyback or an issuance, on both sides of Sila's suggestion.

Now I'll wear my economic hat for a moment. Everybody recognizes that a company might sell, that a company might buy. Don't we take that into our calculations as we buy and sell? And, yes, we may get some transient volatility along the way. But the price will still stay within the range that we expect would avoid action from the corporation (a buyback or issuance of its own shares). The fact that the corporation is able to act doesn't change the behavior of the stock price. Because we all

[43] A stock buyback, also known as a "share repurchase," involves a company buying back its shares from the marketplace. Think of a buyback as a company investing in itself or using its cash to buy its own shares. Because a company can't act as its own *shareholder*, repurchased shares are absorbed by the company, and the number of *outstanding shares* on the market is reduced. When this happens, the relative ownership stake of each investor increases because there are fewer shares, or claims, on the earnings of the company. Source: Investopedia

[44] Referring to the Supplemental Liquidity proposal.

[45] See footnote 45.

[46] Corporations can buyback their own shares with money borrowed in the credit markets or with their own cash. However, the speaker, in a follow-up, stressed that he was referring to was the fact that, at the time of the conference, companies preferred to issue debt over equity.

recognize the corporation could act through those two mechanisms, a buyback or an issuance.

MAHONEY: Frank, didn't you say earlier that at NASDAQ the companies subsidize the market makers in Europe? So, on a bigger picture, it is probably helpful having the companies involved?[47]

HATHEWAY: But that's for liquidity. Those market makers are not privy to information about the state of the company and have no more role in valuation than a market maker who is simply compensated off the spread. At least that's the way it's supposed to work.

MAHONEY: The issue is that there is no one in the marketplace who cares about liquidity in a stock other than the company itself. We've broken the model. You either get the companies involved, or it all becomes hypothetical.

HATHEWAY: I think getting involved on the liquidity and on the valuation sides raise somewhat different questions.

ALAN: Frank, we are not saying the company should not be on the valuation side of it. They start with the first benchmark price, and then it's like 5% above it, I'll sell; 5% below it, I'll buy.[48] It's maximally transparent based on certain numbers, the percentage being based on spreads.

HATHEWAY: You need to get the benchmark somewhere.[49]

ALAN: Then, if this is entered into the call auction, it can act like a reflecting barrier to the prices in the continuous market. For example, say a market participant is trading a $30 stock and knows that there will be a big buy order at $25 at the next call auction. This may also affect his behavior during the continuous market. In this market, the participants may be more willing to catch the falling knife themselves because they know there is effectively a barrier at $25 due to this supplemental liquidity program.

HATHEWAY: I'm saying that if a trader thinks the company would increase their buyback at $25, that barrier is there without the company actually putting an order in the market.

ALAN: It can still surpass that. For example, if there is negative news about the company, more sell orders will inevitably be submitted to the market—that is, to the call auction—and the call clearing price may end up being at $23. So the corporation will have bought the stock at $23, instead of at $25. In other words, the corporation will not be adversely affected when this reflective price barrier is pierced, as long as the SL program is executed only in the call auctions.

HATHEWAY: And now the corporation is in the position of deciding whether Jon is wrong at selling at $23 or not.

TABB: Let's get back to market structure. We've created lots of technology and infrastructure which has kind of led to this chicken and egg issue. For example,

[47] See footnote 17.

[48] Current benchmark price is equal to the price of the last order executed, with the initial benchmark being set to the market closing price on the day before the SL program is implemented.

[49] Ibid.

there are the order management systems and FIX which are innovations. But then these developments led to fragmentation, and this fragmentation, in turn, required high-frequency traders to basically glue the market back together again. Is this just the natural outcome, or is this a challenge? Is technology the problem, the solution, or all of the above? Do we ultimately need regulation to get back to a status quo?

INZIRILLO: I don't think you regulate it. The difficulty on the sell-side is the costs of the technology. There are a lot of things, for example, that NASDAQ does. It has various protocols as opposed to FIX to get you access to the market a little more efficiently.[50] It brings down the tails in terms of time to the market, in terms of processing the execution.[51] So you have to implement things like that. Then there is the matter of maintaining the infrastructure.

In 2011, we updated our infrastructure and put things in two data centers, Weehawken and Piscataway, New Jersey, to get close proximity to all of the major market centers.[52] But, that direct connection that you had isn't as efficient as it used to be.[53] And now you're having an arms race of guys going to trading speeds of millimeters, which is obviously a shorter wavelength than by microwaves.[54] It gets you there more efficiently. And you have to be able to compete with that.

We run into an issue quite often with the buy-side. They'll say, "Well, we see liquidity trading, or we see things at a particular market, and when we're using your algorithms we're not accessing it." It isn't so much a function of the algorithm; it's actually how fast it is that you can get there.[55] You must be able to update that and keep it in tune with the current market structure.

You have to become more efficient and more quantitative, rather than just focusing on the technology and the infrastructure.

TABB: Frank, you're at the heart of this infrastructure. NASDAQ leverages a lot of technology and infrastructure to compete. On the other hand, I'm sure that every day you write a check for some new widget and you're not smiling about it.

HATHEWAY: And we sell a lot of technology. Seventy exchanges in 50 countries around the world use our stuff. On the one hand, technology is terrific; it creates all kinds of efficiencies, innovation, and all the positives we like to see as a result of competition. But there is something else about competition. We all hate it, technology means change, and so we use technology as a differentiator. In many respects, that's what Adam was talking about a second ago.

The market is structured in a certain way so that the market operates with an eye toward fairness. But that eye doesn't always see the implications of how market

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[50] See footnote 34, FIX.

[51] Referring to potential risk in trading. These "tails" mark the highs and lows of the period.

[52] This refers to the ability of market participants to gain advantages in the speed of their trade executions and price-quote data through advanced technology, specifically the "co-location" of their computer servers near stock exchanges' computers. That lowers so-called latency, a critical factor in high-speed trade executions. The practice is regarded as legal though it has many critics.

[53] Ibid.

[54] Ibid.

[55] Ibid.

structure decisions impact fairness. Price/time was a way to be fair when we moved away from how the floors like the NYSE operated back in the day or away from the telephone system that was the old NASDAQ.[56]

But price/time creates incentives to be fast. Do we like the incentives that price/time creates? In some respects it sounds like no, probably not, because the incentives to be fast create these arms races.[57] NASDAQ happens to be pretty good at the arms race. Wearing my corporate hat, let me say that we like having the incentives that price/time creates, because we're successfully responding to the arms race with technology and other products that we offer.

Now wearing my economist's hat, in terms of how you want to organize a market, there is no particular reason that being first is fair. The concepts are not equal. Being first is fair if being first is random. If being first is strategic, then you're moving away from randomness, and it's not necessarily fair. So proposals that a number of people have floated that move us away from a price/time dominated market may, or may not, result in a fairer market.

As you consider whether there is too much or too little technology, you're really better off asking a different question: "Why is there emphasis on FGPA (Field Programmable Gate Array), or on date protocols with names like 'ITCH' and 'OUCH,' or on any of these other wonderful technology acronyms that we have?"[58] Are there incentives for speed that we really are not happy with today, after they were created 10 or 15 years ago?

TABB: Let's talk a bit about the pilots, the other big liquidity change staring at our face, the nickel pilot program. What are your thoughts on the nickel pilot program, and its three tranches: the nickel minimum display with unlimited trading increments; the nickel minimum display and trading group; and the nickel minimum display and trade with a Trade-At component?[59]

This is based upon the idea that moving to nickel trading increments will bring liquidity back to the market.

CLARK: The one word that would sum it up is "skepticism." Whether you are on the buy-side, sell-side, or even on the exchanges, I think many of us are all scratching our head a little bit here, wondering how such an endeavor became so complex,

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[56] Price/time priority refers to how orders are prioritized for execution. In this instance, orders are first ranked according to their price; orders of the same price are then ranked based on when they were entered.

The "old" NASDAQ here refers to the more manual based- trading of stocks by market makers before the advent of advanced technology in NASDAQ trading rooms fostered by regulatory changes.

[57] Refers to the competition among vendors and exchanges to introduce high-speed trading platforms, oftentimes on the basis of speed of execution.

[58] FGPA was developed for military and commercial purposes and later made its way into the business of exchanges. *https://en.wikipedia.org/wiki/Field-programmable_gate_array*

[59] For further background, and most recent updates as of writing, see Investor Alert. *Tick Size Pilot Program. What Investors Need to Know. Securities and Exchange Commission*. October 03, 2016. https://www.sec.gov/oiea/investor-alerts-bulletins/ia_ticksize.html

so quickly. Granted, the final format hasn't been laid out yet, but there is definitely concern about how the pilot will shake out.[60]

I personally think about the tick pilot and what it was born from, the Jobs Act.[61] I'm having a hard time sort of connecting the dots, seeing how a wider tick size would, in fact, create jobs or ultimately improve liquidity. I'm not sure it was ever set out to be about an improvement in liquidity. I would not be surprised to see liquidity or costs worsen as a result. We've talked a lot at Blackrock about how there will be a lot of studying as we enter the tick pilot. The focus could be the width, the spread, or the depth of the market. All I ask is that we consider the parent order, the 100,000 shares, the 50,000 shares, or whatever the size is, which we're actually trying to transact.[62] Let's make sure we're actually looking at the overall impact to engage the marketplace when we're buying or selling stock.

The question was asked this morning about small-cap stocks. I use that word generally speaking on purpose because, yes, costs have come down. But small-cap stocks remain stubbornly high in terms of trading costs. Maybe we just say it's a fact of life. I hope we don't throw our hands up and walk away from the conversation. Historically, this has always been a difficult place. Whether that's because of the lack of float in small-cap stocks or the amount of alpha that we think is embedded in these names, small-cap stocks are tough to trade. If it takes a tick size pilot, or an overly complex tick size pilot, and we uncover some jewel of liquidity in doing so, that's fantastic. But we're all a little skeptical about what we will find out about this pilot.[63]

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[60] Ibid.

[61] Jumpstart Our Business Startups (JOBS) Act *https://www.sec.gov/spotlight/jobs-act.shtml*. The thinking among many proponents of this law is that wider spreads would trigger more demand for otherwise illiquid stocks among market makers and foster more research coverage of these same stocks of small companies. That in turn would ultimately assist the capital raising process for smaller companies, which many see as the engine of job growth in the USA.

[62] The "parent" order is regarded as the original starting order the trader is aiming to execute. For example, it could be a one million block share order but with only 100,000 shares put to work. So the parent order, in this example, is for one million shares.

[63] For an informed discussion on how the pilot program fared, see *Tick-size pilot disappointment has experts searching for alternatives*. New ways to add liquidity, boost trading examined. *Rick Baert*. *Pensions&Investments*

From the story:

"The tick pilot, which began in October and extends through October 2018, has not resulted in an increase in the number of listed small-company stocks, as was hoped, but it hasn't hurt small-cap stock performance so far."

http://www.pionline.com/article/20170621/ONLINE/170629944/tick-size-pilot-disappointment-has-experts-searching-for-alternatives

TABB: Frank, the Trade-At rule in part of Phase 3 was initially thought to be kind of about a full employment act for exchanges.[64] But actually, you have Trade-At issues as well. The rule as it stands makes it hard for exchanges to access hidden liquidity.[65] What are your thoughts on the pilot?

HATHEWAY: Let me first respond to Jon's point about the parent order. That was something that we thought about including in the plan. The challenge we ran into is that the SROs don't have the authority to regulate the buy-side, and therefore to tell Jon what he needs to do, and what data he needs to provide.[66] But if ICI, Blackrock, or anyone wants to suggest how the plan could include sort of a parent order perspective, that would be terrific. We think it is very important.[67]

In terms of the Trade-At of the pilot, a way to think about the plan is in terms of display priority. So the priority rules for the market under Trade-At are first price priority and, second, display priority. The exchanges in the USA internally operate today with price priority first and then followed by display. The overall US market just operates on price priority under the Order Protection rule of Regulation NMS.[68]

Why would you want price display priority? Well, we're going to widen the tick and the displayed quote in the tick pilot. In the past, the tick was 12½ cents so the display quote was wide. At that time, the challenge for the investor was finding where to trade liquid stocks inside that display quote. In the past, having a wide quote hadn't necessarily always worked out. But now under the ticket pilot we're going to try with less active stocks. The tick pilot test groups one and two will have a wider tick, and a wider displayed quote. We will see what happens in trading those stocks.

Test group three includes a Trade-At prohibition, which reflects both 20 years of SEC emphasis on display, and the importance of display. The SEC's emphasis on display is apparent, whether you talk about the Order Handling Rules, the Order

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[64] "The pilot securities assigned to the third test group will adhere to both the quoting and trading requirements of the second test group but will also be subject to a 'Trade-At' requirement, which generally prevents price matching by trading centers that are not already displaying a quotation at that price, unless an exception applies, including for example, an exception for block size orders and exceptions that mirror those under Rule 611 of Regulation NMS."

Source:

Investor Alert. *Tick Size Pilot Program. What Investors Need to Know. Securities and Exchange Commission*. October 03, 2016. *https://www.sec.gov/oiea/investor-alerts-bulletins/ia_ticksize.html*

The "full-employment" reference by Frank Tabb was a tongue- in-cheek comment on the notion that the Trade-At requirement would drove more liquidity and order flow to the exchanges.

[65] During 2014, "Exchanges have been lobbying US regulator the Securities and Exchange Commission (SEC) to introduce a rule that would force equities transactions onto lit exchanges, unless dark pools or internalising matching engines operated by brokers could prove meaningful price improvement had been achieved." From The Trade News.

[66] SRO is the acronym for Self-Regulatory Organization.

[67] The Investment Company Institute.

[68] See footnote 37.

Protection Rules, or Reg NMS.[69] If we don't want a display priority component to the Tick Pilot, then we must also think about how the SEC will address that consistent with its own internal history of promoting order display.

We also have to think about how Congress will respond if there is no effort to promote order display. The Dodd-Frank Act put a lot of emphasis on transparency in other asset classes.[70] So if we're to deemphasize order display, then we need to say, transparency doesn't matter so much in these stocks and here's why.

Finally, if we want to make an argument that display priority is unnecessary, we need to recognize that exchanges in the USA have display priority right now. We have display priority because it is part of the regulatory requirements of US exchanges. We didn't have display priority in the past. Ten plus years ago, display was not part of the priority rules of an exchange in the USA. So if display doesn't matter for the market as a whole, why should it necessarily matter for an exchange?

In Europe we do not have display as the second priority criteria. NASDAQ's European exchanges have broker as the second criteria, meaning we have exchange internalization in our European markets.[71] Not everybody in the market likes that structure. But back to the tick pilot and Trade-At. If display priority doesn't matter for the market as a whole, why should it matter for the exchange?

But here's the big issue, and why that part of the pilot is there: We will widen the spread under the pilot, and that's fine, let's see what happens. Maybe displayed orders will be harder to execute. Then with the Trade-At stocks, we can also widen the spread and put some importance on the display order now going first, and then we'll also see what happens.

On the mechanics of the Trade-At provision, that's something we put in place because we knew what technology people currently had. There are other ways consistent with the order, to give priority to the displayed orders. Certainly we would welcome comments.

INZIRILLO: I think the regulators are probably doing it the right way, as opposed to a one-size-fits-all approach. Having some empirical evidence would be beneficial to share to the various participants in the marketplace.

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[69] The SEC's Order Handling Rules of 1997 and Beyond: Perspective and Outcomes of the Landmark Regulation RICHARD LINDSEY, JOHN AIDAN BYRNE, AND ROBERT A. SCHWARTZ. The Journal of Portfolio Management. Spring 2016 *http://www.iijournals.com/doi/pdfplus/10.3905/jpm.2016.42.3.056*

[70] The Dodd–Frank Wall Street Reform and Consumer Protection Act (commonly referred to as Dodd–Frank Act) was signed by President Barack Obama, on July 21, 2010, in response to the financial crisis of 2007–2008. "An Act to promote the financial stability of the United States by improving accountability and transparency in the financial system, to end 'too big to fail,' to protect the American taxpayer by ending bailouts, to protect consumers from abusive financial services practices, and for other purposes," according to the long title of the Act.

[71] Frank Hatheway elaborated, in a follow-up, that on NASDAQ's European markets operations, trades are matched first to the best price. If multiple orders are at the best price, then the second criteria is whether two orders from the same broker can be matched at the best price. NASDAQ's US markets do not have this second criteria.

Is the difficulty that you have basically the cost of execution? In a study we conducted, about 50% of the names, in theory, would be part of the pilot. Fifty percent of them already trade in less than in nickel increments. Now, all of a sudden, you're "fictitiously" widening them; and then the cost of execution in theory can go up. If you widen the spread, in theory, your cost of execution will go up.

These are obviously theories. But being able to have a little bit of a pilot program gives you the ability to kind of quantify and to determine if it makes sense to be able to do that.

On the retail side, it's more of an issue. For example, we do not have an internalization engine that's proprietary in nature. So we allow the market makers to compete on price.

MAHONEY: You need to have clearly defined goals.[72] I don't feel we have a clear set of metrics that would tell us this is a great success or a big failure. I don't think we've defined that.

My concern is this: We already complain that Reg NMS is too complicated; there are so many order types; there is so much complexity; there's the messaging traffic.[73] Now we're going to put that on steroids for a year. So you're going to increase the complexity and the operational risk to the entire marketplace for a 1-year study.[74]

If there is another event, something worse than a Flash Crash, who'll be responsible because we tried this approach? I guess it's the coders who were trying to code something really complex! You're adding a level of complexity to the marketplace. And it's unclear to me what the benefit is, given this potentially catastrophic level of complexity.

TABB: Questions from our audience?

Ivy Schmerken [Financial markets and technology writer, FlexTrade Systems]:

Smart beta has become really popular recently, and it allows Exchange-Traded Funds, ETFs, to become competitive to those active fund managers.[75] How do you see this smart beta influencing liquidity in the market, considering it might allow the ETFs to share the pie of those market makers?

MAHONEY: I think it has clearly affected the marketplace. Twenty-five percent of the dollar value of all US equities traded is traded in ETPs.[76] If you're a market maker, I could trade 100 shares with my model against either a relatively informed, maybe not a terribly informed counterparty, or I could try to trade against 10,000

[72] Referring to the Nickel Pilot program.

[73] See footnote 37.

[74] See footnote 17.

[75] Smart beta defines a set of investment strategies that emphasize the use of alternative index construction rules to traditional market capitalization-based indices. Smart beta emphasizes capturing investment factors or market inefficiencies in a rules-based and transparent way. The increased popularity of smart beta is linked to a desire for portfolio risk management and diversification along factor dimensions as well as seeking to enhance risk-adjusted returns above cap-weighted indices.

Source: Investopedia

[76] ETPs include exchange-traded funds, ETFs.

shares coming at me from somebody I know understands the stock better than me. It's not surprising that more people are gravitating to that business line.[77]

But exchange shared blocks are a legitimate, investible asset. As an industry, we have adapted to make sure there is liquidity. Our friends at Blackrock long ago figured out the value of ETPs.

It's a clearly important, investible asset. The marketplace has adapted tremendously well to providing liquidity. In the marketplace, it's all about tracking risk.

TABB: Under the Basel III accord, Volcker, and the increasing liquidity constraints that banks are under, I think the hedge funds will have a tougher time getting leverage.[78] This will push more trading toward ETPs and toward synthetic smart beta strategies or whatever because I think dealer leverage will become harder to get.

ANTHONY FORTUNATO [Instinet]: I would love to know everybody's opinion on whether you could have an effective tick size pilot by just going to nickel increments and by studying that over a year rather than making it overly complex.

HATHEWAY: That goes back to what I said. If we simply introduce a nickel tick, there would be more trading activity going on within the wider displayed spread. Now, whether the wider tick requires the trading centers to be allowed to trade within the wider spread (including, to an extent, allowing the exchanges to trade within the spread) is a complication that would improve our understanding of the market response to a wider tick. It is an interesting question whether a market response would be more or less complicated than a regulatory response. The market response may well be more complicated. Searching for the other side of a trade does become a little bit more challenging. The displayed quote becomes a little bit less relevant for some of these stocks when the tick gets wider.

Five years have passed in talking about the tick pilot. We need to find a way to move beyond Reg NMS.[79] If the way to modernize Reg NMS is a pilot, then it's a way to move off Reg NMS (even if I happened to hate the pilot).

Personally, I think I have a pretty good understanding of what the outcome of going to nickels will look like. I might argue that we don't need a pilot. Instead, why don't we just set the tick in European style and change the tick sizes based on price and trading activity. The Europeans set the tick in percentage terms that stays more or less constant. Adopting the European approach would be a movement away from the current penny tick for anything over a dollar. The current US system just doesn't really make sense.

HESSLER: If you think about it, the nickel increment proposal is really about price consolidation.

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[77] The speaker, in a follow-up explained further: "If your choice as a market maker is to trade 100 shares against the uniformed retail flow, or 10,000 shares against an institutional investor, you are trading less money more frequently with less risk by the first way than by the second way. My point is that market making is not a great business enterprise [today], which is why there are not enough market makers in the industry."

[78] See *Dodd-Frank, Basel 111 and the Age of Uncertainty*. Sullivan & Cromwell. 2012. https://www.sullcrom.com/siteFiles/Publications/Wiseman-Gladin-Basel-Dodd-Frank-Oct-2012.pdf

[79] See footnote 37.

This goes back to what Bob Schwartz was talking about earlier. If you have a less liquid name, in general you are better to come up with some kind of restriction in the typical trading parameters of that stock, you must do this to consolidate or aggregate the liquidity, so that market participants on both sides can meet. This so-called restriction could be as simple as trading in nickels, or maybe it would be even better with nickel increments, but without trading inside the spread, so as to really consolidate the liquidity points at a nickel apart.[80]

If you consider a stock that's not very liquid, it tends to trade in a more restricted way. You can buy milk today at a grocery store, a deli, or at a gas station. If you are trying to buy a milking machine you go to a specialist provider. The one thing that seemed really weird to me when I came over from bonds to equities was how listed companies would graduate from the NASDAQ, which was electronic, and had multiple market makers. The company might switch to the New York Stock Exchange, where it would have one specialist assigned to it. To me, that was like moving toward a model that was more effective for less liquid names, not for more liquid names.

Now everything's changed. When you have a less liquid name, you have to figure out how to restrict trading and how to consolidate it. For example, whether it's by auctions, which is about time consolidation; whether it's by nickel trading, which as noted is about price consolidation; or whether it's via dark pools, these are all ways to restrict trading.

Indeed, Liquidnet basically has a restriction on the participants who can play in it. The same thing with the traditional specialist system, once so familiar on the floor of the New York Stock Exchange. In the case of the NYSE specialist system, there was a restriction on where a company's stock could trade, since it was assigned to a single specialist. In the end, you actually aggregate liquidity better as a result of these restrictions.[81]

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[80] Regarding trading nickels without trading inside the spread, Hessler explained in a follow-up, that he was making a case for the second test group in the Nickel Tick pilot program.* His belief is that trading in nickel increments would consolidate liquidity in those stocks better than allowing all price points between the nickels. As a simple example, Hessler offered: "Suppose you owned a stock and wanted to sell it at 20.11. You might decide to wait until a 20.11 bid comes into the market."

However, he added, "if the stock could only trade at 20.10 or 20.15, you might hit a 20.10 bid, and you would certainly be willing to offer at 20.15. Historically, when stocks traded in 1/4 point increments, there was tremendous additional liquidity at each increment. Very liquid stocks don't need this kind of liquidity consolidation, but illiquid ones could benefit from it."

*The pilot securities assigned to the second test group generally will be quoted in $0.05 increments, subject to limited exceptions. In addition, these securities also must trade in $0.05 minimum increments, subject to exceptions, including for executions at the midpoint of the national best bid and offer (NBBO), certain retail investor executions and negotiated trades. Source: Securities and Exchange Commission.

[81] In a follow on "restrictions," George Hessler further explained that by trading certain illiquid stocks in nickel increments, for example, the market is consolidating liquidity by price points. The same stock trading in pennies could be problematic, say when there is a 23 bid and a 27 offer. The two parties are so far apart on price they never realistically expect to meet. "The less liquid a given stock is, the more helpful these restrictions can be in consolidating the liquidity in the stock," Hessler noted.

MAHONEY: Generally, the simplest answer is often the best. What is the return on a risk we take for creating a very complex third bucket?[82] I don't know why we wouldn't potentially come up with another solution. There must be a better way. For example, you can only trade at the midpoint, or something like that. It just seems weird to me that everybody criticizes our marketplace for being too complex. This makes NMS look simple.[83] We're all going to have different answers. But it is complex.

HATHEWAY: That's probably not going to address the liquidity issue.

MAHONEY: You're right, we went to pennies without thinking; and we went from Jimmy Maguire, the guy forever asking for the nickel pilot, 2 days after our markets switched to trading in pennies.[84] We knew it was a problem, right? So everything shouldn't be at the same spread. And if it adds to liquidity, it does.

BRETT REDFEARN [JP Morgan]: I have a question that relates to this over complexification situation. We have a bit of a paradox. On the one hand, you have what by most accounts is an overly complex proposal. The majority of people I've spoken to, and I think the majority of the industry, thinks this is too complex to ever pass.

On the other hand, we have another situation where we don't want a one-size-fits-all market. We know we have a challenge for illiquid stocks. And so, when you have done them one-size-fits-all, there is always some sort of complexity with that. Is there some way that we can take this pilot, simplify and make it workable, and something constructive, without having everybody say it's too complex? And let's just not do it at any cost?

HATHEWAY: Sure, the proposal that's out there is meant to preserve as much of the market structure as we could. There are other ways to do it that are significantly simpler. We did not propose them. I don't think we would propose some of the alternatives, because the exchanges would be criticized for being self-serving, even more so than we are getting yelled at for already. But other entities can feel free to propose them. There are ways to make trading illiquid stock simpler than having them trade across 11 exchanges, 55 dark pools, and God knows how many broker matching systems.

CLARK: Simplifying it is the right way to go. But, hey, the comment window is not open yet. Once it is, let it fly.

ALAN: But still, even if it stays at this complex version of it, isn't it better than leaving it as it is today? Right now, it seems like there is a big problem, that there are illiquid stocks. From an academic perspective, I can't compare all three versions and analyze the proposal.[85] In that sense, yes, simplifying it obviously would be better. At the end of the day, if something needs to be done, it needs to be done.

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[82] Referring to the nickel tick pilot program.
See footnote, 61 for "third bucket."

[83] See footnote 37.

[84] The late New York Stock Exchange floor specialist, James (Jimmy) Maguire. He died in August 2017. Maguire, a trading vet, was famous for advocating a return to nickel trading.

[85] See footnote 61.

MAHONEY: But if we're looking at liquidity, your idea is as good as anybody's idea, so why aren't we testing that?

ALAN: We tested our SL idea, back testing it 5 years for liquid stocks, and discovered that it was a profitable and self-supporting outcome. But it would be great if we could actually test it with some companies in the real world.

This paper is forthcoming in the *Journal of Portfolio Management*, Winter 2015 issue. But there can still be subsequent studies on this issue, so we welcome any comments. And if we can get people from the industry to say something positive about this, which would definitely help. That's why I appreciate your thoughts, Tim, very much.

MAHONEY: I agree with Frank. It's not surprising Bob [Schwartz] has a call auction idea. But as often with a good idea, the answer is not the original idea, it's a derivative of that idea. And it's our comments that get you to more of a pragmatic approach. Did I say pragmatic, I'm sorry!

ALAN: We actually conclude the paper with this sentence: "We suggest that additional steps be taken to refine and further test and implement this procedure." Obviously, this is not ready to be directly implemented. But this is the first step in getting people to think about this pretty unconventional idea.

MAHONEY: It's probably as good an idea for liquidity as nickel spreads. My only point is that if you were to put on your complete academic hat, why wouldn't you try that, too?

HATHEWAY: That goes back to my answer to the question, we have to have a way to move off Reg NMS reflected systems that were designed for practices from 2002. In other words, technology has to adapt to the realities of today's markets.

DAVE WEISBERGER [CoreOne Technologies]: Frank, you talk about the need to move away from one-size-fits-all. Somewhere north of 90%, maybe 100% of people in this room agree. But here's my problem: Why are we conflating the notion of widening spreads with the notion of matching tick sizes to spreads better? Mainly stocks that trade at 5, 10, 15, 20 cents. Having a tick size of a penny might very well be too small, and kind of what you were alluding to with Europe. But why wouldn't we focus on a pilot, which simply matched tick sizes to spreads, rather than actively widening spreads?

Stocks that are trading with narrow spreads already potentially don't need the help. I agree with you that if you do widen spreads, then you have to worry about trading in the middle. But if you are looking to tighten spreads by making them match better, then there is much less need for all the complexity.

HATHEWAY: A lot of the ills that we worry about are a function of the tick size being wrong. And as for these "ills" in the market—and by that, I mean illiquidity and a lot of other things—let me say this much: NASDAQ has a 4-year-old petition with the NYSE and BATS about changing tick sizes and active stocks, and it hasn't been acted on.[86] When I was talking about how interested parties might comment on the pilot, and the issues beyond that Trade-At aspect of the pilot, I said that there's

[86] See *https://www.sec.gov/spotlight/regnms/jointnmsexemptionrequest043010.pdf*

a political dimension to the discussion of the Tick Pilot. Trying to pretend otherwise is simply naïve.

A lot of us were at the Rosenblatt Global Exchange Leader Conference last week where we listened to a Republican staffer on the House side and a Democratic staffer on the Senate side. In many ways, it was interesting to hear these two staffers, on different sides of the aisle, agreeing with each other about how we should deal with certain industry issues. As you know, there are often differences in opinion on both sides of the aisle, on a range of matters including market structure. But, in this case, both speakers agreed with each other.

TABB: Thank you Frank for that last comment, and to all the speakers for an excellent panel. I'll pass it back to Bob.

Jonathan Clark joined Luminex Trading & Analytics as President in June 2015, after his career at Blackrock. At Blackrock he was head equity trader. At the time of writing, Clark serves as CEO of Luminex.

At the time of writing, late 2017, George Hessler is CEO of New York-based Magma Trading, which aims to become an Alternative Trading System.

Chapter 3
The View from Here

Kevan Cowan

COWAN: When I read the title of this conference, "Equity Trading Roundup: Proposals for Strengthening the Markets," I immediately thought of corrals and horses, and I wondered if I had stepped into the wrong city, if I was travelling in the wrong direction by coming here to New York instead of to somewhere in the West! [laughter.] Of course, thankfully, that is not the case.

It is my pleasure to be here. I've heard many notable things about this great conference. The quality of the program, the attendees and speakers, shows me that this is a wonderful gathering.

My speech is titled, "The View from Here." It's an honor to bring you the Canadian perspective on many of the hot and contentious issues facing our markets in Canada. Canada is in many ways similar to the USA. In fact, it is most similar in terms of capital markets. But there are a few key differences. I'll focus on them today.

Clearly, the USA is the leader in all of this. And often when I think about these things, I imagine a conversation at the end of the day between Canada and the USA. Canada might say to the USA, what did you think about Canada today, sorry for asking; and the USA might respond, "Well, we didn't think about you today; and by the way, that doesn't come with an apology."

And that reminds me of a story told about Condoleezza Rice, former US Secretary of State, and Peter McKay, Canada's former Minister of Foreign Affairs. Apparently Minister McKay said to Secretary Rice, "You know, you never talk or think much about Canada." And apparently Secretary Rice's answer was, "Well, that's a good thing, because we in the United States do talk about our own problems." So, it's a testimony of the strong relationship between Canada and the USA that things between us do go so well.

K. Cowan (✉)
TSX Markets, Toronto, Canada

TMX Group, Toronto, Canada

R. A. Schwartz et al. (eds.), *Equity Trading Round-Up*, Zicklin School of Business Financial Markets Series, https://doi.org/10.1007/978-3-030-51015-2_3

Let me back up and talk about the TMX Group to set the stage.[1] TMX Group owns Canada's most recognized markets, the Toronto Stock Exchange (which is our senior listings and trading market), the TSX Venture Exchange, and the Montreal Exchange (for derivatives trading). Within the group, CDS Clearing and Depository Services is the equivalent of the Depository Trust Company, or DTC here in the USA. So we share in common the same kind of clearing and settlement function.[2] We also own NGX, a natural gas exchange in Calgary, and we are the majority owner of the Boston Options Exchange, or BOX.[3]

Here are some rankings. I'm always careful about rankings in a city like New York. I was thinking about this, despite the fact you haven't won a Stanley Cup in the National Hockey League in 20 years! [laughter]. For that matter, Toronto hasn't won the title in 47 years! [laughter]. So any battle of statistics is in your favor.

The TMX Group, or the Toronto Stock Exchange, is number three in North America by market capitalization, behind the New York Stock Exchange and NASDAQ. We're number one in North America by the total number of listings, which is more than either the NYSE or NASDAQ. Actually, we're number two in the world by number of listings. That is at the heart of a central theme here today: How much we use public equity markets for the financing of junior companies, notwithstanding that Canada is a country of just over 30 million people (about a tenth the size of the total US population). Canada is fifth in the world this year in terms of the total equity capital raised by our listed issuers and has been as high as number three in recent years. So, there is a very strong equity culture in Canada, a culture that supports public marketplaces for financing everything from nano-cap to large blue chip companies.

Canada, of course, and the TMX Group, in particular, has a very close relationship with the USA. I spend a lot of time in the USA. When I do, I'm pitching not only TMX but Canada as well. The USA is very key to the success of our operations. We have 170 US companies listed between the Toronto Stock Exchange and the TSX Venture Exchange. A large percentage of our trading volume comes from the USA. We estimate that about 40% of our daily volumes on the Toronto Stock Exchange are from outside Canada. By far, the largest proportion is from right here in the USA.

Since the Free Trade Agreement in 1989, trade has more than tripled between Canada and the USA.[4] In fact, $1.4 million dollars in goods and services pass between our countries every minute, almost a trillion dollars in a year. Canada is the largest customer of the USA, purchasing more goods by dollar value than China,

[1] TMX Group. https://www.tmx.com/

[2] CDS Clearing and Depository Services Inc. (CDS) https://www.cds.ca/cds-products

[3] See *ICE completes Trayport sale, acquires NGX and Shorcan Energy*. *Automated Trader*. December 15, 2017 http://www.automatedtrader.net/news/at/158519/ice-completes-trayport-sale--acquires-ngx-and-shorcan-energy.

[4] The Canada-US Free Trade Agreement enacted on January 1, 1989, was replaced in 1994 by NAFTA, or the North American Free Trade Agreement, which includes Mexico.

Japan, and the UK combined. Canadian-owned companies are present in 17,000 locations in the USA, and employ over 600,000 Americans.

When you move from general trade to the equities markets in particular, we share some of the same sorts of interlinkages in terms of interlistings and capital flows. Capital flows easily across the border, back and forth. We have upward of 200 companies interlisted between our exchanges, the Toronto Stock Exchange and TSX Venture, the NASDAQ, and the NYSE.

Because of that we face many of the same issues: Market fragmentation, off-exchange trading, dark trading, capital formation, and particularly the same issues for small and medium enterprise, or SMEs. Fairness and investor confidence, which are both big issues, are also common ground. As we think about all these hot and contentious issues, whether they are a reality or a perception, we all know these have some impact on investor confidence.

But our equity markets do differ, just like our two versions of professional football, each of them using the same type of shoulder pads and having the same type of touchdowns. Yet there are many differences, from the regulated size of our playing fields to the number of downs to advance the ball. In capital markets, there are a few key areas where we, in Canada, have made different choices than the USA. In some ways, that's because of our legacy in terms of our marketplace structures, such as natural resources. And sometimes it's because we're the second mover. You know, the USA is usually the first mover, and that alone has many competitive advantages. But sometimes there's a luxury to being a second mover. As you watch what's going on in the other jurisdiction, you can make some different choices. The two choices in particular are different. First, what we've done with junior stock exchanges and the capital formation side with our TSX Venture Exchange. Second, the choices we've made around dark trading, which impacts so many issues like internalization and fragmentation.[5]

Here is a brief history of our group. Prior to 1999, Canada had a lot of different regional stock exchanges. We started to consolidate those regional exchanges in 1999, and that led to specialty arrangements. Montreal became the derivatives exchange; Toronto Stock Exchange became the listings venue for more senior issuers; and we created a new venture exchange out of five regional markets to create this new wonderful beast, TSX Venture Exchange.

Competition then arrived in our marketplace. But this competition shook things up a little later than in the USA, the USA had felt the brunt impact of competition earlier than in Canada. Our regulators laid the groundwork in the early 2000s. By the 2000s, this started to be ramped up, particularly in the 2007/2008 period. You know, compared to your 50-plus trading venues in the USA, we currently have 12 trading venues in Canada. And we have listings competition between ourselves at

[5] See Fragmentation in Canadian Equity Markets Corey Garriott, Anna Pomeranets, Joshua Slive and Thomas Thorn, Financial Markets Department. Markets Bank of Canada Review. Autumn 2013
https://www.bankofcanada.ca/wp-content/uploads/2013/11/boc-review-autumn13-garriott.pdf

TMX Group and one other marketplace, the Canadian Securities Exchange (CSE). My friend, Richard Carleton, is here from the CSE today.

Our regulation is very similar to that in the USA. Our securities laws are based very much on your 1933 and 1934 Acts; and our securities commissions are very similar to the Securities and Exchange Commission, or the SEC, in the USA.[6] We have an SRO called the Investment Industry Regulatory Organization of Canada, or IIROC.[7] It's roughly similar in scope to FINRA in the USA.[8] IIROC's mandate is to enforce the Canadian Universal Market Integrity Rules instituted in 2002 to ensure fairness and to prevent manipulation in a multi-marketplace competitive environment.

Let's talk about the key differences between Canada and the USA. My focus, once again, will be on two things. First, the extent to which we use junior stock exchanges to finance early stage companies. Second, dark trading. Our TSX Venture Exchange was originally formed in 1999 with a basic philosophy. If the regional junior exchanges were consolidated into one liquidity pool, better capital formation for early stage companies could be fostered.[9] Unlike some of the debates here in the USA, our philosophy was very much based on the idea that we would manage regulatory risk. We were not going to manage the investment risk. We have all sorts of companies listed on our Venture Exchange that trade in pennies and that often fail, that undertake a lot of consolidation and reverse takeovers, and so on. Our job is to manage the regulatory risks.

We want to make sure those companies are fulfilling the mandate they presented to the public, that they've made appropriate disclosure, management that is appropriate, that has integrity and good records. Most importantly, that a company has the working capital to carry out the next phase of the business plan that it disclosed to the public. Many of these companies succeed, and many, of course, don't. That's the investment risk side. We let the marketplace take care of that.

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[6] "The Securities Act of 1933 was the first major legislation regarding the sale of securities. Prior to this legislation, the sales of securities were primarily governed by state laws. The legislation addressed the need for better disclosure by requiring companies to register with the Securities and Exchange Commission. Registration ensures companies provide the SEC and potential investors with all relevant information by means of the prospectus and registration statement."

Amendments passed in 1934 and subsequent years.

Source: Investopedia

Each province in Canada has its own securities regulator. The two national self-regulatory organizations, the IIROC, Investment Industry Regulatory Organization of Canada, and the MFDA, Mutual Fund Dealers Association, play a key role for most of the regulation of these organizations' member firms and their employees.

[7] Investment Industry Regulatory Organization of Canada. http://www.iiroc.ca/Pages/default.aspx

[8] FINRA. http://www.finra.org/

[9] See TSX Venture Exchange. *https://www.tsx.com/?lang=en*

The Canadian Venture Exchange was formed in *Canada* on November 29, 1999, following an agreement among the Vancouver, Alberta, Toronto and Montreal exchanges to realign the Canadian capital markets. The Canadian Venture Exchange - now known as the *TMX Group* - renamed it the TSX Venture Exchange.

In doing so, one of the central pillars is proportionate regulation. In the case of junior companies, we have very low financial listings tests.[10] But we have fairly high governance tests. We apply the same kinds of standards for those companies in terms of, for example, integrity of management, and disclosure, that you would see with any company listed on say, the Toronto Stock Exchange. And Canada itself usually ranks in the top five internationally for corporate governance confidence among investors, both institutional and retail.

We made a very distinct and different choice from the USA when Sarbanes-Oxley was in play, following the financial crisis just over 10 years ago.[11] The focus of this legislation was on the involvement of auditors in the certification of the internal controls of companies. After much consultation with both institutional and retail investors, we decided that wasn't the approach for Canada. That's because the US approach did not provide the same reach in terms of that certification over internal controls by auditors. Thus, the dreaded SOX 404 has had a lot of controversy here in the USA.[12] And this is very much based on the idea that, in Canada, size does matter. While we're leading the world with almost 4000 listings on our two exchanges, TSX and TSX Venture Exchange, many of those are nano- and small-cap companies that you typically would not see on stock exchanges in other countries, including here in the USA. The overall market cap of our markets is roughly one-third of NASDAQ's. We're dealing with much smaller companies, so we felt it was important that we put proportionate regulation in place.

In this context, it is interesting that one of the things we also do in Canada that's different than in the USA is this: on our stock exchange, we have no challenges or problems with listing companies that are trading in pennies. If you look at the regulations in the USA, a public company coming onto one of the large exchanges typically must have a trading value well above a dollar. That's not something we've ever

[10] In law, proportionality is a measure of fairness, especially in constitutional law, to assist in striking the right balance between the restriction imposed by a corrective measure, and the seriousness of the prohibited act.

[11] "The Sarbanes-Oxley Act of 2002 (SOX) is an act passed by US Congress on July 30, 2002, to protect investors from the possibility of fraudulent accounting activities by corporations. The Sarbanes-Oxley Act of 2002, also known as the Corporate Responsibility Act of 2002, mandated strict reforms to improve financial disclosures from corporations and prevent accounting fraud.

The Act was created in response to accounting malpractice in the early 2000s, when public scandals such as Enron Corporation, Tyco International plc., and WorldCom, shook investor confidence in financial statements and demanded an overhaul of regulatory standards."

Source: Investopedia

[12] "There are two key provisions of the Sarbanes-Oxley Act of 2002, Section 302 and Section 404. Section 302 of the Sarbanes-Oxley Act of 2002 is a mandate that requires senior management to certify the accuracy of the reported financial statement."

"Section 404 of the Sarbanes-Oxley Act of 2002 is a requirement that management and auditors establish internal controls and reporting methods on the adequacy of those controls. Section 404 has very costly implications for publicly traded companies as it is expensive to establish and maintain the required internal controls."

Source: Investopedia

focused on. Most of the companies on our Venture Exchange trade in pennies, and we have a very different philosophy about that than the USA does.[13]

We've always concluded that if you force companies to consolidate their shares, you're actually, if anything, harming liquidity. We've observed with smaller companies that a larger number of outstanding shares are often a good thing. That is especially so because many of these companies are traded by retail investors.

I find it interesting to look at the old pink sheets and, at the company, OTC Markets, founded and run by a good friend of mine, Cromwell Coulson.[14] But this speaks to a very, very different philosophy than what exists in Canada. In Canada, we have an OTC marketplace that has a much lower standard of regulation than NYSE, NASDAQ, TSX, or TSX Venture. Yet all those companies are trading in pennies on the OTC markets in the USA. And when you get to the more regulated exchanges, particularly here in the USA, they have to trade at higher values. That's never made a lot of sense to me in terms of establishing a high level of regulation. But companies at an early stage of development probably should be trading in pennies.

I often say, speaking to an American audience, that we're always told as Canadians about how we're too modest and that we should learn from our American cousins. So, I'll throw a few stats at you. In running this two-tier exchange system, the hallmark for us has been the rate at which companies graduate from the junior stock exchange, the Venture Exchange, to the senior stock exchange, the Toronto Stock Exchange. All told, since we formed the Venture Exchange, we have had, in the first full year in 2000 alone, 700 companies incubated on our junior venture exchange that are now trading on the Toronto Stock Exchange.

Our nearest competitor in the world is the London Stock Exchange and its junior market AIM.[15] It has less than 10% of the graduation success rate than we have with those 700 companies. Not only have those 700 companies graduated, in many cases they have become the successful stars of today and tomorrow. But by sheer numbers, they're forming 20% now of our composite index on the Toronto Stock Exchange. So this has been a tremendous growth opportunity for us.

I was listening to the comments this morning about issuers and about them having a say on trading.[16] We have had the most vigorous debate among our venture exchange issuers over the last year or 2, as the high-frequency debate has hit with

[13] "For a stock to qualify for trading on the NYSE, it must meet certain criteria, such as a minimum price and minimum company value. Occasionally, a stock will trade on the NYSE for less than $1, but if it remains at that level for too long, it can eventually be delisted, or removed, from the exchange. If you find a stock for that price, it might be a risky investment." Source: Zack Research

Structural Differences Between Canadian and US Equity Markets Have Different Implications for Market Fairness. Investment Industry Association of Canada. http://iiac.ca/wp-content/uploads/HFTs-and-the-Structural-Differences-Between-Canadian-and-U-S-Equity-Markets1.pdf

[14] See OTC Markets. https://www.otcmarkets.com/

[15] See London Stock Exchange. https://www.londonstockexchange.com/home/homepage.htm

[16] See the chapter, Coping with Liquidity Provision Chap. *2*.

full force.[17] Many of our issuers in tough equity markets are trying to figure out what's wrong. Some might argue for scapegoats, certainly high-frequency trading has been blamed. But we've done the math. On our Venture Exchange, high-frequency trading accounts for less than 2% of trading volumes.

In the context of junior stock exchanges with the Venture Exchange, take a closer look at US developments. I see a convergence of certain things. From a public policy view and a marketplace view, people are once again looking to foster an environment where stock exchanges are a piece of the puzzle for capital formation for earlier stage issuers. A great example is the Jobs Act.[18] Look at much of the public policy behind that and statements from the SEC. Certainly, Commissioner Daniel Gallagher has been speaking publicly on venture exchanges.[19] And then, of course, in this regard, there's the tick size pilot, itself, which was talked about in more detail, by the last panel.[20]

In Canada, we have thought about the tick size pilot proposed in the USA.[21] At least from my perspective, there seems to be a public policy issue at play here. You see it when you read the preparatory materials for the Jobs Act, and the Grant Thornton studies and reports by David Weild about the challenges with IPOs in the US market.[22] Arguably, at the root of widening tick sizes, in many ways, is a wealth transfer from investors to the smaller independent and boutique dealers. It is an attempt to shore up the independent and boutique dealer community. That community is incredibly important to us in Canada. It's a big part of our Venture Exchange.

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[17] For perspective on this two-sided debate, see *High-frequency trading corrupts markets: Our view*. USA Today. April 1, 2014. https://www.usatoday.com/story/opinion/2014/04/01/high-frequency-trading-michael-lewis-stocks-editorials-debates/7180003/

[18] Jumpstart Our Business Startups (JOBS) Act is a US law. *https://www.sec.gov/spotlight/jobs-act.shtml*

[19] *Whatever Happened to Promoting Small Business Capital Formation?* Commissioner Daniel M. Gallagher, Securities and Exchange Commission. Washington, D.C.
Sept. 17, 2014 https://www.sec.gov/news/speech/2014-spch091714dmg

[20] Referring to a proposed pilot program for trading small-cap stocks in wider minimum increments. The pilot eventually was approved by the Securities and Exchange Commission. See *SEC Approves Pilot Program to Assess Tick Size Impact for Smaller Companies*. Center for Financial Stability, May 7, 2015. *http://centerforfinancialstability.org/wp/?p=5987*

The pilot eventually was approved by the Securities and Exchange Commission. See *SEC Approves Pilot Program to Assess Tick Size Impact for Smaller Companies*. Press Release. Securities and Exchange Commission. May 6, 2015. *https://www.sec.gov/news/pressrelease/2015-82.html*

[21] The pilot eventually was approved by the Securities and Exchange Commission. See *SEC Approves Pilot Program to Assess Tick Size Impact for Smaller Companies*. Press Release. Securities and Exchange Commission. May 6, 2015. *https://www.sec.gov/news/pressrelease/2015-82.html*

See also *SEC Approves Pilot Program to Assess Tick Size Impact for Smaller Companies*. Center for Financial Stability, May 7, 2015. *http://centerforfinancialstability.org/wp/?p=5987*

[22] See IPO Capital Raising in the Global Economy panel, moderated by David Weild, Grant Thornton. Zicklin School of Business Conference, October 4, 2011. The Economic Function of a Stock Exchange. Springer, November 2014.

But it seems to me there's a public policy issue to be discussed. If that's our decision, we better make sure that will work if we undertake that wealth transfer.

Finally, in the context of junior stock exchanges or venture exchanges, we've moved in Canada to off-exchange financing. There has been a lot of talk in the USA about the decline in IPOs. We've had some of the same discussions in Canada with a lot of people moving to exempt transactions.

We've launched a TSX Private Markets initiative.[23] NASDAQ, of course, is moving into this same space. We very much see this as a supplement to what's happening in the public markets. With the Venture Exchange, we finance very early stage companies. We see this as a supplement to existing arrangements for even earlier stage companies or for companies that stay clear of public markets so they can have access to a different source of capital.

In this context, the crowd funding phenomenon is fascinating. Crowd funding attracts all the headlines. But, at the end of the day, it will be other means of exempt or private market transactions, where the bigger dollars are raised. And it will be worth watching how regulators deal with the crowd funding approach. In Canada, unfortunately, we have multiple securities commissions with different sets of rules and about three different versions of crowd funding legislation right now. Hopefully, it will come together.

Let me talk about dark trading, and all of the related issues around fragmentation and internalization.[24] It probably suffices to say that, in Canada, we have had a tradition over the last decade or so (and even more recently) of rules that have a higher priority for visible over dark markets. It has manifested itself in four ways: First, and most important, are the dark trading rules.[25] Second is our version of the Order Protection Rule.[26] Third is payment for order flow. Fourth is our Fair Access Rule.[27]

With that legacy of priority for visible markets in Canada, we have something that dates back to the Order Exposure Rule. In this rule, any dealer has to expose a retail order for under 5000 shares to the visible book.[28] More recently, in October of 2012, our new dark rules came into place with two fundamental distinctions compared with the dark rules applicable for the USA.[29] First, visible orders must always

[23] See TSX Private Markets. https://www.tsxprivatemarkets.com/en/

[24] See footnote 5

[25] *Dark pools arrive in Canada*. Financial Post. Barbara Shecter. April 13, 2012. https://business.financialpost.com/news/fp-street/dark-pool-rules-arrive-in-canada

[26] *Canada reviews order protection rule*. Markets Media. Terry Flanagan. July 21, 2014. https://www.marketsmedia.com/canada-reviews-order-protection-rule/

[27] *Payment for Order Flow Spurs Canadian Regs*. Markets Media. Terry Flanagan. March 27, 2017. https://www.marketsmedia.com/payment-for-order-flow-spurs-canadian-regs/

[28] "The Order Exposure Rule was created to make sure smaller orders were given the same priority as larger ones. Here, 50 standard trading units or fewer (about 5,000 shares) have to be immediately entered on a marketplace. Brokers can't fill their larger orders first." Source: Day Trading for Canadians. For Dummies. Ann C. Logue, MBA and Bryan Borzykowski. John Wiley & Sibs, Canada, 2011.

[29] See, footnote 25.

receive priority within any marketplace over a dark order. Second, our version of Trade-At requires meaningful price improvement for anything that trades in the dark.[30] And that is a full tick (or in the case of a penny-wide spread, a half a tick). Of course, this is very different than what applies in the USA, and it fits right into the discussion that's going on now.

Another area is disclosure. In Canada, we have had a very firm view on all marketplaces being disclosed and very transparent about their rules. We haven't had the same level of fragmentation, crossing networks, and private markets as in the USA, and these don't necessarily have the same kind of disclosure around their rules and allocation methodologies, for example, compared with the USA. And in Canada that must be fully disclosed.

On the Order Protection Rule, there is this distinction: in the USA, it is top of book only; in Canada it's full depth of book in terms of trade-through prevention.[31] That's a distinction which also contributes to the difference in dark trading in the USA versus Canada.

The Order Protection Rule, or OPR, has been very controversial in Canada. We're in a public consultation process which our regulators will be responding to. We're most likely to see a 5% threshold for protected market status for new markets.[32] So that would mean any market coming into Canada to set up to trade equities will not be protected and will not be part of the Order Protection Rule until it reaches a 5% threshold. Of course, the idea is to reduce the runaway costs for dealers to connect to multiple markets.

The third issue, in the area of dark trading, is payment for order flow.[33] In Canada, unlike in the USA, payment for order flow is illegal. We don't have a situation where it could be a wholesaler purchasing order flow.

Now we do, just like you, have maker-taker placing, and the marketplaces in Canada can pay rebates.[34] That's also under heavy debate in Canada. You've heard some comments on the tick size pilot here.[35] The Canadian regulators are looking at a pilot to actually ban maker-taker pricing on a portion of the stock list.[36] There are

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[30] About the time of this conference, participants in the US markets had been lobbying the Securities and Exchange Commission to introduce a rule, referred to as the Trade-At rule, forcing equities transactions onto lit exchanges unless dark pools, or internalizing matching engines operated by brokers, could demonstrate meaningful price improvement had been offered.

[31] See footnote 26.

[32] *See CSA Amendments to NI 23-101 Trading Rules*. Wildeboer Dellelce LLP *July 6, 2016* *https://wildlaw.ca/resource-centre/legal-updates/2016/csa-amendments-to-ni-23-101-trading-rules/*

[33] See footnote 27.

[34] In the USA, maker-taker fees provide a transaction rebate to trading participants who provide liquidity, while at the same time charging customers who take liquidity.

[35] See footnote 20.

[36] See *TMX Group bows to pressure and lowers controversial "maker-taker" rebates*

The pricing changes announced Monday should reduce fees for dealers and lower revenues and profits for high frequency electronic traders. *Barbara Shecter*. Financial Post. May 04, 2015. https://business.financialpost.com/news/fp-street/tmx-group-bows-to-pressure-by-lowering-controversial-maker-taker-fees

many areas where Canada can go it alone with different rules than the USA. But this is not one of them.

We are so interconnected, the trading is so interlinked, and we have 200 issuers that are interlisted between our two countries. So it would be a very, very challenging outcome for Canada if this isn't done with coordination between the Securities Commissions in Canada and the SEC in the USA. We've been encouraging our Securities Commissions and the SEC to coordinate any such pilot with each other.

The fourth piece of dark trading is fair access.[37] In Canada, if you're defined as a marketplace, you have to provide fair access. That would include a broker's proprietary crossing network. Everybody must be able to access that marketplace. I expect that's a little different than in the USA, particularly as you get into some of the proprietary crossing networks.

If you take those four different rules and put them together, the result is the dark rules, the order protection rule, payment for order flow and fair access. In the USA, if you combine dark and off-exchange trading, you're in the range of 40% of trading volume. In Canada, dark trading is about 5%, so the outcome has been very, very different. We see much greater fragmentation in the USA, with 40 or 50 plus crossing networks, internalization pools and dark trading platforms.

I would also like to comment on a few other issues. I never feel I can go anywhere these days without commenting on Flash Boys.[38] The headlines are very similar in Canada. Many people (myself included) would probably agree; this is very much overheated in terms of the headlines, particularly in Canada where high-frequency trading would comprise about 20% of the marketplace. That's a much smaller proportion than in the USA.

To me, one of the most important things is to remember what equity markets are all about. In my view, equity markets are about the best markets in the world. If you really think about it, if you're buying gold, or currency, or a 2014 Mustang GT, any kind of fungible goods, who else gives you a price guarantee? In equity markets you're basically subject to rules this way or that, given a price guarantee, a best price guarantee. To me that's an extraordinary thing. Why do we do that? Well, I guess, number one, securities are fungible, and, number two, we can, so we do, and it's great for capital markets and investor confidence. But I don't think we should lose sight of that as people debate the challenges in equity markets.

To my mind, one of the big upsides of the Flash Boys controversy has been the quality of intellectual discourse. I don't think I've ever seen a period of time since the release of that book where the quality of discourse, on both sides has been as strong. The public debate and public forums about it are fabulous. That's a wonderful thing for our industry.

From our perspective, defining high-frequency trading is key, as well as trying to keep the public policy debate relevant to the facts, rather than on sensational headlines, gray areas and unresearched facts. There are many great things, as all of the

[37] See footnote 27.

[38] *Flash Boys: A Wall Street Revolt. Michael Lewis* (2015, WW Norton & Company, LLC.)

studies have shown, about high-frequency trading. There are also bad things, whether it's quote stuffing, or otherwise.[39] We have rules to enforce against those practices, and we should do that in both Canada and the USA.

If you remove what's obviously good, and what's obviously bad, a public policy debate still remains. We should bring great transparency to that debate and talk about the issues, supported by evidence-based policy making. In this regard, the SEC and the Securities Commissions in Canada, as well as the IIROC in Canada, have made tremendous strides in their ability to dig into these issues and produce quality, evidence-based policy making. That will be the most important thing going forward.

In the midst of all of this, there is a lot of complexity between regulation, fragmentation, technology, and order types. In Canada, I think we have some 35–40 order types, which is much less than here in the USA. Nonetheless, people still complain about complexity. The question is, is it too complex in Canada?

As an exchange, what are we doing about it? In Canada, we're on the brink of moving from market fragmentation to customer segmentation, as marketplaces look continually for new and niche ways to serve smaller and smaller portions of the customer base. This, of course, will lead to this whole other round of complexity, like we've had here in Canada.

Let me explain. At the TMX, as I have already noted, we run four marketplaces: Toronto Stock Exchange, TSX Venture, Select (which is our own ATS), and TMX Alpha. Should they be running forward? Should they be running in a different manner? How can we take complexity out of the system? As we do that, our goal will be focused on two very simple things: quality of execution and reining in complexity.

In conclusion, we have the USA and Canada, very close, very interlinked, with very similar histories and very similar experiences. The USA, of course, usually experiences significant change or drives significant change first. We in Canada have a bit of a different legacy. Sometimes, we have the luxury of being a second mover, so we can follow what's going on south of the border.

Some of the different paths we've taken have been around the aforementioned junior stock exchanges or venture exchanges, like TSX Venture Exchange. When it comes to equity markets, we all have the same goal of capital formation. In the last few years, we're so caught up in the challenges and the technicalities of trading that we often forget that the whole basis of this is capital formation for issuers. Investor confidence is the cornerstone of that.

Our role as a stock exchange is to try and find the right balance between those two things. With all of these hot button issues and international economic stability, that's become harder and harder to do. But we keep trying. As we keep doing so, there is lots of work to be done on both sides of the border, and on both sides of the order books. We'll continue to chart our path by looking closely at what's happening here in the USA.

[39] Quote stuffing is the practice of submitting an excessive amount of larger orders to buy or sell stocks in fractions of a second and then canceling the orders almost immediately.

SCHWARTZ: Do we have questions?

ATTENDEE: You're ahead of us with broker preferencing, right?[40]

COWAN: Indeed.

ATTENDEE: There will be a big public policy debate over the next year or so on broker preferencing. A lot of dark trading is from brokers trading themselves. But they can't preference here. On the Toronto Stock Exchange, which would be the most liquid of the exchanges in Canada, what percentage of all those trades are broker preferenced, brokers trading against themselves?

COWAN: Less than 10%. It's less than people think. The last number I saw was about 8%. As we looked and started to face the challenges of fragmentation and the threat of internalization, we made a different move with going to price/broker/time priorities. Our allocation priority on the Toronto Stock Exchange, for example, is price/broker/time, not price/time. The philosophy is to try and bring in a lot of that trading that would otherwise be internalized off exchange. Of course, IEX, founded by a Canadian, is operating with a similar model here in the US.[41]

ATTENDEE: We had a succession of regulations from the Sarbanes-Oxley Act, to Basel I, Basel II, and so on, arising from various scandals and crisis in recent years. Did Canada have any similar laws in response to these events in the past 10 years? They really have shaken up the market? I'm referring to the Enron scandal and so on in the USA.

Also, how long does it take for the emerging markets countries, like India, China, and others, to register at your Toronto Stock Exchange?

COWAN: The big headline type of challenges over the last 20 years was really defined by Bre-X.[42] Bre-X involved a mining find overseas and was a big challenge that predated Enron and WorldCom back in the 1990s.[43] And because we're such a natural resources base, that's obviously something we have to take very carefully. That really suppressed financing in the natural resources area for many years.

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[40] "One of the reasons why dark pool volumes in Canada are so low is the existence of broker preferencing. Broker preferencing is an internalization practice that allows incoming orders to a trading venue to match with other orders from the same dealer ahead of similarly priced orders from other dealers, without concern for time priority.

"'Broker preferencing in Canada gives enough functionality of dark pools that brokers will stay in the lit market,'" said Jeff Drew, liquidity center program director at NYSE Technologies, the technology arm of transatlantic exchange operator NYSE Euronext."

From: Dark Trading Gets Lighter in Canada. Terry Flanagan. Markets Media. September 11, 2012. https://www.marketsmedia.com/dark-gets-lighter-in-canada/

[41] IEX. https://iextrading.com/about/

[42] Bre-X Minerals Ltd., part of Bre-X based in *Calgary*, was implicated in a major *gold mining* scandal when it reported it was sitting atop a huge *gold* deposit at *Busang*, *Indonesia*. Though originally a *penny stock*, its stock price soared to *CAD* $286.50 (split adjusted) in May 1996 on the *Toronto Stock Exchange*. In 1997, Bre-X Minerals collapsed after the gold samples were discovered to be a hoax.

[43] The *Enron* scandal broke in the summer of 2001. Scandal-plagued WorldCom filed for bankruptcy in 2012.

We responded by establishing the Mining Standards Task Force and by developing a new set of standards and regulations that are now seen as the international gold standard—pun intended—for mining.[44]

I have watched US exchange executives struggle when reporters challenge them on the success of investments. From my point of view, our philosophy is about managing regulatory risk, not investment risk.

On the second question, how long would it take to get registered from India, I assume you mean for an issuer to get listed on the exchange? India is a bit of a tricky question. We have over 300 international listings on our marketplace. They go through the same process and standards of all of the other listed companies, and it occurs generally in the same period of time. We advise foreign issuers to make sure all their disclosure work is done in advance, so that we're not reinventing the wheel when they come to us later.

India is a little bit trickier. India has some very active stock exchanges, including the Bombay Stock Exchange, which has the world's highest number of listings. We are second. Bombay has been much more restrictive in allowing Indian companies to finance offshore. That said, it has occurred, but often through a more complicated offshore structure. So we have not seen as many of those. But that's more due to regulations in India.

COWAN: Thank you very much.

[44] The Mining Standards Task Force was created in July, 1997, as a joint arrangement of the Ontario Securities Commission and the Toronto Stock Exchange.

Chapter 4
Coping with the Dynamics of a Continuous Market

Amber Anand, Amy Edwards, Vijay Kedia, Dmitry Bulkin, Richard Carleton, Philip Pearson, and Robert Shapiro

ROBERT SCHWARTZ: Our next moderator, Amber Anand, is now based a long way from New York City — in Syracuse, upstate New York, to be precise. My goodness, he's practically in the snow belt these days!

Amber has been an important part of the Baruch community for a long time. I am very proud to say he is a graduate student of our college. He's a very good friend and colleague. So in this frame of mind, what do I do? I organize a conference so I can get Amber back here, as our moderator for this panel.

AMBER ANAND: Bob is very kind behind a microphone.

We know Bob, just to set it up, the continuous market versus the call auction or other kinds of discreet auction mechanisms, is what we are exploring today. The title of our panel is, Coping with the Dynamics of a Continuous Market.

One of the issues in continuous markets is intermediation, an issue talked about today on another panel. Intermediation is an issue because time mismatches are

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much more likely to occur between buyers and sellers, so we need intermediaries. And because of the way, we have organized the US markets it seems as if the incentive for intermediation is the maker-taker model.[1] Does maker taker, the way it currently is structured, create too much intermediation, or too little intermediation on some stocks? Your thoughts?

ROBERT (ROB) SHAPIRO: The right way to start is really to decide whether or not it creates conflicts of interest that we can live with. There is certainly an incentive based model that a lot of exchanges use to attract liquidity to their market centers. I'm curious about views on whether the model is working or not and, more importantly, perhaps from the exchange reps on this panel, and certainly the regulators on the panel, whether or not there is a variant of maker-taker that would be something they both could better live with?

It's very easy to say, "Do away with it." You can do away with it, and remove the conflict of interest associated with why brokers, or how brokers route orders. But it's really hard to figure out the repercussions. I am sure everyone would agree that some of the best, or the most sweeping legislative moments in market structure history, have always had unintended consequences that were gargantuan relative to the actual statute.

RICHARD CARLETON: Amber, as the lit exchange operator on the panel, we have a somewhat unique perspective.[2] As Kevan Cowan mentioned earlier, we list, generally speaking, what you would consider to be micro- and nano-cap stocks.[3] But we also post all of the stocks listed on the TSX and the venture exchange.[4] That means we have everything from the most liquid to the least liquid stocks in Canada trading on our platform.

You're right, for the most liquid stocks, maker-taker is the principal incentive. It's fair to say, although I wish I was of a more analytical bent, that we could prove it empirically. Still, it's my sense when you look at the amount of professional participation in the most liquid names, the ETFs and the constituent stocks for the Benchmark 60 index, that we are over-compensating the liquidity providers for the liquidity they project into the marketplace.[5] And when you look at the difficulty in

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[1] In a competitive program to encourage trading on exchanges, maker-taker fees offer a transaction rebate to trading participants who provide liquidity, and charge customers who take liquidity.

[2] A lit exchange or market refers to venues that display the various bids and offers in stocks. By contrast, dark markets, or dark pools, do not display prices.

[3] Chapter 3: Luncheon Address: The View from Here
Kevin Cowan, President, TSX Markets and Group Head of Equities, TMX Group.

[4] In a follow-up note, Richard Carleton explained that the Canadian Securities Exchange (CSE) also provides a continuous auction market for stocks listed on other Canadian exchanges. In the USA, these are the "Unlisted Trading Privileges" sanctioned by regulators to provide competition in execution services, while aiming to ensure the integrity of "better priced orders" being executed.

[5] In a follow-up, Carleton explained that the USA and Canada both have rules limiting the incentive a market can pay a liquidity provider, that is the "maker" in the maker-taker model, to 30 mils per share. "The issue is that, at the time of this discussion, the typical US equity share was $50/share US while Canada was in the $20/share range," Carleton noted. "On a value basis, the liquidity provider is being paid a lot more in Canada than in the US."
Benchmark 60 index. *https://us.spindices.com/indices/equity/sp-tsx-60-index*

trading, the incentive structure, in fact, is not succeeding. It's not just with the micro- and the nano-caps but also with small caps and even mid-caps stocks.[6]

There's the other impact of maker taker that we also can't ignore. That is the impact on the cost of operations for dealers that are principally handling agency flow. That agency flow is aggressive with spreads coming in on the most liquid names, and it will pay a taker fee.[7] And you've seen the business models of dealers in North America turned upside down as a result of that.

In the USA, with a different structure for proprietary trading platforms, the dealers have been able to protect themselves with the dark pools and other instruments they use. In Canada, as Kevan Cowan mentioned earlier at this conference, the rule structure is different, and the dealers have not been able to protect themselves.[8] And as a result, we have very strong regulations that some people here would say are biased in favor of the public markets, as opposed to private instrumentalities.[9] Yes, Dmitry, you know all about that. And, as I say, the impact on cost has been quite drastic.

The final thing that has happened, however, is tied to this: The border is not a fortress. So the consolidators, or the wholesalers in the USA, have now figured out how to buy flow from the Canadian dealers that would otherwise be paying the taker fees and to execute those orders on the US OTC markets.[10] Once again, capitalism has found a way, with a willing buyer and a willing seller, to address that cost imbalance the Canadian dealers weren't able to address.[11]

SHAPIRO: Why wouldn't the natural forces, just the economics of it, straighten that out? If the large-cap incentives are too high and the small-cap incentives are too low, why must there be either a regulatory solution rather than something that's a little more classically economic in terms of the invisible hand? Is that possible in Canada, or in general?

ANAND: That's not just a Canadian problem, right?

SHAPIRO: Not at all.

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[6] In a follow-up, Carleton explained that the maker-taker model "stimulated"—indeed, it "probably overstimulated"—trading in large cap names in Canada and was not successful in increasing or improving market quality in the mid- and small-cap portions of the market.

[7] In a follow-up, Carleton noted that the "aggressive" side of the order at the time of the conference, or the liquidity "taker," was almost an agency order.

"This meant that discount brokers and other firms that handle primarily agency orders were seeing their costs escalate because the clients typically enter marketable orders into the system," he added. "They don't have a balance of 'maker' orders and 'taken' orders."

[8] See, footnote 3.

[9] Carleton was describing dark pools operated by most of the bulge-bracket dealers in the USA.

[10] This is a source of controversy. It is widely believed, but never publicly confirmed, that a number of the large Canadian-based bank brokers sought to reduce their costs by selling their retail flow to US wholesalers, through the US subsidiaries of these same Canadian-based bank brokers.

"In this way, they could avoid payment of 'take' fees to Canadian exchanges, and instead earn fees from the sale of the orders to the US wholesalers. Payment for order flow is not a permitted practice under Canadian securities laws," according to Carleton in a follow-up.

[11] Ibid.

ANAND: If there is too much intermediation in a large-cap stock, the market solution is that somebody would then have to come in and say I'm going to lower the fees. So it's not clear that the market leads to that solution, does it?[12]

PHILIP (PHIL) PEARSON: I kind of think that the market already has led to that solution. We see that in terms of very large cap stocks, and very liquid stocks. If you want to be at the top of the queue, you're going to have to trade in the venues that have either a lot lower rebates or even the inverted venues.[13] In the more illiquid stocks, we're trading in the venues that have the higher rebates. I think that is going to persist. And that's the best thing for the competitive nature between the different exchanges.

VIJAY KEDIA: Mostly, the maker-taker model, itself, is not so flawed because it's uniform for everyone. What makes it really complicated is the complete fragmentation of the market. So, in my view, the subsequent 5 years after Reg NMS saw the most innovation in the capital markets, primarily from the exchanges, and other players in the market.[14]

It's really not a level playing field between all the players. In fact, those who can invest in a certain kind of technology can truly capitalize on the maker-taker model. The maker-taker model has further promoted fragmentation and the increase in latency advantages for some participants versus others.[15] So the maker-taker model has really become a fuel for the fragmentation of the market.

SCHWARTZ: Rob, if memory serves me, that cross-subsidization, if you will, referred to here today, was served quite robustly at the New York Stock Exchange by the way in which listings were allocated to specialists. The specialists would handle some big stocks and some little stocks. The profits they made from trading

[12] In a follow-up interview, Anand explained that he was speaking in the context of the maker-taker model and of incentives for posting and taking liquidity. He was questioning whether natural marker responses to buying and selling stocks as an intermediary — that is to say, reduce rebates when there are a growing number of intermediaries — would be viable, and result in desired outcomes. In fact, he envisages that such an approach would reduce liquidity.

[13] In a follow-up, Phil Pearson noted that traders use "inverted venues to 'cut the queue' because cost-sensitive smart order routers target inverted venues first." As he further elaborated, to trade passively in stocks with large queues at the primary exchange, "the only way to do so is by posting on a different exchange."

An inverted venue refers to an exchange that offers two models to lure more equity trading volume, the conventional maker-taker model and a taker-maker model, or inverted rebate system where the liquidity taker is paid for handling a trade. Examples of exchanges offering inverted rebates have included Nasdaq BX, Bats BYX, and Bats EDGA.

[14] Reg NMS (Regulation National Market System) was adopted by the Securities and Exchange Commission in 2005 and introduced 2 years later to further advance the ideals of a national market system. The regulation includes the order protection, or trade-through rule; access rule (fair access) to market data including quotations; rules on sub-penny trading and on market data.

[15] This refers to the ability of market participants to gain advantages in the speed of their trade executions and price-quote data through advanced technology, specifically by the "co-location" of their computer servers near stock exchanges' computers. That lowers so-called latency, a critical factor in high-speed trade executions. The practice is regarded as legal though it has many critics.

the big stocks helped them to provide more liquidity for the little stocks. Now we have sort of strayed away from that.

SHAPIRO: Ten years ago, when I was here at this conference, we really only talked about how messed up the specialist system was and whether or not TCA was a good concept.[16] Vijay touched upon SIP related maker-taker, latency arbitrage, and the speed issue.[17] It is mind-boggling to think about how complex things have become. I would only say that I'm not quite sure the specialist system worked as well as it was designed. So, while everyone is pining for simplicity, we had a pretty simple model for most of the previous 220 years of the NYSE specialist system; and there was a lot wrong with that as well. So, we probably just shot to the other side in terms of complexity — and we need the likes of Amy bringing us back to the center of the continuum.

AMY EDWARDS: I don't know if I can do that. But actually Rob reminded me that I need to give my standard disclaimer, that I'm speaking on my own behalf, these are my own opinions, not the opinions of anybody else at the SEC. Maker-taker is one area where we really need more research. It would be great if there was more data out there. I can't just go and create data like that. But it would be great if there was more data, if we had more academics interested in this area. Amber has his own paper on maker-taker.[18] There is also a paper by Rob Battalio, Shane Corwin and Bob Jennings on maker-taker that has generated press.[19] It would be really great to see more papers that address these very issues on what the conflicts of interest are.

There has been talk in the media about a maker-taker pilot. The biggest challenge to a maker-taker pilot is trying to figure out the general hypotheses. Are we studying conflicts of interest when we study the pilot? And, if so, how do we frame a testable hypothesis, in a way that we can design the pilot to address that testable hypothesis? That's a very difficult question.

BULKIN: An excellent point. The discussion about conflict of interest seems to be the prevailing theme around many subjects we're talking about today. The only way to completely eliminate conflicts of interest is to mandate a single price point

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[16] A method of determining the effectiveness of a company's portfolio transactions. Transaction cost analysis (TCA) is essentially a rating of the spread between two possible prices – and the difference between those prices is often called "slippage."

Source: ft.com/lexicon

[17] For an extensive study on the debate between SIP versus Direct Feeds, See, SIP vs. Direct Feeds Latency—What are the Rules? Bloomberg Tradebook, May 15, 2014 *https://www.bloomberg.com/professional/blog/sip-vs-direct-feeds-latency-rules/*

[18] Does the 'Make-Take' Structure Dominate the Traditional Structure?—Evidence from the Options Markets

A Anand, J Hua, T McCormick Management Science 62 (11), 3271-3290. 2016

[19] *Can Brokers Have It all? On the Relationship between Maker Taker Fees and Limit Order Execution Quality. Robert Battalio, Shane A. Corwin, Robert Jennings*. Journal of Finance. May 23, 2016. *Volume 71, Issue 5*.

across all market centers that would effectively eliminate conflicts of interest.[20] Since no one is going to do that, we need to come up with a structure that potentially reduces a perceived conflict of interest.[21]

On maker-taker, I know there is a certain large US-based exchange that–was very vocal about their opposition to maker-taker. And there is a consensus, as much as we can count a consensus in this industry, around a simpler solution, which is to reduce a regulatory mandated cap on access fees, from the current 30 mils to some significantly smaller number, say 5 mils.[22] And it's a very simple idea on the surface. Unfortunately, people who understand details of market structure in the USA would say that, again, it's a one-size-fits-all solution, and it would probably make sense to have different regimes for liquid and illiquid names. If we were to embark on the single, simple change that would potentially address concerns in the market around routing and conflict of interests, and not drastically change the way US markets operate, this is the one change I would advocate.

ANAND: Why not zero then?[23]

DMITRY BULKIN: There are some firms pushing for zero. Now that gets us into the discussion about how that change is going to make money. You have to come up with an economic model that would work for the exchanges to make them profitable. After all, they are for-profit organizations.

ANAND: No, it's not a zero fee. It's the asymmetry in the fee that is the question. In other words, you charge a penny, two pennies or whatever, whether you are on the supply or demand side. And go back to the old model.[24]

BULKIN: By that, you mean eliminate a rebate for providing liquidity?

ANAND: I am saying if that's the concern you are trying to make, then that eliminates it.

BULKIN: And again, it all comes down to the question of which issue are we trying to address. Are we trying to ascertain if brokers are, or are not, taking price into account when making their routing decisions? That probably would go somewhere into resolving that issue. But again, the only way to achieve complete fairness is by having all the exchanges charging the exact same amount!

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[20] As Bulkin explained in a follow-up interview, conflicts of interest would be eliminated if all US exchanges were mandated to set the same pricing structure for executions, with or without rebates for order flow. As the system is currently structured, market participants will base their order executions decisions on the economics and incentives offered by prices and rebates, Bulkin argues.

[21] As Bulkin remarked in a follow-up interview, mandated prices across US exchanges is problematic in a capitalistic economic system.

[22] See update, *Exchanges' Fees and Rebates Could Get a Cut*

SEC proposes test on trading without system of incentives that have been criticized. Dave Michaels. Wall Street Journal. March 14, 2018 https://www.wsj.com/articles/exchanges-fees-and-rebates-could-get-a-cut-1521042510

[23] Zero refers to the idea of executions that are effectively free, and only cost "zero."

[24] Referring to the maker-taker model. Anand explained in a follow-up that with "asymmetry" – that is to say, a different price for posting liquidity than the price for taking liquidity - there is an incentive for market participants. "If both sides have to pay, say 3 cents for 100 shares, then there is no incentive to be on one side or the other of the trade," he said.

ANAND: Here is my concern. I know we talked a lot about routing, but generally intermediation is necessary, and intermediation needs to be compensated. So, if it is not the market maker, then something else needs to be provided in that regard.

Amy, I want to talk a little bit about the tick-size pilot. I know the focus may be on illiquid stocks, but you've gone up to $5 billion in market cap.[25] What do we expect to learn?

EDWARDS: The tick-size pilot is designed as a test. So it applies to stocks with $5 billion in market cap, and up to one million shares per day in average daily trading volume.[26] The goal is to have a big enough sample so that you can test for where a 5 cent tick is appropriate or not.[27] If you restrict it too narrowly, then you are not going to be able to achieve that cutoff point. You need to be able to have a test group of stocks big enough to find that cutoff point.

That said, if you look at the data and if you plot it—that is, effective spreads or quoted spreads relative to market cap — you find a low variance in the quoted spreads. There's not very much variance across securities. But you do have a lot of stocks with bigger spreads. There is a lot more variance across spreads as you get to smaller and less liquid stocks.[28]

It isn't perfect, and it's not meant to be. It's meant as a way to exogenously come up with a sample, where you can test different ways of going about a solution.[29] The idea is to get to a solution that's not necessarily the cutoffs for the pilot.

BULKIN: I want to commend the SEC for creating something very close to consensus in the industry about how complex the proposal is [laughter].

ANAND: Complexity is one thing, but look at the elegance of the design of the tick-size pilot. There's a control sample; there are three test samples; there are randomized stocks — so this is a great job.

BULKIN: If we are talking about the tick-size pilot, they discussed it a lot on the previous panel. I don't want to repeat all the gripes that people had with it before. My issue was that the project is, unfortunately, going to take a lot of time and effort on behalf of the industry. In addition to creating complexity for market participants, it will also divert SEC resources from other, potentially worse issues. My understanding is that if the tick-size pilot is approved in a format resembling the current

[25] Referring to the proposed pilot program for trading small-cap stocks in wider minimum increments. The pilot eventually was approved by the Securities and Exchange Commission. See, *SEC Approves Pilot Program to Assess Tick Size Impact for Smaller Companies*. Center for Financial Stability, May 7, 2015. *http://centerforfinancialstability.org/wp/?p=5987*

This tick-size pilot program, October 2016 through October 2018, defined Securities eligible for participation in the tick-size pilot program as having a market cap of $5 billion or below.

[26] The tick-size pilot included stocks with a market capitalization of up to $5 billion, and volume of up to 1 million shares per day. After public comment the market capitalization threshold was changed to $3 billion.

[27] The tick-size pilot was an experiment that examined whether a 5 cent tick is more appropriate than a 1 cent tick.

[28] Referring to the baseline spreads with a 1 penny tick.

[29] This is to say, "using a threshold metric that is not likely to be impacted by the pilot program," Amy Edwards elaborated in a follow-up note.

proposal, it will take years to implement it, and then possibly significantly more time to analyze it.

The other issue is the absence of clearly defined criteria for success and failure. I assume that this is done to kind of create some flexibility around the conclusions.

EDWARDS: Yes, there are a couple of issues there. I'll deal with the clear outcome issue. When you are looking at pilots, and you're looking at a complex system, it will be hard to say if X goes up and Y goes down, then this is the decision that we're going to make in the end. There are too many different variables that can change in this instance.[30] A lot can change. What we're really going to get out of a pilot, and pretty much any pilot you design, is the ability to identify the trade-offs. There will be trade-offs, there will be some good things; there may be some bad things with the pilot. There are a lot of priors, or expected outcomes, about the bad things in the pilot.[31] But the pilot will identify those trade-offs, not so that the decision is easy, because the decision may still be hard in the end. But to shed light, and to make the decision more informed than it would be today.

On complexity, I was involved in the design of the Regulation SHO pilot.[32] That was a lot easier that the tick-size pilot program. You flipped a switch, you're in or you're not in by a stratified sample.[33] You can't flip a switch in a tick-size pilot. You have to first decide the tick size, so then you can say, "Okay, let's now do the quote size."[34] Well, if we're really going to be good about increasing the quoting increment, then there may be other changes we want to make along the way.

You have to think about the changes the industry will demand with an increase in the quote increment. And once you get into that space where you don't necessarily know what the regulatory response will be coming out of the pilot — and you don't know what the most efficient tick size is — you are really in a complicated arena to start. Before you can begin designing anything it's already complex.

KEDIA: As a technologist, I really love this idea, because the more complicated we make the market structure, the better it is for us. That's in my own self interest![35] But if the tick size is dynamic, in real-time, where it can change tick by tick, that would be even better for us as a technology provider.[36]

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[30] In a follow-up, Amy Edwards explained: "The pilot can have both positive and negative effects across a number of metrics. Therefore, it is not possible to specify one rule that would clearly indicate that a 5 cent tick size is better than a 1 cent tick size."

[31] "Prior probability, in Bayesian statistical inference, is the probability of an event before new data is collected. This is the best rational assessment of the probability of an outcome based on the current knowledge before an experiment is performed." Source: Investopedia

[32] Regulation SHO. *https://www.sec.gov/spotlight/shopilot.htm*

[33] Stratified sampling is a process of sampling from a population in a systematic manner to ensure a representative sample.

[34] The tick size is the minimum dollar increment for prices in a market. In the equity market, the tick size determines the quoting increment. The bid and offer quotation prices must be specified in tick sizes. However, traded prices are not restricted to tick increments.

[35] A somewhat tongue-in-cheek comment, presumably referring to the idea that technological complexity is self-perpetuating, creating business opportunities for technology vendors.

[36] For a more complete understanding of the technology referenced here go to the FlexTrade website: https://flextrade.com/

ANAND: Vijay, how difficult is it to implement the tick size pilot?

KEDIA: We already do quite a bit of it in other asset classes. For example, in options there is a concept of tick size based on the price, strike price and so on. Similarly in FX.[37]

BULKIN: There is one direct application of the complexity of the tick-size proposal on the potential results, or usefulness of the results, in bucket three.[38] And while exchanges being SROs will be forced to do it, some ATSs and market makers, especially smaller ATSs, may decide against spending the resources on the pilot for, say 400 names, that will potentially last only for 12 months.

Now, by definition, that may skew the results. Because if you remove certain market participants from a bucket in the pilot, you may not get results as clean as you would have hoped for. Is that a concern?

EDWARDS: You do want the results to be as clean as possible. Because ultimately you want the results of the pilot to be useful in making regulatory decisions in the future. Pilots will never be exactly like implementing the rule. But you want the pilots to get as close as possible, and to be as informative as possible, in the decisions in the future.

The tick-size pilot program will be going out for public comment. When the Commission issued the order in June, there was no public comment after that; it just ordered the SROs to submit a proposal by August 25th.[39] The SROs submitted that proposal. I'm sure there will be a lot of comment. And issues about the cost of certain elements of the pilot will be very important. And issues on whether this will really tell us what we need to know as regulators in making decisions will be very interesting to read.

I want to point people to the data elements. As academics, we don't always have the best data they want studying an issue. Some academics will get specialized data, often to study certain things. But it is few and far between when academics obtain this data. There are a number of data items listed in the tick-size filing, and in the order. And it would be really great to get comment on how costly those would be to produce, as well as how valuable they might be to academics, or to others studying the pilot.

ANAND: Conceivably, we would reach a conclusion that there are four different regimes which work for different kinds of stocks. Are we comfortable with that; how many regimes are we comfortable running in a market? Some are ideally suited for a certain kind of a stock.

PEARSON: I mean, I would personally hope that the regulatory bodies wouldn't decide to use each of these different regimes for different types of stocks. I don't

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[37] Ibid.

[38] See, footnote 25.

[39] SECURITIES AND EXCHANGE COMMISSION
(Release No. 34 -72460) June 24, 2014. Order Directing the Exchanges and the Financial Industry Regulatory Authority To Submit a Tick Size Pilot Plan.
https://www.sec.gov/rules/other/2014/34-72460.pdf

think that is their objective. That being said, I do worry that once this is all over they're going to want to do something.

I don't know if it's going to be data mining, or something else. But it will be related to the idea that we need to change something, otherwise this was a whole waste of time.[40]

ANAND: Economists do not data mine.

PEARSON: Well, I hope that's the case. But we do want to make sure of that because we don't have an exact level that has led to a success in this process. We want to see that we're not just doing something for the sake of it. You want to see that it's going to have a meaningful, positive effect on the markets.

ANAND: That's one model. You can increase the tick size, and maybe that will lead to more intermediation, more research, and all the good things will happen. What are some of the other models? Richard, could you talk more about it given your business?

CARLETON: We've looked at a number of different models. Again, we have some nano- and micro-cap stocks where intermediation is, in fact, vital to provide retail-sized liquidity. And I guess there are a few models we've looked at, some of them on an informal pilot basis. I'm very intrigued, and support the notion of having the issuer pay in a relationship that's fully disclosed to the marketplace, a certain amount of money a month. In fact, competitive market forces do come to bear with the proposed market maker committing to certain spreads, to participation levels in the book, and to maintaining certain depth in the book.[41] And we have the capability of providing a report to the market maker, and to the issuer on a monthly basis, measuring whether or not those commitments are, in fact, being met and whether the issuer is in a position to perhaps select another market maker.

But sometimes, Amber, it gets as simple as this. A lot of these companies don't even really know how to tell their story very well to the marketplace. So we find as an exchange we're investing resources to help provide training to the executives of these companies. Typically, they are talented software engineers, geologists, mining people, or are in other fields so they really need this help and support.[42] They need coaching on how to basically tell their story in a more compelling way to the marketplace, so that they build that retail and institutional interest in their company.

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[40] In a follow-up, Phil Pearson explained that he was suggesting that when there is no set criteria to determine success/failure of a project or pilot, "regulatory bodies may be willing to find statistics that validate their theories rather than view the data objectively," so as to prove "the experiment" was worthwhile and not just a waste of time.

[41] In a follow-up, Richard Carleton explained that in an effort to ensure all listed stocks have a market maker prepared to commit to providing a two-sided market, "with agreed order size and spread maintenance goals, the CSE was looking at a system that would permit the listed company to pay the market maker a fixed amount per month."

[42] In a follow-up, Carleton explained that the leadership of these companies were not typically financial markets experts, but were otherwise talented professionals. "We found that it was extremely helpful to these people to provide training in market structure, fund raising and presentation skills," he added.

Here is the other thing I should mention. This was a bit of a happy accident, with greater activity from the US wholesalers in Canada, our names are now all quoted on the US OTC market. Most of the issuers then apply to join either the QX or the QB operated by the OTC markets group.[43] Those stocks were accessible from the US retail community, via the discount brokers, as well as accessible obviously from the full-service firms. The market makers have been providing efficient quotes. There's enough cross-border arbitrage so that the quotes in the US market represent a reasonably tight market, vis-à-vis the whole market in Canada. So we've added a group of people, and a whole lot more money to the trading crowd.[44] And we have definitely seen improvements in the last few months in market quality, in turnover, spread performance and so on, since that's become a reality.

As I said, I'm not sure whether the answer is for the US companies to trade OTC in Canada or something like that. But as I note, it was a powerful affirmation of the benefits of adding more people, and more interest to the crowd.

SHAPIRO: We have to acknowledge something.

The regulators obviously have a significant impact on the way the financial industry does business. They sort of own the show, and they impose their will after lengthy commentary and discussion. When I think back over the 20-some-odd years that I've really been focused on market structure, and the topics that are discussed every year at Baruch, the most monumental changes came from entrepreneurs and private industry.

Now I was listening to Amy talk about all these different trials that are underway. And I would argue that the most significant trial underway in US market structure is IEX.[45] Like them or hate them, but just think about what is represented on the dais here. You have ITG as a fabulous innovator, going back to the days of Ray Killian. Think about the creation of algorithmic trading happening literally at Credit Suisse, and then there is Vijay Kedia who operates one of the most advanced EMS platforms for multi-asset aggregation.[46] Aside from this, you have Liquidnet, of course, which was something we were all talking about some 10 years ago, how it was going to be the death of block trading at the desk level.[47] And it wasn't quite death, but it was a body blow, right?

We now have this trial underway where IEX is stripping away all these indignities we're talking about here. And it's going to be very interesting to see whether or

[43] Referring to the OTC QB and OTC QX boards operated by the OTC Markets Group in the USA.

[44] "For the issuer, the benefit of having a quotation on a regulated market in the USA is that their potential shareholder audience has increased by a factor of [between] 10 to 13," Carleton explained in a follow-up, comparing the smaller Canadian market with the much larger US market. "We also see that activity in the US comes back to the Canadian market," he added. "The market makers will cover short positions in Canada, flatten long positions and line the Canadian book with orders to protect against sudden market moves. All of this improves market quality in Canada."

[45] IEX Group. https://iextrading.com/about/

[46] Raymond (Ray) L. Killian, Jr. was the former president and CEO of Investment Technology Group (ITG) and one of the company's original founder.

[47] Liquidnet. http://www.liquidnet.com/

not that is a model, or another regime, that solves a lot of the problems. We're all in with anything that's innovative and disruptive. I just think we have to pay respects to where respects are due, because a lot of the good stuff comes from private industry.

KEDIA: One point about the tick size is that there could be some unintended consequences that we might be ignoring. I wonder how much of those unintended consequences could be figured out ahead of time. The market is smart enough, very innovative, and we already know the reaction to changes in regulation. And it really doesn't play out exactly the way you intend it to, whether it is Reg NMS, or any other regulatory change for that matter.[48]

EDWARDS: Another model that is particularly interesting for smaller stocks is the issuer-pay model. This is where issuers pay an additional listing fee to have someone provide more incentives to market makers in an effort to provide liquidity.[49] And sometimes they have the opportunity to select those market makers as well. And this model is happening internationally, in non-US markets. In the USA, we have the issuer-pay model only in a select group of ETFs, and no one has signed up yet.[50]

As an economist, I'd be interested in seeing the issuer-pay model for stocks as well. I recognize that there are probably some regulatory impediments in the exchanges trying to list, and to get issuers to pay. But it is interesting to me that no ETFs have chosen to sign up for issuer-pay so far.

ROBERT SCHWARTZ: Europe has had designated market makers (DMMs) for some time.[51] I first heard this term come out of France and Germany, now we have DMMs here in the USA. And DMMs were referred to earlier today. The exchanges, or DMMs in Europe, are paid by the companies to encourage liquidity. So, to what extent have you guys looked at what's happening in Europe for some clues in terms of handling trading in the most efficient manner? My intuition and work with Sila tells me this would be very important to observe.[52]

EDWARDS: We have certainly seen the research on the European exchanges. And we discussed it a lot with the exchanges that have the issuer-pay models for ETFs. But no exchange has come forward to propose such a system for stocks yet.

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[48] See, footnote 14.

[49] The issuers would pay some specific sum to exchanges, or in some instances, directly to market makers, to incentivize them to generate more liquidity in the trading of their company stocks.

[50] In a follow-up, Amy Edwards noted that exchange-issuer pay programs were available for a subset of ETFs in the USA. NASDAQ, ARCA, and BATS had these programs but had no subscribers at the time of the conference. Later, on this same panel, Steven Poser of the New York Stock Exchange, noted that the NYSE had one ETF listed on the issuer-pay model.

[51] Many exchanges in Europe utilize designated market makers (DMMs) to supplement and provide liquidity, especially in mid- and to small-caps. In the USA, DMMs, formerly known as specialists on the New York Stock Exchange, are responsible for providing fair and orderly markets in their assigned stocks.

[52] *A Liquidity Program to Stabilize Equity Markets*, Journal of Portfolio Management, August, 2014. *Nazli Sila Alan*, Fairfield University, *John S Mask,* Deutsche Börse AG, *Robert A. Schwartz* Baruch College—CUNY https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2495819

ANAND: The models they have come up with in the USA tend to be more complicated than the European model, which is a straight contract between the issuer and the market maker. It lays down the rules, and they do it. This is a little different I think. I don't know if it's to overcome the regulatory barriers that exist, or just a preference.

EDWARDS: Yes. I'm an economist and not a lawyer, so I'm not going to be able to tell you all of the different regulations, and what effect they would have on issuer pay. But, the regulation obviously is a little bit different, and it wouldn't be as straightforward in the USA.

ANAND: The other issue in the market right now, at least in my mind, is data. There is a lot of it, and it is produced very quickly. It's a hard process, because some data are not as detailed as we would like it to be, which allows a lot of murkiness. How can the sell-side give better and more meaningful information to the buy-side?

PEARSON: The buy-side, in general, has been under the impression it needs to get more and more data. What are they actually doing with the data? Some firms are moving in the right direction. But a lot of the firms, especially the smaller buy-side firms, don't have the manpower to sort through this big data. In this regard, that raises the issue of putting more reliance on either some kind of third party, whether it be a broker, or whether it be a consultant. Either way, that's really going to be necessary for a lot of people in order to use the data for any kind of productive purposes.

BULKIN: I agree with Phil. The fact that they're asking the right questions is very important. If I were to come up with one very positive outcome since the book came out 5 months ago, it is that there is a lot more understanding on the buy-side about what brokers do.[53] A lot of fear has gone away exactly because the sell-side and buy-side are now closer, much better together in terms of sharing information, and in terms of the buy-side dedicating time and resources to learn about how the sell-side handles their orders.

ANAND: Since we're talking about regulatory pilots, is there any big buy-side firm running its own pilot, saying we'll switch off from dark pools, turn back to them next month, or turn away from certain dark pools, just to see what happens?[54]

BULKIN: First of all, this is a very complex problem you are raising.

ANAND: Every problem is complex.

BULKIN: This one, in particular, is extremely complex. The question of venue analysis, quality of execution, and the performance of the algorithms, all go hand in hand. And you can't really look at the venue performance without trying to understand the intent of the top-level algo, and then go to the next step and try to analyze what the SOR (the smart order router), or a suborder was trying to accomplish.[55]

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[53] See, *Flash Boys: A Wall Street Revolt. Michael Lewis* (2015, WW Norton & Company, LLC).

[54] Referring to the idea that large buy-side institutions are in a better position than smaller institutions to run their own "experimentations" in terms of incentives and executions, according to Anand in a follow-up.

[55] Referring to the idea that an algorithm will break down a large order, say for 100,000 shares, and called the "parent order," into smaller orders, known as "suborders" or "child orders," say of 5000.

And again, we are at the stage where people understand that complexity. They are not just asking simple questions like, which dark pool is the best, which dark pool is the worst? They ask them in the context of what their strategy is trying to accomplish. And that goes back to the intent of the portfolio manager.

When the portfolio manager gives an order to the trading desk on the buy-side, and the trading desk sends an order to a sell-side algo, sometimes they want to interact with all kinds of liquidity. They want to interact with all venues and all market makers in the world. Sometimes they want to be cautious, and that intent drives the quality of the discussion.

PEARSON: By just looking at raw statistics, traders historically would disable certain pools without paying credence to the different order types being used at each pool, or the interplay between venues. Now we've seen some new developments. For example, Ian Domowitz at ITG wrote a paper about how, if you just use VWAP algorithms at a certain venue, versus if you use really aggressive algorithms at a different venue, the results are going to be very different, and performance is going to be very different.[56] And since the buy-side and sell-side are moving in the direction of looking at the more complicated ways we're using venues, both in terms of smart routers and algorithms, this has gone to the next level. That's in terms of people understanding and knowing what to do with the data.[57]

KEDIA: In many ways, it's a myth that data are too big for the buy-side to consume. Today, for $5000, you can get your complete human genome mapped, that's a sequence of billions of characters, unique characters per individual. The amount of data that can be consumed and stored has grown truly exponentially. Every time I use Google to search anything, it remembers what I've done. No matter what computer I use, it will show me ads that are relevant to that. Imagine it doing that on billions and billions of people searching every single second.

Consider the amount of data that can be consumed, stored, and analyzed. There are plenty of tools out there to help you use it. But in many ways, given all the advancements in creating technologies, smart routers, dark pools, fragmentation, and book feeds, the transaction flow analysis has really not kept up with that at all.

As a very simple example, you can get book feeds from multiple exchanges like BATS and NASDAQ and others. With every fill you can find out the order ID associated with it. This really means, as a high-frequency trader, or any trader, for that matter, you can know the first to get the fill at that price; the last to get the fill; and how much stock was previously printed. In fact, there are other fields which tell you whether the fill was based on a hidden order, or a display order; and a bunch of other activities that are very important to black box traders, or other traders.

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[56] *Garbage In, Garbage Out: An Optical Tour of the Role of Strategy in Venue Analysis*. Ian Domowitz, Krsti Reitnauer, Colleen Ruane. ITG. 26 August, 2016
http://www.itg.com/marketing/ITG_WP_Domowitz_Reitnauer_Ruane_20140825.pdf

[57] In a follow-up, Philip Pearson noted that this was referring to the same concept as previously described. "By understanding all of the different ways venues are accessed, including the entire routing decision-making process, different order types, etc., venue (data) evaluation can take place using more rigorous approaches," he said.

Let me add that TCA, or transaction flow analysis, is really hampered, or limited by the amount of information that comes back with the fills.[58] We can probably all say that today the slippage versus VWAP, (the Volume Weighted Average Price), is far superior, far better, than it was 10 years ago. But it's very difficult to argue this if VWAP itself has been compromised versus what it was 10 years ago. All of this can only be done if there is far more data coming back which can be used in TCA. I'm glad of the efforts by Larry Tabb of the Tabb Group and his team on venue routing analysis. But this too can go much further in terms of capturing far more data points in many of the book feeds.

ANAND: Amy, will CAT, the Consolidated Audit Trail, help with this?[59]

EDWARDS: CAT will help for regulators. But right now there is nothing in the consolidated audit trail that says it will go out to third parties. I believe as a buy-side institution that you have a right to your entries in the consolidated audit trail. So it may be that once this linking mechanism is in place, you would be able to track your orders all the way through.

Here's something that may be a little bit simpler than analyzing CAT data—which may have this big data issue — and it is in some of the chair's initiatives that were announced last June.[60] One would be that brokers provide a report to the buy-side on their institutional routing on a periodic basis. One question is whether it seems the market is moving in that direction now and whether there will be more information provided about ATS operations. In this regard, are there market frictions that say regulators need to do this? Is this going to happen on its own?

SHAPIRO: There's definitely a trend toward more transparency in the marketplace, and it is not just a grassroots effort. There are certain brokers setting new standards for disclosure around their ATS filings, and things of that nature. Phil Pearson touched upon the big issue. You could provide reams and reams of data to buy-side desks, but having come from that world, you have a lot of responsibilities. It's awful hard to make heads or tails out of all this information.

We used to say data, but it's sort of like water, you need just enough to live. Too much of it can kill you. The truth is, some data that are not actionable are noise.[61] And it's not actionable because it's in the wrong format; or it's not actionable because you don't know how to discern the real message and numbers. And that's a very, very tricky problem. By the same token, there's a slew of firms doing great work on TCA.[62] Frankly, they haven't figured it out though. They haven't been able to create the golden dataset that solves all the problems, that tells you this broker is

[58] See, footnote 16.

[59] In the process of being implemented as of writing, 2018. *www.catnmsplan.com*

[60] Enhancing Our Equity Market Structure.

SEC Chair Mary Jo White.

Sandler O'Neill & Partners, L.P. Global Exchange and Brokerage Conference New York, N.Y. June 5, 2014. *https://www.sec.gov/news/speech/2014-spch060514mjw*

[61] Actionable in this context is referring broadly to the idea of the data being useful in the trading process.

[62] See, footnote 16.

better than that one, or that this VWAP is better than that one. It's a very complex problem. The question is, who is really driving the solution? If necessity is the mother of all invention, who is clamoring for this solution? It's hard to say.

KEDIA: One thing I've experienced personally is that no one really wants to pay for TCA. And that's the root cause for it. If I go to either the buy-side or the sell-side, selling an EMS or OMS platform, they are willing to pay for algos; they're willing to pay for the platform itself. But they assume that TCA comes for free along with the system.[63] If the TCA is given due attention, if it's paid for, well there will be plenty of firms who have an incentive and motive to improve on that. But TCA pretty much has stayed the same for the last 10, 15 years, compared to the progress, enhancements and advancement we have seen in other areas.

ANAND: But there must be some heterogeneity. We had a paper that looked at implementation shortfall for institutions versus brokers.[64] We found that some institutions do really well consistently, some institutions don't do as well consistently. And it's persistent over time. It's the less sophisticated institutions that seem to benefit from market structure changes. And the good ones seem to stay where they are. The effect on shortfalls is much more driven by institutional decisions, or the institutional identity in our database, than by the brokers that they choose.

All of what you're describing seems to suggest that, yes, we can get gains from improving the market structure. But there also may be gains we have not really realized, which can come from more sophistication on the buy-side.

ANAND: Questions.

ERIC SWANSON [BATS Global Markets]: At BATS, we have a competitive liquidity provider program for a new product coming to market. Today, we list only ETFs. Under that program, market makers compete for an award every day. That's based on a measurement that we do throughout the day of competing market makers, and the size that they're displaying at the inside. And it's a modest award, $200–$300, but it is funded by the issuer, initially through a listing fee, and now today through a direct payment from the issuer (although it flows through the exchange). It can be variable up to $100,000 a year. And with this program, we've been able to get the market makers really interested in competing in the symbol. It's been very successful.[65]

EDWARDS: And ETFs are signing up as well?

SWANSON: We have 26 ETFs participating.

EDWARDS: And they have a choice, right?

SWANSON: Yes.

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[63] EMS is an Electronic Management System; OMS is an Order Management System.

[64] Anand, A., P. Irvine, A. Puckett, and K. Venkataraman. 2012. Performance of institutional trading desks: An analysis of persistence in trading costs. Review of Financial Studies 25:557–98

[65] SECURITIES AND EXCHANGE COMMISSION (Release No. 34-72692; File No. SR-BATS-2014-022) July 28, 2014 Self-Regulatory Organizations; BATS Exchange, Inc.; Order Granting Approval of a Proposed Rule Change to Amend the Competitive Liquidity Provider Program On June 3, 2014, BATS Exchange, Inc. ("Exchange" or "BATS") filed *www.sec.gov/rules/sro/bats/2014/34-72692.pdf*

TABB: While the topic is continuous market dynamics, the idea of an auction formula has been mentioned today. Bob [Schwartz] has talked before about call markets. You know, there's a proposal about the staccato markets creating discreet call auctions. At least, from my perspective, we've seen call auctions get a lot of notoriety, but they don't seem to take up a ton of market share. Your thoughts?

BULKIN: If I were to organize the first exchange in the country, this is a model I would seriously consider. Unfortunately, the reality, or fortunately the reality, is that we're dealing in the realm of Reg NMS, in a highly-fragmented US market.[66] And while any ATSs or dark pool would be more than welcome to innovate in that regard, logistically it's going to introduce tremendous complexity into this system. I'm sure Bob [Schwartz] has the answer.

SCHWARTZ: Eric Budish of the University of Chicago who was on the program at this conference last year, talking about staccato trading.[67] It's the same thing that I've been suggesting all along — staccato trading — although I don't think Eric uses the term.[68] Here's how it works: If you have trading every second but not intrasecond, then in that gap you can have multiple orders. And once you have multiple orders, you need a call auction type algo. Hence you call it a call auction. From my perspective, I don't see it as truly a call auction, which looks to get the benefits of temporal consolidation over a considerably longer period of time, at least several minutes, 5 min or more. All that the staccato does is this: It says that within those small sub-seconds, order arrival sequences should be ignored. That's all. But it can help counter the enormous cost of competing in this horse race. But it's not a liquidity amassing feature, in and of itself.

EDWARDS: I want to bring up one issue with the continuous markets, about sometimes having temporal gaps in liquidity. There is a limit up, limit down in place right now on a pilot basis.[69] Steven Poser at the New York Stock Exchange, and Frank Hatheway at Nasdaq, are studying it. There is a component where if it hits a price limit, and the price doesn't reverse, it goes into a trading pause. Trading reopens with an opening auction on the listing exchange.

Steven (Steve) Poser [New York Stock Exchange]: Yes, and they let me away from that for a few minutes to come here today! I'll also point out that the NYSE does have one ETF where there is issuer pay and that has been active for 2 weeks.

Richard, with regard to issuer pay, what percentage of your listings do you see that in, and up to how large? Is it mostly the nano-caps? Does it move up to some of

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[66] See, footnote 14.

[67] *Zicklin School of Business* Annual
Financial Markets Conference, Baruch College, Market Integrity: Do Our Equity Markets Pass the Test?

[68] Equity Trading in the Fast Lane: The Staccato Alternative
Robert A. Schwartz and Liuren Wu
The Journal of Portfolio Management Spring 2013, 39 (3) 3-6; DOI: https://doi.org/10.3905/jpm.2013.39.3.003

[69] See, Limit Up, Limit Down. *www.luldplan.com*

your slightly larger ones? I know you don't have stocks as big as the TMX Group, but I'm curious.

CARLETON: Yes, the issuer-pay model is of principle interest really to, I guess, the small and nano-cap issuers.[70] We're talking about market caps of between $5 million and $20 million. That alone isn't going to move the needle sufficiently; it has to be accompanied by the company getting out there on the hostings, and telling a story to the community as well.[71] So it's not just one silver bullet, it's got to be part of a full-on investor relations program to really see the true benefits.

ANAND: Let me add how we observed nonlinear phenomena, as laid out in our other paper, when we studied listed firms that contracted directly with liquidity providers.[72] It's not the very small stocks that signed up. So we looked at the Stockholm Stock Exchange, and the very large stocks are obviously not interested. In fact, it's the middle tier where the benefits are the greatest. That's because you have to pay the market maker, and the market maker will charge a lot for something that never trades.

I guess we have to leave it here. Thanks, everyone. Thank you very much.

[70] In a follow-up, Carleton explained that he was saying that "paying a market maker would not, on its own, have all of the desired market quality improvements without also being supported by an aggressive communications programme."

[71] Carleton is speaking metaphorically, employing the British and Canadian term for political campaigning.

[72] Anand, A., Tanggaard, C., and D. Weaver, "Paying for market quality." Journal of Financial and Quantitative Analysis, 44 (2009), No. 6, 1427-1457

Chapter 5
Strengthening the Infrastructure

Richard Repetto, Bill Harts, Eric Swanson, Boris Ilyevsky, Eric Noll, and Brett Redfearn

ROBERT SCHWARTZ: Our moderator, Rich Repetto is a well-known industry practitioner who needs no lengthy introduction. Welcome, Rich!

REPETTO: As many of you know, I'm a sell-side analyst who covers the exchanges and e-brokers. And I am delighted we have a great cross section of industry professionals on this panel.

Picking up on the title, what have we done to improve the industry's infrastructure? What are some of the biggest historical failures and events in market infrastructure? The Flash Crash and the failure of the SIP are certainly two.

The Flash Crash happened on May 2010, the NASDAQ SIP failure on August 2013.[1] Let's talk a little bit about IPOs in the same context. Were there any IPOs that

[1] The Flash Crash of May 6, 2010, lasted about 36 min, erasing 998.5 points in the Dow Jones Industrial Average, and then quickly recouped much of the losses as indexes rapidly rebounded in this high-speed, electronic trading phenomena.

Nasdaq says software bug caused trading outage.

John McCrank. Reuters. August 29, 2013 https://www.reuters.com/article/us-nasdaq-halt-glitch/nasdaq-says-software-bug-caused-trading-outage-idUSBRE97S11420130829

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R. A. Schwartz et al. (eds.), *Equity Trading Round-Up*, Zicklin School of Business Financial Markets Series, https://doi.org/10.1007/978-3-030-51015-2_5

weren't exactly smooth sailing? Facebook? That clearly rings a bell. When did that occur?

It occurred on May 2012.[2] We're talking about events that really did change the perception of markets. The BATS IPO. When did that occur? It occurred in March 2012.[3] Here's another one: When did Knight experience a computer glitch? Yes, August 2012.[4] Finally, does anyone remember when Goldman Sachs had a little problem with their order router and pricing in the options markets? That happened on August 2013.[5]

Failure is an established fact. Indeed, there have been other notable problems in the markets at large, from market structure and electronics to automation and individual exchange processes.

We haven't had anything in the last year or so, and I don't want to jinx things! Should we be talking right now, if we've had a good year so far? In any event, how do you feel about the infrastructure, the stability of the markets today? If you feel it's good, tell me why you think so? If you don't think it's good, tell us what we're missing? And what's the next event that we should be looking out for?

ILYEVSKY: It sounds now like you're saying we're due another event soon!

REPETTO: I didn't mean to imply that something will happen within the next week!

ILYEVSKY: If something does happen in the next week, it's going to look really bad! We've felt pretty comfortable for quite some time. These various events obviously have caused different levels of disruption. As just noted, something happened at the exchange level, at the SIP level, and also at the broker dealer level. In this

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[2] *Facebook IPO: What the %$#! happened? Julianne Pepitone*, CNNMoney, May 23, 2012. http://money.cnn.com/2012/05/23/technology/facebook-ipo-what-went-wrong/index.htm

[3] This BATS IPO was scrapped after a software glitch sent its shares plunging a fraction of a cent within seconds of the attempted IPO on March 23, 2012.

"The initial public offering of a computerized stock exchange turned into a major debacle on Friday as a software glitch sent its shares plunging to a fraction of a cent in a matter of seconds, leading it to scotch the IPO.

BATS attempted the launch on its stock exchange, but the company *aborted the IPO after a technical glitch* caused an infinite loop that overloaded a server and sent share prices tumbling."

Trading Firm IPO Fizzles in Seconds. Apple Shares Also Affected as Glitch Mars Debut of BATS Global Markets. Tom Lauricella, Scott Patterson and David Benoit. Wall Street Journal. March 25, 2012

https://www.wsj.com/articles/SB10001424052702304636404577299560502440118

[4] Aug. 1 stock trading fiasco costs Knight $604M. USA Today, October 17, 2012. According to this AP story: "The Knight Capital Group trading firm said it lost $764.3 million in the third quarter because of a software glitch that flooded the stock market with trades one day in August, causing dozens of stocks to fluctuate wildly." **http://www.usatoday.com/story/money/markets/2012/10/17/knight-capital-earnings/1638817/**

[5] *Goldman Sachs technical error causes erroneous US option trades*. Reuters. August 20, 2013. Caroline Valetkevitch, Doris Frankel

https://www.reuters.com/article/us-nasdaq-trades/goldman-sachs-technical-error-causes-erroneous-u-s-option-trades-idUSBRE97J0R920130820

regard, aside from having some of these broker dealers as our major participants, at ISE, we have been more or less fortunate in not having been directly involved in a lot of these unsettling, market events referred to a moment ago. Every time one of them occurred, we always sat down to see if we had any inherent weaknesses in our systems. In fact, we continually strive to improve our infrastructure, our security measures, all of our belts and suspenders, to make sure we can prevent at least what we know and what we see happening.

I don't want to speak for all the options exchanges. Generally, we've had a fairly acceptable track record over the last few years with all of the new regulations. We continue to do a lot of work by ourselves but also in conjunction with the OCC and the other exchanges in terms of infrastructure.[6] That includes supporting Reg SCI, looking at new risk tools and at harmonizing rules across the exchanges as they relate to halts, re-openings, and things like the obvious error rules.[7] So we feel comfortable in this regard.

ERIC SWANSON: The industry has evolved dramatically, yet without regulation catching up from behind it and without the industry completely focusing on infrastructure. As we see it, there has been a significant number of initiatives that directly target the industry problems. For example, there is the Flash Crash initiatives with limit up/limit down, seemingly working quite well. In the aftermath of the SIP outage late last year, all of the SROs, the self-regulator organizations, met in Washington with the chair of the SEC and her staff.[8] The gathering went through a laundry list of items that needed to be addressed, to help shore up the infrastructure connected with the SIP. At the same time, there has been a lot of industry investments in new hardware, new software, and in new auditing regimes.

We're feeling pretty good about where things are at today, and the direction they are headed in with the various initiatives. Reg SCI certainly adds a lot of benefits.

REDFEARN: We have to remember that things are better but probably not perfect. We still have a very complex market structure. As mentioned by someone earlier today at this conference, we still have, to a certain degree, a technology arms race, alongside a significant amount of market complexity.[9]

I don't want to say it's inevitable, but there will continue to be technology glitches. And in today's complex technological environment, that's just something we should all plan for. The key is, can we manage those issues quickly and smartly,

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[6] The Options Clearing Corporation (OCC), https://www.theocc.com/

[7] "For purposes of this Rule, an Obvious Error will be deemed to have occurred when the Exchange receives a properly submitted filing where the execution price of a transaction is higher or lower than the Theoretical Price for the series by an amount equal to at least," a specific amount. Definition posted on Nasdaqtrader. https://nasdaqtrader.com/Micro.aspx?id=ObviousErrorPolicy

[8] *SEC talks on Nasdaq failure to focus on backing up system. Herbert Lash and John McCrank. Reuters. September 11, 2013. https://finance.yahoo.com/news/sec-talks-nasdaq-failure-focus-182241277.html*

[9] *The High-Frequency Trading Arms Race: Frequent Batch Auctions as a Market Design Response*. Eric Budish, Peter Cramton, and John Shim, February 3, 2015. http://home.uchicago.edu/~shim/Papers/HFT-FrequentBatchAuctions.pdf

and without a lot of impact? I sit on a trading desk between traders in our operations group. When something goes wrong, you hear a lot of noise. You still hear self-help declarations; you hear how such and such a market is down.[10] So, in this event, we just shut them off, and we move on.

When there are system issues, there are processes in place to deal with them. Fortunately, for a long time, we haven't had any big ones. But we should expect that something could happen again, given the complexity of the markets. Hopefully, we can manage any future event well and limit the impact.

SWANSON: Good point about the self-help declarations. This doesn't get enough attention because it's not just about trying to prevent a problem. I mean, you need to do everything you can to prevent a problem. But you are never going to be 100 percent successful. So, the next layer is about how do you prevent that problem from having a widespread impact on the market? To that end, in the wake of Reg NMS, self-help is a really good example of where we can document instances of an exchange having gone down completely for some period of time and where it doesn't get reported.

It is or can be completely unnoticed because there's enough redundancy in the existing infrastructure for firms to just simply—as Brett alluded to in the self-help declarations—route around the market that is down for some period of time.[11] It happens less frequently than it did in the past, say, in 2008, 2009, but it still happens.

REPETTO: In case some in the audience are not familiar with it, can anyone on the panel define and describe self-help in some detail?

SWANSON: Simply put, for your quote to be protected under the order protection rule of Reg NMS, it has to be immediately and automatically accessible, meaning people essentially have to respect your price and route to you. And after trying to access a quote multiple times within a second, and not being able to access it, you're allowed to essentially declare self-help. You have to notify the exchange you're declaring self-help. In practice, market participants notify all the exchanges at the same time as they are declaring self-help on a particular exchange. At that point, everybody pulls that exchange out of their analysis of whether or not their quote is making up part of the protected national best bid and offer, or NBBO—until the exchange announces it has fixed the problem and is back up.[12]

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[10] Under Reg NMS, the best price in the displayed market must be honored. Consequently, there is a mechanism to respond to when that best price is out there but not accessible. So, if a market is having technical problems, the market might have a quote a participant can't access. Under Reg NMS, if a repeated attempt by a market participant to access that quote during a single, 1-second period of time, is unsuccessful, the participant can declare "self-help." The participant does this by sending a notice to the exchange it is declaring self-help to. In practice, typically what market participants have done is blast a notification to the Street that it has declared "self-help." That allows a participant to immediately start ignoring the quote from that market having a tech problem until that market publicly acknowledges it is fixed. It might be a barometer of improvement in tech controls in that self-help declarations were much more common when this provision was originally introduced.

[11] Ibid.

[12] Ibid.

REPETTO: Eric, if I had to sum it up, it is about how the other exchanges all of a sudden say we're not playing ball with you anymore, because you're not operational. I've looked at the self-help numbers. They are down some 50% or so the last couple of years. My point is we haven't had a problem; self-help declarations have gone down. And this area of market structure is exaggerated a bit today. Any questions?

JOE ROSEN [RKA, Inc.]: I will partly play the devil's advocate. I mean who am I to quibble with my distinguished colleagues on the panel? If we were to take the same attitude that we seem to be taking here about market infrastructure, that is, some event is going to happen, it's complex; there are inherent problems; then let's consider this: If you took that argument to the airline industry level, where arguably the electronics running these planes are just as complex, if not more so than in the securities industry, we'd have a lot more fatalities in theory with plane crashes. I think we may be a little bit too smug in not focusing enough on quality control.

I don't have the answers. I'm just saying that I don't think it's a good attitude for us to say, well, it's inevitable; it's complex. I mean, so it's going to be. We're going to have problems.

NOLL: I really don't think that's what we're saying. We're recognizing that this is a complex system, and complex systems fail. You can do all the things you want to prepare yourself to keep them from failing, but they are still going to fail. Airlines still crash.

ROSEN: There hasn't been a serious airline crash in the US in quite a long time.

NOLL: But airplanes still crash. Markets work most of the time, right? Most of the time they work, and they work exceptionally well. There are still problems. I don't think anyone is being smug about it. I don't think anyone is saying that these things aren't being addressed. As far as I am concerned, we can't identify the next problem.

I agree with Brett. The real issue here is how do we recover when there is a failure? How do you manage an event after it happens, to make sure that it doesn't spread systemically to the rest of the market? And how can you recover? I don't think the smartest guy in the world will figure out when the next failure will happen. I just think it's realistic to say that the next failure is inevitable.

REDFEARN: Let me underscore how much money has been invested in market infrastructure and improvements, whether it's 15c3-5 or all of the other market structure rules that have been introduced.[13] There have been a lot of lessons learned from recent history, including the regulatory violations for not adequately implementing the Market Access Rules.[14] The amount of effort and work involved is really unprecedented. Nobody in this industry wants to be hurt by negative media headlines, or by extra costs because of a failure. The SEC had a roundtable, shortly

[13] Rule 15c3-5 — Risk Management Controls for Brokers or Dealers with Market Access A Small Entity Compliance Guide https://www.sec.gov/rules/final/2010/34-63241-secg.htm

[14] Ibid.

after Knight, bringing together various experts.[15] They had airline industry people, rocket scientists, and others present. I remember hearing how things will fail and that complex systems eventually will.

So, we're not trying to say that everything possible to avoid these things shouldn't be done. That's our burden, and certainly we all suffer the consequences if we don't do something to avoid problems later. At the same time, we have to be realistic. In a nod to Eric Swanson, we just have to be prepared to manage these things if, and when, they do occur.

HARTS: There's a larger point here. Market stability is so crucial, not just for us as traders, but to restore confidence in the markets for the general public, for the investing public.[16] And that's why we, as an industry, have to be so much in favor of things like Reg SCI, kill switches, adequate testing of systems, and limit up/limit down. We have to be in favor of things perceived by the public as restoring confidence in our markets, and in market structure.[17]

REPETTO: You should understand that there are things that even go wrong today with the markets. And, sort of like the airline industry, there are more industry redundancies, more backups, and the industry is looking at potential failures constantly. Bill Hart's point is well taken; we need to really look hard and to attack the problem.

SCHWARTZ: I will build on what Joe Rosen was saying, but in a slightly different way. And that is, the Flash Crash was totally dramatic because it happened across the board, and it gets a special name to describe it.[18] But when you look at the transaction records for individual stocks, you see a lot of sharp price movements that are not clearly justified by fundamental news. Is it really because of fundamental news? I have increasingly focused my attention on selecting situations where it does look like something is going on. I am not just looking at aggregate data and at averages. That's the approach I have taken in some of my more recent work with Sila.[19] We're looking at intraday volatility, isolating instances where it really is high, and then looking to see if it is justified by news.

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[15] See *Introductory Remarks at SEC's Market Technology Roundtable*. Chairman Mary L. Schapiro. U.S. Securities and Exchange Commission. Washington, D.C. Oct. 2, 2012 https://www.sec.gov/news/speech/2012-spch100212mlshtm

[16] As context, this conference was hosted during a period when the after effects of the financial crisis of 2007 and 2008 were still fresh, with the economy weak and the stock market lukewarm at best.

[17] "A kill switch would enable market participants such as exchanges or broker dealers to switch off immediately, trading algorithms that are causing instability or erroneous trading in markets." Source: Lexicon.fit.com for Financial Times
http://lexicon.ft.com/Term?term=kill-switch

[18] See footnote 1.

[19] *A Liquidity Program to Stabilize Equity Markets*. Journal of Portfolio Management, August, 2014. *Nazli Sila Alan*, Fairfield University, *John S. Mask*, Deutsche Börse AG, *Robert A. Schwartz*, Baruch College–CUNY. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2495819

So, maybe if it's stock specific, not system wide, it isn't as dramatic, and it doesn't get into the newspapers. But it is certainly something we should be looking at and be more aware of.

REDFEARN: Bob, you're talking about how any time a limit up/limit down trigger occurs; you're seeing a move in a very short period of time.[20] We still have a lot of clearly erroneous executions that can occur when a stocks moves beyond a certain level. In a fully continuous market, if you have an imbalance of supply and demand that's dramatic in a short period of time, sometimes you see these moves. Fortunately, we have limit up/limit down, and other mechanisms in the market to protect against that. We don't see too many of them. But when we have those sort of short-term dislocations, we do have mechanisms in the market that sort of stop it, which we didn't have a few years ago.

SCHWARTZ: And those are important controls. The question is, do we need more? In my opinion, I think we do. My analysis with Sila has shown that intraday volatility has gone up for the New York Stock Exchange. It hasn't gone up for NASDAQ, and her supplemental studies have shown that it's related to fragmentation. There's complex stuff going on. I do think that more market structure innovation will be helpful.

REDFEARN: You have both competition and significant change in the speed of trading happening at the same time. The New York Stock Exchange fragmented at the same time that it went from an average execution time on the order of 15 s. Now, you're talking about the ability to execute orders at a rate of 1000 individual times in a second. So that speed may be just as significant in terms of short-term dislocations between supply and demand, as market fragmentation. Don't you think, Bob?

SCHWARTZ: Well, NASDAQ also sped up, but their volatility has not trended up as has the NYSE's. That said, excessive speed can have detrimental effects, a point I have argued elsewhere. For instance, in a JPM paper titled "Equity Trading in the Fast Lane: The Staccato Alternative," Liuren Wu and I suggested that conducting trading via a succession of rapid calls could advantageously defuse some of the problems associated with hyper-fast, continuous markets.[21]

REPETTO: Bob, it also depends on the time period of the study. Look at NASDAQ, which has been all-electronic since the early 2000s, and at the New York Stock Exchange, with its transition from a human trader, floor-based specialist system to the present hybrid model.[22] There are still some differences between the NASDAQ and NYSE structures. And I don't think anybody disagrees we should be looking for more rules, or other precautions to address market infrastructure. The

[20] See *NASDAQ Frequently Asked Questions:* https://www.nasdaqtrader.com/content/MarketRegulation/LULD_FAQ.pdf

[21] "Equity Trading in The Fast Lane: The Staccato Alternative," Robert A. Schwartz and Liuren Wu, Invited Editorial, Journal of Portfolio Management, Volume39, Issue 3, Spring 2013, pp.3-6

[22] See *Electronic Trading: The Exchanges https://www.investopedia.com/university/electronictrading/trading1.asp*

move on stub quotes, for instance, was appropriate, I thought.[23] The Market Access Rule, for another, also helped.[24]

HARTS: Look, if market instability occurs because of market structure problems, then that's exactly what we should focus on. That's what we should go after.

REPETTO: Let's take a look at Reg SCI, which stands for Regulation Systems Compliance and Integrity.[25] Can we have some background on SCI?

HARTS: Most exchanges, in fact, probably all exchanges and most brokers for years, have voluntarily tested their own systems and implemented controls around their electronic trading methodologies. Reg SCI was an attempt by the SEC to say, let's put some regulation behind that, so it could then say, here are the types of things firms should be doing, the types of things firms should be looking at. I would just note that it was first proposed in March of 2013. And it still hasn't been published.[26]

REDFEARN: There was an expectation of a vote by the SEC on Reg SCI by October 8. Just prior to that, there was some pushback by a couple of the commissioners to expand the rule to include wholesalers. And now they've gone back to the table to figure out if they need to approve Reg SCI as is, or whether or not they would expand it, which could cause some delay.

SWANSON: On the legal side, you would have to put it out for a re-proposal to expand Reg SCI now to include wholesalers under the Administrative Procedures Act. That question was not fully addressed in the original proposal, so you didn't necessarily get adequate public comment on that concept.[27]

HARTS: Forget about the legal framework of re-proposing for a moment; I haven't heard wholesalers—by and large, high-frequency trading firms—complaining about Reg SCI. I assume most of them do rigorous and regular testing of their systems.

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[23] See *SEC Approves New Rules Prohibiting Market Stub Quotes*.SEC Release Nov 08, 2010. https://www.sec.gov/news/press/2010/2010-216.htm

[24] The Securities and Exchange Commission adopted the final version of Rule 15c3-5 on November 3, 2010. See Risk Management Controls for Brokers or Dealers with Market Access. Securities and Exchange Commission. *https://www.sec.gov/rules/final/2010/34-63241.pdf*

[25] Final Rule, Reg SCI. *https://www.sec.gov/rules/final/2014/34-73639.pdf*

[26] As of writing, the first enforcement action under Reg SCI was reported in March 2018.
See NYSE's lapses lead to first enforcement under "Reg SCI" continuity rule.
https://www.reuters.com/article/bc-finreg-reg-sci-continuity-rule/nyses-lapses-lead-to-first-enforcement-under-reg-sci-continuity-rule-idUSKBN1H51VU

[27] See Final Rule, Reg SCI. *https://www.sec.gov/rules/final/2014/34-73639.pdf*
See also Public Statement, Regulation Systems Compliance & Integrity (SCI).
Commissioner Kara M. Stein, Nov. 19, 2014 *https://www.sec.gov/news/public-statement/spch111914kms*
According to a disclosure in the Public Statement by Commissioner Stein: "There are currently 44 entities that would be within the scope of SCI, including eighteen registered national securities exchanges, seven registered clearing agencies, the Financial Industry Regulatory Authority (FINRA), the Municipal Securities Rulemaking Board (MSRB), fourteen registered alternative trading systems, two securities information processors, and one exempt clearing agency."

SWANSON: The Market Access Rule covers a lot of what Reg SCI would cover for them.[28]

REPETTO: Bill, I have to politely disagree with you. I cover one of the wholesalers. And after I talked with some of them, I would say that they are not in favor of being covered by Reg SCI.

I'll be blunt. The political aspect of it is this: You have two Democratic commissioners that want the wholesalers covered by it; two commissioners that want it as proposed, and right now you have a split in opinion among the commissioners.[29] We have three exchange representatives here today. Eric, I know BATS wrote a detailed Comment Letter a year or so ago.[30] Just for the benefit of the audience, let's get a taste of the flavor of Reg SCI. What will it require? What does it cover for exchanges in broad terms? Do you think it's an adequate and needed response to these events that we have talked about on this panel?

SWANSON: In the broadest sense, Reg SCI requires you to maintain policies and procedures that are essentially adopting best practices around things like software development, capacity testing, industry-wide testing, and the security of your systems. It also includes fairly rigorous reporting requirements to the SEC, and, some-times publicly; 30 days advance notice are needed when you want to make, for example, material systems changes, detailing exactly what those changes are, as well as a reporting regime (when you have a problem with your trading systems). Reg SCI also includes a requirement when your surveillance and operational alert systems are not working.

It's a very reasonable response in the broadest sense. There are a lot of problems with the initial proposal, in terms of some of the details, frankly, that drew a lot of industry comments including BATS' comment.

I don't have an inside scoop on exactly how the final order ended up changing as a result of BATS' comment. But there was a kind of consistent theme among the Comment Letters insofar as the SEC was maybe a little too prescriptive, in particular, with the policies and procedures tied to software development. The SEC had proposed some very rigorous standards it thought would be appropriate for covered entities to adopt. But some of those standards were really out of sync with how the financial services industry oversees software development. Some of the definitions and the reporting requirements themselves were problematic. But, in general, Reg SCI codifies a lot of what the SROs do today, albeit and arguably, voluntarily with the SEC.

NOLL: We operate several ATSs. When we look at Reg SCI, one of the things concerning us, and, indeed, may have some effect on us, is the personal liability aspects for the technical folks handling software, or certifying that the technology is

[28] See footnote 24.

[29] The SEC has five commissioners appointed by the US President.

[30] BATS Comment Letter to SEC, May 10, 2013: *https://www.sec.gov/comments/s7-01-13/s70113-15.pdf*

BATS Comment Letter to SEC, July 10, 2013: *https://www.sec.gov/comments/s7-01-13/s70113-53.pdf*

good to go. It's not unlike the CFO requirements for Sarbanes-Oxley.[31] It's the personal liability attached on the technological side that concerns a lot of professionals in the space.

I don't have a firm opinion of it, one way or another. But I am a little concerned. It creates a chill on innovation and development, when you take the people who are supposed to be your most creative employees and who are creating new and better ways to apply technology to the marketplace. You are like, "Oh, by the way, if you make a mistake doing this, you're going to lose your job and have personal liability for this." The result is that they are then not all that interested in innovating anymore.

And, eventually, that will come to haunt the industry in some way, by driving out talented people you want engaged in the process. You will hunt them out by telling them, "Listen, you're going to get really punished badly if you screw up."

ILYEVSKY: I was going to echo what both Erics on the panel have said. We've also heard some concerns from our members and the industry. Every discussion seems to be about liquidity, and how to get more of it.

When we look at Reg SCI and apply it to liquidity providers, market makers, and wholesalers, we ask, is this really an area where we want to significantly raise the barrier to entry? For the most part, the exchanges, certainly ISE, have adhered to virtually all of the Reg SCI principles for quite a long time, and we're very supportive of Reg SCI as it's proposed. But when we look at our business, when we look at the equity business, we seek new participants, and we seek liquidity providers. We want our markets to be more stable, and we want more and more liquidity. What concerns us is this: How does the benefit of extending Reg SCI to market makers square with potentially driving certain participants out of the business (or preventing new participants from joining) because of associated compliance costs?

We look at market quality when we think of any expenditures, whether it's hardware or software, and when we look at our fee structure, and when we think about the fee structure debate.[32] At the end of the day, for all of us, it boils down to what happens to the actual market quality on the screen. A component of that in our opinion is the breadth of participants that you have in this business, and our ability to retain them.

REPETTO: Two large wholesalers I have talked with say that extra costs are one issue. They believe that their algorithms would have to be reviewed for changes. I haven't gone through each and every detail, and we know that changes in rules at the exchanges need to be reviewed by the SEC, for exchanges to deploy their proprietary algos. Every change has to be reviewed.

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[31] Section 302 of the Sarbanes-Oxley Act of 2002 requires CEO and CFO certification of quarterly and annual company reports.

[32] In a competitive program to encourage trading on exchanges, maker-taker fees offer a transaction rebate to trading participants who provide liquidity, charging customers who take liquidity.

See update, as of writing*: Pension funds come out in support of SEC maker-taker fee pilot program*. Rick Baert. Pensions&Investments. May 29, 2018 http://www.pionline.com/article/20180529/ONLINE/180529832/pension-funds-come-out-in-support-of-sec-maker-taker-fee-pilot-program

Chair White gave a speech in June at the second best industry conference after this one today! I refer, of course, to my conference at Sandler O'Neill [laughter].[33] At our conference, Chair White laid out a number of initiatives; Reg SCI would be the first major thing since then. The SEC has talked about market structure and about fixed income, so it has been a sort of sticking point that the agency hasn't been able to at least get it out for public comment at this point.

There are other topics when it comes to stability and market structure. One is the SIP data versus proprietary feeds. That was certainly an issue with the SIP. It has certainly been an issue when people debate market structure, whether or not you actually think the Flash Boys presents all the facts.[34]

Are we making the right moves? What are your views on the SIP versus proprietary data feeds? What are your views on this process of picking who's going to run, administer, and operate the SIPs going forward?

REDFEARN: Look, the SIP issue has occurred, in part, because you have these NBBO quotes being published that, many would argue, are factually at a slower speed than people can get from the direct feeds being sold by the exchanges. Now you will hear that most of the participants in the exchange landscape are, indeed, using direct feeds. So there is some question about what is the value, or the utility, of the SIP overall?

One of the challenges is that some of the exchanges still use data tied to the SIP for pricing their own order books. You also have some dark pools that use the SIPs for pricing their own order book. Ultimately, we do have a bit of a bifurcated market data landscape which lends fodder to the arguments about latency arbitrage, and to these speed differentials and advantages.

There is a process in place to select a new processor for the NASDAQ SIP.[35] There is some concern about the lack of transparency in the selection process, as well as, generally speaking, in the governance of the SIP.

Many in the industry believe that more transparency is required over the SIP selection process, as well as in any potential changes in the SIP governance model. Right now the self-regulatory organizations (SROs) handle SIP governance. This, in some respects, is a relic of the era of US exchanges before they were transformed from being mutual, member-owned entities, to publicly traded exchanges.

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[33] *Enhancing Our Equity Market Structure*. Chair Mary Jo White, Sandler O'Neil Partners, L.P. Global Exchange and Brokerage Conference. New York, N.Y. June 5, 2014. https://www.sec.gov/news/speech/2014-spch060514mjw

[34] *Flash Boys: A Wall Street Revolt*. Michael Lewis (2015, WW Norton & Company, LLC).

[35] *US exchanges battle over SIP data system*
Bradley Hope. MarketWatch. February 7, 2014
https://www.marketwatch.com/story/us-exchanges-battle-over-sip-data-system-2014-02-07
A Nasdaq Speed Upgrade Is Threatening IEX. An overhaul at Nasdaq will sharply shrink the time it takes for trades to be published on its consolidated feed of stock prices. Alexander Osipovich. October 20, 2016. https://www.wsj.com/articles/a-nasdaq-speed-upgrade-is-threatening-iex-1476982856

HARTS: Flash Boys was mentioned.[36] I want to make sure everybody understands something. If you want to read a really good book by someone who actually knows about market structure, please read Bob Schwartz's book.

REPETTO: It's always good to suck up to the host, the organizer of the second best conference [laughter]!

HARTS: Look, the principle you have to start with is this: We're very much in favor of equal access, but not in special access.[37] If there are market data feeds that somehow allow people to get an unfair advantage, we should look at that. As long as market data feeds are offered on the same terms to all participants in the market, that's a fair way of handling this issue.

REPETTO: Any views from the exchange guy? Is it possible to speed the SIP up to where it's comparable to the proprietary feeds? Do you think that's an issue from an exchange perspective?

SWANSON: I don't think you will ever get the SIP to be as fast as direct feeds, because of the sort of natural consolidation process that the SIP has to go through. But the SIP has gotten dramatically faster.[38]

REDFEARN: It's not really published, or transparent to the industry, so we don't know exactly.

SWANSON: Well, it has gotten dramatically faster. We've advocated for that since joining the National Market System plan in 2008. Once we joined, we immediately started to press for investment in technology at SIP meetings, in an effort to make the SIP faster, because it can, in fact, be made to operate faster.[39] It has continued to become faster and faster, so that differential is really quite narrow today.[40]

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[36] See footnote 34.

[37] In a follow-up, Bill Harts explained that the "equal access" comment wasn't about any particular rule. His point was that all data feeds should be made available equally, on the same commercial terms, "and that no one should have special access."

[38] As Eric Swanson explained in a follow-up interview, the Securities Industry Processor, or SIP, will inevitably be always slower by design, because the process of receiving consolidating market data from industry participants into a single view, and then disseminating it to users, will take slightly more time, measured in microseconds, for them to receive than if they were receiving direct feeds.

Speeding Up the SIP Isn't Enough, Say Market Pros at Baruch Conference. Ivy Schmerken. Wall Street & Technology. October 17, 2014.

http://www.wallstreetandtech.com/infrastructure/speeding-up-the-sip-isnt-enough-say-market-pros-at-baruch-conference/d/d-id/1316724.html

For an extensive study on the debate between SIP versus direct feeds, see *SIP vs. Direct Feeds Latency – What are the Rules?* Bloomberg Tradebook, May 15, 2014. https://www.bloomberg.com/professional/blog/sip-vs-direct-feeds-latency-rules/

[39] This refers to BATS operating as a registered securities exchange within the National Market System, following approval by the Securities Exchange in 2008. See BATS Trading wins SEC approval for exchange status.

https://www.reuters.com/article/sppage012-n18456533-oisbn/update-1-bats-trading-wins-sec-approval-for-exchange-status-idUSN1845653320080818

[40] The differential here refers to the difference in speed of delivery between the SIP and direct feeds.

NOLL: I'm fond of quoting one of Bill Hart's members at Modern Markets Initiative, one who often says that making the SIP better is just making it less bad. I don't think you are ever going to get the SIP up to the same kind of speed levels that proprietary data feeds get to. Also, I think proprietary data feeds contain a lot more information in them than the SIP does. They have order book data; they have order book priorities. These are things that, as an active market participant, you really need to know about if you're going to work in the marketplace.

The debate should be about how do we measure best execution; and what is the standard by which we measure executions? Will we allow people to use the SIP when they are pricing orders in the marketplace? Or are we going to require them to use proprietary data feeds, and the latest and best data feeds as opposed to the SIP? That's a much more interesting discussion. I don't think we're ever going to get the SIP and the proprietary data feeds close enough together that we will solve this problem.

REPETTO: Questions?

ANTHONY FORTUNATO [Instinet]: In the decision-making process for selecting the SIP processor, was the idea of having multiple SIP processors considered for the purpose of competition?[41]

HARTS: A long time ago, I was on the Seligman Commission put together by the SEC, to examine market structure.[42] One of the proposals we considered was having multiple competing SIPs. I remember that NASDAQ was pulling back, nobody wanted to touch it, so there was basically no chance that anyone would want to compete. But maybe it's time to look at that again.

REDFEARN: SIFMA recently published a set of recommendations on market data issues. One specifically recommended the creation of competing market data aggregators, which potentially means creating a gold standard at each of the market data centers. We're talking about a system of competing market data aggregators at each data center. You would have the fastest possible quote at each of them.[43]

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[41] See SIFMA Letter, October 14, 2014. *Re: Nasdaq/UTP Plan: Selection of Processor for the Nasdaq SIP*. https://www.sifma.org/wp-content/uploads/2017/05/sifma-writes-letter-to-nasdaq-utp-plan-operating-committee-on-selection-of-processor-for-the-nasdaq-sip.pdf

[42] The "Advisory Committee on Market Information" chaired by Joel Seligman, Dean of Washington University School of Law, was convened in 2000. The final report was issued on September 14, 2001. See https://www.sec.gov/divisions/marketreg/marketinfo/finalreport.htm

[43] *SIFMA Board Committee on Equity Market Structure Recommendations, as of July 10, 2014. https://www.sifma.org/wp-content/uploads/2017/05/sifma-equity-market-structure-recommendations.pdf*

How to Improve Market Structure. Dealbook. New York Times. Curt Bradbury and Kenneth E. Bentsen Jr. July 14, 2014

https://dealbook.nytimes.com/2014/07/14/how-to-improve-market-structure/

SIFMA's Market Structure Recommendations before Roundtable on Equity Market Structure. July 28, 2014. https://www.sifma.org/wp-content/uploads/2017/05/sifma-statement-on-sifmas-market-structure-recommendations-before-roundtable-on-equity-market-structure.pdf

A few weeks ago, I participated in Congressman Garrett's roundtable on market structure.[44] There was a panel on infrastructure. My recollection is that every single panelist believed that introducing competition into this process was perhaps the only way that you could really raise the bar. That is to say, you create a competitive force to help enhance the SIP so that perhaps it is truly competitive.

As long as you have time travel, we all realize there will be some difference in the quote if we're dealing in microseconds. The best we can ask for is that, at a given location, it has the fastest possible quote.

ILYEVSKY: We ensure that every trade we execute and send out to the options SIP (known as the OPRA, or Options Price Reporting Authority) is within the NBBO.[45] We use it to adhere to our obligations of intermarket linkage, by sending orders to the best possible market at all times.

We also recognize that many of our participants, specifically proprietary trading firms and high-frequency traders, don't even subscribe to the SIP. However most of them, in fact, take advantage of the much richer proprietary feeds. They either do this directly, or they do this through a variety of market data vendors that put together their own specific NBBO that caters to their needs.

It's hard to imagine that you would have two official SIPs that might, in fact, show different sets of pricing.[46] It would be very confusing, certainly for us. As an exchange, we're not sure what the public at large would do with that. That's not to say that we don't support the SIP getting as good as it possibly can. But, if you are a discount brokerage firm, a retail firm that's currently using the SIP, or you're using a wholesaler and relying on them to adhere to the SIP for your best execution responsibilities, it's not clear to me that a model that would create two official sets of the NBBO makes a lot of sense.

REDFEARN: We'd have fragmentation of the SIP?

HARTS: It seems to me that as long as there's any SIP, it will always going to be slower than the direct feeds. We're talking about laws of physics, right?

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[44] *DC roundtable to feature Who's Who of Wall Street*.

Bob Pisani. CNBC. Mon, 28 July 2014. https://www.cnbc.com/2014/07/28/market-structure-hearings-in-dc-to-draw-scrutiny-.html

[45] OPRA is separate from the SIP for equities debated on this panel. As described by the Options Clearing Corporation, OPRA (Options Price Reporting Authority, LLC) is a securities information processor that is registered as such in accordance with Section 11A(b) of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). OPRA's members consist of the national securities exchanges that have been approved by the Securities and Exchange Commission (the "Commission") to provide markets for the listing and trading of exchange-traded securities options. These exchanges have been authorized by the Commission pursuant to Section 11A(a)(3)(B) of the Exchange Act to act jointly as parties to the OPRA National Market System Plan, which is entitled "Limited Liability Company Agreement of Options Price Reporting Authority, LLC." This plan as amended from time to time in accordance with its provisions is often referred to as the "OPRA Plan," and the parties to the OPRA Plan as they exist from time to time are referred to as the "OPRA Participants."

[46] The "two" SIPs mentioned here refer back to the idea of competing SIPs. At the time of the conference, and as of writing, there is a SIP for equities – which is the focus of much of the panel - and another "SIP" for options.

REDFEARN: Right.

HARTS: Is the purpose of having a better SIP to make compliance or reporting easier? You're not going to eliminate the time lags, and the latency is not going away, as long as you have any SIP. I don't care how good it is.

REDFEARN: Right. My position is that we're talking about creating a system of competing market data aggregators, and that doesn't entail one SIP. As I noted already, the idea is that, at each individual data center, you could have the fastest possible quote at that location, because that's the most that you can possibly ask for. You already have that today. So you say, what happens if you have different feeds? Because all the broker dealers, and most of the dark pools, are currently aggregating a synthetic quote based upon the direct data feeds at those locations.[47] If you had to take every single market center and compare exactly their quotations down to the microsecond, you'd get a very different looking picture, depending on where they are, and the geographic latency.

As I have described it, when we talk about competing market data aggregators, we're talking about different locations competing but offering in that location the best possible gold standard that they could offer.

REPETTO: Question?

JOE LAMPA [Pace University student]: We have a very complex market structure today that invites technological glitches that will hinder operations. Ever since the financial crisis, there's been a shift into risk management, which reflects what was stated today at the conference. How will we recover from these glitches and setbacks?

The Dodd-Frank Act was basically created to mitigate systematic risk with stress tests, capital requirements, as well as leverage limitations.[48] Is our problem just an infrastructure problem? Do we need to really regulate and question the real market players who cause fluctuations in the markets?

I don't think that would be the issue, but perhaps you can explain and give me your thoughts. It was also mentioned that to aggregate liquidity is another concern. But a bigger spread also opens and invites more fluctuations in the market. There is

[47] The idea of "synthetic quotes" refers back to Brett Redfearn's earlier comment: "Look, the SIP issue has occurred, in part, because you have these one sort of utility NBBO quotes being published, that many would argue are factually at a slower speed than people can get from the direct feeds being sold by the exchanges."

See *Speeding Up the SIP Isn't Enough, Say Market Pros at Baruch Conference*. Ivy Schmerken. Wall Street & Technology. October 17, 2014.

http://www.wallstreetandtech.com/infrastructure/speeding-up-the-sip-isnt-enough-say-market-pros-at-baruch-conference/d/d-id/1316724.html

[48] The Dodd-Frank Wall Street Reform and Consumer Protection Act (commonly referred to as the Dodd–Frank Act) was signed by President Barack Obama, on July 21, 2010, in response to the financial crisis of 2007 to 2008. "An Act to promote the financial stability of the United States by improving accountability and transparency in the financial system, to end 'too big to fail,' to protect the American taxpayer by ending bailouts, to protect consumers from abusive financial services practices, and for other purposes," according to the long title of the Act.

an interesting relationship between the amount of liquidity available and the amount of risk that's imposed.

NOLL: You raise an interesting point. If you are going to ask market participants to harden or reinforce market infrastructure, as the system becomes more and more complex, that effort is not financially rewarding for market participants. You get an incentive problem, which means you're asking market players to invest in making the overall complex system better. It will cost them money. But the rewards for hardening the system are not likely to accrue directly to them, right? They spend the money; and they may get some of the benefits because the whole system is better. But they're probably not getting the return out of spending on the system. It's a problem that hasn't been solved yet in financial services. How do you ensure that the system is robust enough and that people are willing to spend money to make it robust enough but not, so to speak, at the point of a gun?

ROSEN [RKA, Inc.]: I always like to ask, and half of my friends love it, ATSs effectively compete with exchanges. Should they be regulated as exchanges?

REDFEARN: No.

NOLL: Every person on this panel has worked on an exchange, even Brett.

REPETTO: I was actually undershooting the number at three.

ROSEN: Should ATSs, Rich, be regulated as exchanges?

REPETTO: The rules have to apply. The regulatory regime needs to be applied across venues more equally than it has been in the past. The regulatory costs need to be spread out more equally than they have been in the past.

SWANSON: The answer is no; ATSs shouldn't be regulated as exchanges. There's clearly a role for ATSs which, as you know, are exempt from registering as exchanges. I mean BATS launched as an ATS. We were an ECN, and over time we graduated to exchange status. I don't think we could have gone through that growth period and then became an exchange if we were regulated like an exchange from the beginning. The benefits of the current regulatory model enabled us to incubate, innovate, and eventually compete a few years later as an exchange. I think that was consistent with the intention behind Regulation ATS.[49]

REDFEARN: I would add that the industry as a whole and the broker dealers recognize that there are issues in terms of where Reg ATS stands today, and the amount of transparency that's available in the ATS landscape. We have been supportive of increased disclosures around order types, market data feeds, and in other areas. We think that a more rigorous set of disclosures is required for ATSs. While we don't believe that you should go full steam ahead, let's do the 19b-4 filings for them that the exchanges do all the time.[50] We believe that more transparency is warranted. We need to up the game a little in terms of people understanding exactly what's going on inside the ATSs.[51]

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[49] See Reg ATS, Final Rule. *https://www.sec.gov/rules/final/34-40760.txt*

[50] Referring to ATSs.

[51] Refers to SEC Form 19b-4 to inform the *Securities and Exchange Commission* of a proposed rule change by a *self-regulatory organization*, pursuant to Rule 19b-4 of the Securities Exchange Act of 1934.

REPETTO: On a final note, I want to talk about cyber security. When we talk about infrastructure, there's a bunch of other topics we could have broached. But let's hone in briefly on cyber security. Has the industry given it much thought?

NOLL: Cyber security is probably the cornerstone issue that we will all face as an industry going forward. From my perspective, I think there's been a couple of good things in that space. The exchanges, because of the way they're constructed, generally have some protection from hacking because they tend to be isolated and contained systems. Their only real connection to other systems is the order-entry ports from their members and generally one way ports of market data going out. So they have some hardening around them that protects their sort of core functionality.

The industry has the rollout of the Market Access Rule, which prevents fat fingers, erroneous trades. But that doesn't prevent someone from hacking into a firm, and then trying to hack through that firm into an exchange.[52] But the Market Access Rule limits the damage that could happen if that should occur. That's not to say that there isn't great risk in this space. We always need to look at how we can make the system more secure. The industry has made some great strides, at least in the equity execution space of protecting itself in the cyber security area.

REPETTO: This was an excellent panel. Thank you panelists.

[52] See footnote 24.

Chapter 6
A Closer Look at How to Improve and Repair Market Structure

Seth Merrin

ROBERT SCHWARTZ: I am very much looking forward to our next speaker, Seth Merrin. Our friendship and working relationship go back a long way. As you well know, Seth is a pioneer in his field. In my opening remarks, I said we need more competition in the area of innovation. We need innovators. And so it was only natural for me to call Seth, who is a great innovator. He accepted my invitation without any hesitation. I'm now delighted to introduce Seth.

SETH MERRIN: I told Bob that when I first started Liquidnet, my goal in life was to keynote his conference.[1] And here I am! I have finally made it.

It's incredibly important to talk about market structure today. As you know, regulation has a very clear impact on market structure. And market structure has a very clear impact on efficient trading and capital formation. That ultimately affects our economy. We have to make this market structure as good as we possibly can.

There's a great quote that says, "Good is the enemy of great."[2] Market structure is better today than it has ever been, though there is still room for improvement. So I want to offer a couple of suggestions about what the buy-side, the regulators, and the venues could do to help enhance the market structure. Then I will open it up for questions. We have some incredibly smart people in the audience, and that's a little bit intimidating!

I want to talk about how we can repair markets. Sometimes, the markets have evolved organically. That's all fine except that when you start from so long ago, way before technology was really involved in the markets, if you haven't managed that growth over time, then it ends up sitting on top of a very shaky foundation. That could ultimately lead to a house of cards.

[1] Liquidnet was established in 2001. See more on http://www.liquidnet.com/#/about-us/

[2] See James C. Collins, Good to Great: Why Some Companies Make the Leap…and Other Don't. (HarperBusiness 2001).

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R. A. Schwartz et al. (eds.), *Equity Trading Round-Up*, Zicklin School of Business Financial Markets Series, https://doi.org/10.1007/978-3-030-51015-2_6

Like in the case of an architect who is constructing a building that doesn't have any drawings, the outcome will be similarly shaky at best. There's no way that the architects of market structure could have foreseen how these markets were going to evolve.

I would say that we are at the intersection of two of the fastest-changing industries in the world, financial markets and technology. How could you possibly keep up with all of these changes? How could you possibly have put a foundation in place that could handle everything we're doing today?

Let's talk about the term "positive destruction". Sometimes it's better, more efficient, and just easier to knock something down and start all over again from scratch. I'm not really suggesting that we throw out all of the market structure that we have today, or all of the regulation that we have today. But there are some things that we should just raze and start afresh.

At this point I would say that we have put Band-Aid upon Band-Aid upon Band-Aid on this market structure, and obviously it's creaking, which is a little embarrassing.

First, I want to ask what can the regulators do? What are the issues we're facing from a regulatory structure? Then I want to talk about some of the problems in the market structure today. The regulators seem to release these massive batches of regulation. There is no way we could possibly stay on top of, nor stay ahead of, these regulations.

But you can't just patch it up all at once. Markets are dynamic. Regulation has to be dynamic, and regulators have to work with industry practitioners. I apologize up front for who I'm about to offend. I generally do any time I speak! The regulators, to some extent, sit in Washington, taking a look at the regulations — not FINRA, by the way, just the Securities and Exchange Commission. They sit in Washington, looking at the regulations, as if these were the Constitution of the United States, simply interpreting what's in there, as opposed to changing and making it dynamic.

Most of this regulation was written before computers were in the markets. That's not the way to release more timely regulations. A lot of the time, we're also regulating by putting out the fire du jour. That, too, is no way to create regulations. So, either you have market structure by design, or you have market structure by default. And I would say that today we have market structure by default. That's a really big problem.

Let me explain. Think about what our market structure looks like today: We have 11 exchanges, 45 dark pools, and 57 different order types. The top ten order types comprise 85% of US equity volume. I've been in this market for a long time. The only order types that I know of are a buy, a sell, a sell short, and a cover. I don't know what the other six are, much less the other 47. But I do know that every single order type has to be approved by the regulators. And some of those order types are so singular in nature that only the people who requested it have the intelligence, or the ability, to actually use those order types.

This is the market structure that we have today. The question you have to ask yourselves, if we were going to design this market today, is how we would design it. Make up your own minds; I've got my own skeptical opinion.

I put together a working group last year comprised of a former SEC chairman, a former SEC commissioner, a former top executive at a stock exchange, and myself. We sat around, uncompensated. And we said, okay, if we are going to make some suggestions to the regulators, what would they be? It's one thing to complain about it; it's another thing to actually make some suggestions that would help them out.

What we said was, first, we have to make this market less complex, and we have to offer the regulators a way to regulate, so that they're not constantly 5–10 years behind the curve on what's actually happening in the markets. How do you do that?

The first thing we asked is, What is the job? What is the SEC there to accomplish? And we really broke it down. In fact, it's on their own website, it's in their mission statement: The SEC's job is really threefold—one, to ensure the markets are as efficient as possible; to promote efficient capital formation; and, finally, to instill and maintain investor confidence in the markets.

I asked this question when I spoke to an audience a couple of weeks ago. If you had to grade the SEC, what would it be? For everyone that says an A, raise their hand; B, raise your hand; C, raise your hand; and D, raise your hand. The grades were a C, C–, and C+. This is the lens the SEC should look at every time it is considering some regulation. When somebody asks the SEC for the 58th order type, the agency should ask, Does it make the markets more efficient? Does it promote capital formation? Does it instill and maintain investor confidence? We can all agree that there are a lot of investors. We've had a great bull market for the last 3 or 4 years, except that some people call this the most unloved bull market in history. We have had outflows for the majority of these 4 years of the bull market, which means the individual investors have lost out on a massive amount of wealth creation. It obviously affects our economy, retirement pensions, purchasing power, and so on.

I know that the head of the TSX was here earlier today.[3] Here are markets that are being more proactive than our markets in the USA.[4] And they're doing a couple of things that we had recommended our regulators should do. For one, they have the market participants very, very heavily involved in the conversation. The structure at the SEC is such that it cannot actually have closed door meetings with industry participants. And so, if everything is on the record, how honest are you going to be?

If you think about it, this is what should happen. They should call in a bunch of industry practitioners, the Financial Accounting Standards Board, (FASB), who does this. FASB asks real accountants from accounting firms, to come in and join their board for a 2-year stint, to help them form new regulations. Our regulators don't do that. Think about calling in a bunch of us to Washington, getting us into a room.

And we should do the same thing as well-run companies. That is, every quarter they should take a look at the landscape and ask, What are my top ten risks today? And we have to put mitigation plans in place for those top ten risks.

[3] Kevan Cowan, the then President, TSX Markets and Group Head of Equities at TMX Group, operator of the Toronto Stock Exchange and other entities, at time of the conference.

[4] Referring to TSX, which today has a broad panoply of cash and derivatives markets.

I would bet that some of us knew about electronic trading 10, 15 years ago. We probably could have foreseen a couple of problems that eventually occurred. It's not good enough to simply regulate after the fact. That's like putting on a seat belt after you've gone through the front windshield. Who needs that? Let us get into a room, call a bunch of people into a room, and let's debate. What are the issues facing us now?

There are new participants today in the marketplace. Thirty years ago there was virtually no institutional sector. The institutional sector has grown 40 times in the last 30 years.[5] Thirty years ago, for instance, Fidelity managed some $2 billion, so that whole institutional sector has grown. The newest entrants into the financial ecosystem are high-frequency traders, or HFT firms, as well as dark pools, both of which obviously have had an effect on overall market structure. They can tip, or upset, some of the scales that traditionally the markets have been working on.

Let's look at Australia and Canada, both having focused specifically on these two new entrants (high-frequency trading and dark pools). First, they put some transparency around the dark pools and discovered — as FINRA has done here in the USA[6] — that the average execution size on the dark pool was smaller than at the exchanges. What is a dark pool meant for? What was it created for? It wasn't created for retail folks; it was created for institutions. What do institutions need? Well, larger size, better executions, something above and beyond what can be found on the exchanges. If you are not doing that, who needs entities that are not adding value to the overall market structure?

If you're going to execute in the dark, execute at least a minimum of 5000 shares. Indeed, 5000 shares isn't even a block trade.[7] Australia did something even simpler; it said if you're going to execute in the dark, at least give price improvement, by trading at the midpoint. Following this regulation, 50% of the volume went back to the exchanges.

Then the regulators started to take a close look at high-frequency trading. In Australia, it was found that ten firms made up 90% of the equity trading volume. The regulators said, look, if you guys are going to create this massive message traffic, you have to pay for it. Canada also took a regulatory reform approach to HFT. The consequence? High-frequency trading is massively under control in those two countries.

These are examples of people going out and talking to the constituents. Clearly, they're getting different views, but they're making a decision; they're going forward, and it has positively affected market structure. It is market structure by design.

Back in the good old days, this is what the market structure was like. It was made up of investors, retail and institutional. That was the composition of the entire vol-

[5] Assets held by US institutional investors totaled nearly $11 trillion, as of 2014, according to Greenwich Associates.

[6] FINRA concluded that the average execution size in dark pools was much smaller tha.n the average at exchanges. At the time of the conference, the average size in dark pools was 187 shares.

[7] Technically, 10,000 shares are regarded as the minimum size of a block trades. Average execution size at Liquidnet was 43,000 in 2014.

ume, plus there was market making, and one exchange.[8] It wasn't all that complicated to figure out. Today, as I noted, our market structure consists of 11 exchanges, roughly 45 dark pools, high-frequency trading, and 57 different order types. It is a mess. And when FINRA asked all the dark pools to report their volume, this was a shocking number.[9] The average execution size in the dark pools is 187 shares. When you think about an institutional trade, I use this analogy: If you were going to buy 1000 shares, would you buy it one share at a time? No, I don't think you would. And the same could be said for institutions! Who wants to buy a block at 187 shares a shot, considering all the market leakage and movement that that can cause?

There are some folks who are working within the current market structure. God bless them, because that's what we have to deal with today. The problem we have is that there is so much money in trading against these inefficiencies in the marketplace. If you use the analogy of a leaky roof — and this is a very old leaky, creaky market structure — then every time you roof something over, there are a whole bunch of other guys on top of that roof poking new holes into it. It's sort of like a zero-sum game. As soon as you patch one leak, others will start. But at least they're working on it, and they're trying to fix something.

Here is our approach at Liquidnet. And this is actually changing the dynamics of the market, starting from scratch. The approach is about having only a community of like-minded institutional investors, being very particular about who comes into the marketplace — who stays in the marketplace — and making sure that everybody has the same problem and needs the same solution.

Liquidnet connects 750 of the largest asset managers around the world. We trade in 43 different markets. In any given market, our average execution size is anywhere from 100 to 400 times more than that on the local exchanges of the other venues. Ninety-seven percent of the time we execute at the midpoint. And executing at the midpoint at 43,000 shares is price improvement.[10] Getting price improvement on 187 shares is not so much, right? And there's a reason why we were named the best broker in the world 3 years in a row. It's because you have to fix the problem at the very underlying basis.

I want to talk next about something the venues can do and something that the buy-side has to do, because this, too, is an issue.[11] Back in the day when we had one or two exchanges, and you used a broker to access the market, there was not all that much for the buy-side to know about market structure. But today, it is different, with

[8] The speaker is referring to the New York Stock Exchange. While the NYSE handled most of the listed volume in the USA, it had some smaller competitors including crosstown rival, the American Stock Exchange.

[9] In late 2014, FINRA started publishing volume for Alternative Trading Systems, or ATSs. For each ATS, FINRA published the total number of shares and trades for each symbol. The data for Tier 1 Securities is delayed by 2 weeks; the data for Tier 2 Securities is delayed by 4 weeks. The Tier 1 symbols comprise the vast majority of the volume. Brokers and other analysts have been utilizing this data to measure ATS market share.

[10] Average execution size at Liquidnet was 43,000 shares in 2014.

[11] Venues refers to "execution" venues.

so many different venues and things changing so rapidly. Of course, we all want to continue to progress and to change for the better. But think about it. Right now, it's up to the buy-side to know everything that's going on in every venue in the face of transparency. We expect every trader at every client firm will read a notice, for example, every time something is changed.[12]

So right now the onus is completely on the buy-side to know everything going on inside of every venue. That just is not scalable. And if you think that the market structure will remain complex, as I do, then we think that this control, the onus, has to be put back on the venue. This is something we believe that the venues should do; and it's something that we've done as well. At Liquidnet, we used to think that we were completely transparent. And we would tell our customers everything we were doing, and we expected they knew it. That's just not realistic.[13]

Liquidnet has flipped that paradigm and said, "Look, it's incumbent upon us if we're going to change something, to inform our customers, and to have them opt into it." If they do not opt into it, by default, they are opted out. They do not accept anything from us, until we can sell them the value. That way, the buy-side, the actual customers, will not be constantly surprised. That should consist of how we use their data, which is a big issue. That consists of who else is in the pool. We think that this is the right paradigm. Ultimately, we want to lead the way on it. I think our clients certainly have been very, very supportive of it. I think that this is the way the vendors should operate going forward.

Let's look at another area. If we want to be proactive, and if we want the regulators to be proactive, let's talk about fixed income. This is a disaster waiting to happen. I think we all know why, because of these intersecting lines. And because interest rates have been so low for so long. We all know that this has traditionally been a dealer-facilitated market. In fact, this is a cliff that everybody is walking toward. We know that interest rates are only going in one direction, and it's only a matter of time before interest rates start rising.

We know that a trillion dollars has gone into fixed-income funds over the last 10 years. For the last 10 years, they've been absolutely right. But I think there's a lot of people who really don't think bond funds can lose money. Think about the traditional asset allocation model, where wealth managers advise clients to put 1% of their assets into bond funds for every year they've lived. If you're 70 years old, you should have 70% of your assets in bond funds. Those are the people who will be the most affected, most hurt. When they start seeing red on their financial statements, then everyone will be running for the door. The problem is that there are all these doors that are now closed to them, so this is a massive dislocation waiting to happen.

[12] In a follow-up, Seth Merrin's office explained that he was talking here about the burden of obtaining and understanding all of the information provided by venues. Even with full disclosure and transparency from venues, traders ultimately had to handle the burden.

[13] In a follow-up, Seth Merrin's office explained that the dynamics he outlined, which is full transparency in how Liquidnet handle their orders, was not realistic in the practical world.

We clearly have an axe in this because we just bought a fixed-income platform.[14] Not that we're going to be the 100% solution. But we know that the bond market will become more electronic. We might drag them kicking and screaming, but it has to become more electronic. The equity market faced this exact problem 15 years ago.[15] And, look, the uptick in electronics has been massive. Can you imagine not trading electronically in the equity markets? Today, only 15% of the bond markets are electronic.[16]

How many people here today work at the SEC on fixed income?

This is an issue we can all see here.[17] We think the regulators should be more proactive in it. This is an area that we know will change massively. There will be issues. We might as well talk about what the risks are going forward.

I will conclude on these three points and then will open it up to questions. I want to talk about, again, what do the buy-side, the regulators, and the venues do.

The buy-side in the USA has been largely absent when it came to lobbying on regulations out of Washington. I understand why. Still, in today's environment, where there is so much regulation being contemplated and potentially implemented, the buy-side has to make its voice heard. Some of this can put them out of business. If you take a look at Europe, I will guarantee you that the buy-side is very heavily invested there in lobbying with all of the commission pressure and rules that might go into effect.[18] We must have the same thing here in the USA. The sell-side has their lobbyists, HFT has their lobbyists, everybody is represented. But this not so much the case on the buy-side.

We think that the SEC has to take a principle- based approach.[19] Not looking at it simply tactically, not interpreting the regulation. They have to take a look at everything it is doing, at this entire market structure. And if and when they do, I don't think that we would wind up with 45 different dark pools that are no different from the exchanges, or 57 different order types. These things complicate the market terribly. It's one part of keeping retail out of the market.[20] It's so complex. Certainly

[14] In March 2014, Liquidnet announced its acquisition of bond trading platform Vega-Chi.

[15] Refers to the more manual market structure of the US listed and over-the-counter markets prior to the introduction of advanced technology and new regulations.

[16] Comparing the voice, or manual-based bond trading markets, to the electronic bond trading markets.

[17] The issue, as Seth Merrin's office elaborated in a follow-up, is that there was not even one full body at the Securities and Exchange Commission dedicated to the oversight of the fixed-income markets.

[18] Refers to MiFID in particular.

[19] In recent years, some observers note, the SEC has moved more toward this "principles-based" regulation, in which regulatory guidance offers broad compliance principles, entrusting the regulated firms with applying those principles to their own circumstances. Historically, the SEC's rule-making has been "rules-based," its regulations aiming to prescribe specific and detailed rules for reporting, or other obligations.

[20] Referring to how retail orders are typically small compared with institutional orders which are much larger.

Michael Lewis doesn't help at all.[21] But the fact is, I don't think that retail understands the game. Not that investing is a game, but retail doesn't understand the rules. If they don't understand the rules, they're not going to come in. They're not going to invest. And this is one of the problems. Granted, market crashes don't help either, but it's one of the issues.

Finally, as for the venues themselves, posting your Form ATS on a website, that's okay, but it's just a start.[22] It's not enough. Creating real, true transparency, and selling the value of your propositions to the buy-side, is the right way to proceed in market structure going forward. That is to say, having the buy-side opt in to any changes, knowing that they've checked a box, or clicked a button, or checked a mark saying that, yes, they want this. Any questions?

ATTENDEE: For block trading, what's the right size in your view for the minimum order size in dark pools?

MERRIN: I would go with less than a block, 5000 shares. That would suffice. You have to keep it simple, and you might do it by market cap. But let's not complicate it. All the regulators around the world are basically focused on the same two things, high-frequency trading and dark pools. Basically, the line they're drawing in the sand is this: If you provide value above and beyond what can be found on the exchanges, that's complimentary, that's added value.[23] If not, you should probably go away. Do it as simply as you possibly can. Don't do it the European way.

AUDIENCE VOICE: In most of the dark pools, the buy-side clients have the ability to specify both counterparties. If they decide they don't want to trade with, say, an ELP in a dark pool, they can check a box and not trade with an ELP.[24]Similarly, if they want to put in minimum order sizes, they can do so. Given that so many institutional traders continue to come into dark pools, and find a lot of value in trading in smaller size, don't you think that if they wanted to just trade in 5000 shares, they could put a 5000 share minimum order size in there and select that themselves?

MERRIN: Maybe they can. I don't know all the different buttons that you can press in the different dark pools. What I'm trying to get at is that there are, as we all know, some issues in dark pools. The New York Attorney General is certainly focused on some of them, whether it's right or wrong.[25] But there are too many surprises. Frankly, there is not enough transparency. If that capability is open to the buy-side, where they have a 5000 share minimum, then that's great. But they should know exactly who they're interacting with. They should know the rules of the game. You know the rules of the game are different in the different dark pools, and they change also.

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[21] See *Flash Boys: A Wall Street Revolt. Michael Lewis* (2015, WW Norton & Company, LLC.).

[22] A form that Alternative Trading Systems (ATSs) are required to file with the Securities and Exchange Commission pursuant to Regulation ATS. Form ATS provides important information on the operation of an ATS.

[23] In other words, this value added is the equivalent of price improvement.

[24] Enhanced Liquidity Provider.

[25] See *NY Attorney General Goes After Barclays*, Melvin Backman. *CNNMoney.com.* June 26, 2014. http://money.cnn.com/2014/06/25/investing/barclays-ny-ag-lawsuit/index.html

If something is going to change, then it should be incumbent upon us to tell the customers this is what changed, do you want it, yes or no? I think it's pretty simple.

AUDIENCE VOICE: What's the difference between not knowing your counterparty in a dark pool and not knowing your counterparty in an exchange?

MERRIN: Market structure is a necessary utility. We have to make sure for the good of most that this is operating as efficiently as we possibly can. When it proliferates to 45 different dark pools, that's another matter. I understand you want to save costs. But that leads to conflicts of interest that might or might not be a problem for some. But it also could lead to degradation of the ultimate pricing mechanism.

I would say that, for the benefit of an efficient market structure, all we're saying is if you're going to internalize, you must add some value. You must do something above and beyond what the exchange can offer. Otherwise, what's the point of the exchange?[26] We're all working off that pricing mechanism. It's all critical to everything that we're doing.[27] We have to maintain it. That's my point.

RICHARD REPETTO [Sandler O'Neill + Partners, L.P.]: You've spent a lot of time thinking about the maker-taker model. Should we change that, should we have caps on fees, payments for order flow?[28]

MERRIN: All of those distort the market.[29] My favorite example is the Senate hearings earlier this year. An executive at TD Waterhouse was on the panel, along with the new New York Stock Exchange President. When the tobacco companies were testifying in front of Congress, that was another matter entirely. But I'm sure that the executive at TD Waterhouse believed what he was saying.

The Senator asked him, How do you decide where to route your orders to? And he responded, number one, it's about best execution. And if there are multiple venues that are giving me the best execution, then I will route it to the place that pays me the most. The Senator was one step ahead. He looked at him and said, So what you're telling me, for the entire past quarter, the venue that paid you the most was the best execution every single time? And the TD Waterhouse executive responded, "yes." Then the Senator turns to the President of the New York Stock Exchange and said, Do you believe that that's the case? That the New York Stock Exchange could not have had a better price than this other venue, any time during that quarter? And his answer, of course, was "no," that's not the case.

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[26] A trade is internalized for an investor when it is handled and executed by their "internalizing" brokerage firm using securities held by this investor's brokerage. Brokerage firms that internalize orders can sometimes benefit from the spread, in this case the difference between what they pay for the shares and what they sell them for.

[27] Referring to the New York Stock Exchange's critical role for price setting on stocks traded across US equity markets.

[28] In a competitive program to encourage trading on exchanges, maker-taker fees offer a transaction rebate to trading participants who provide liquidity, charging customers who take liquidity.

[29] See related, *At Senate Hearings, Brokerage Firms Call out for Conflicts. Willliam Alden. New York Times*, June 17, 2014. https://dealbook.nytimes.com/2014/06/17/trader-who-called-markets-rigged-tempers-his-critique/

So this is very distortive. There is absolutely no reason for it today. Even 5 years ago, as far back as 10 years ago, best execution was simply about if you offered best execution at the NBBO,[30] then that was fine. That's not the case anymore.

We all know that payment for order flow is bad. We all know that that it should be eliminated. Maker-taker, it's completely distortive. It's a big reason why we have 11 exchanges. Who needs 11 exchanges? I don't care how big this country is or how big the market is. Who needs 11 exchanges?

Again, maker-taker was created outside of the regulatory concept. It was just allowed. There are lots of markets that do not allow maker-taker. Anything that distorts the pricing, or that distorts the incentives, is a thing that should be eliminated.

REPETTO: What about the retail trades that are internalized, that is to say matched, before the exchange? They wouldn't hit your aforementioned 5000 limit. They might not necessarily hit the midpoint either.

MERRIN: In order to have the most efficient market structure, you need venues that can match buyer and seller without an intermediary. But that is really for the vast minority of stocks. For most stocks, you also need market making. You absolutely need market making to create an efficient market structure.

Let's not equate high-frequency trading with market making, because market making is really necessary in the less liquid stocks. We all know that HFT really occurs in the most liquid stocks. That doesn't mean that there are a lot of stocks out there that are liquid enough not to have any intermediary any time. As long as they're giving a good price, and as long as they are subject to market making rules, I believe that they should absolutely exist.

YURI MONACO [Ariel Investments]: Talk about the difference between equity market structure, and foreign exchange market structure which has maybe a few electronic platforms, and hundreds of constituent banks, and no rules. Outside of that, it's all basically a continuous market, operating 24/7 without necessarily the same amount of noise, at least that you had in the US equity market structure. What do you see as different between what we're experiencing here under, let's say, rules-based regulation from the SEC, compared to FX, which is more under the purview of the Commodities Futures Trading Commission?

MERRIN: The big problem we have in the equity markets is the lack of depth.[31] We have no depth. In the FX market, there are very few FX pairs left. But because there are so many banks that are making such large markets, we don't have any problem.

A lot of the HFT, and a lot of the problems that we have in market structure, is simply that it's so shallow. The average execution size on the exchanges is 250, and on dark pools it is 187. That's what leads to problems in the market. Regulation, bad

[30] National Best Bid and Offer. In simple terms, the National Best Bid and Offer requires brokers under US regulation, to guarantee that customers receive the best prevailing ask price when they buy securities and the best prevailing bid price when they sell.

[31] Refers to pools of liquidity, and the equity markets specifically, and to a lack of shares available in the market to complete large orders, in particular block orders, resulting in average trades size of 187 shares.

regulation obviously, distorts that and exacerbates it. But that's what leads to where we have to fix the underlying problem. This is what leads to HFT. Not all HFT is bad. But the HFT that simply trades ahead of the institution because of the supply/demand imbalance is not desirable.

Think about market structure today. If you have an investor market, there's a high correlation between the underlying stock price and the fundamentals of the company. At some point an investor is going to see value and come and step in. With HFT, they split the correlation; there's no correlation. They don't care about the underlying company, which is how a stock could go from, for instance, $60.00 down to a penny. Because it's all electronic and so fast, you change the entire dynamics of the market when you have a market that goes from 100% investor based to 60% HFT based. This is where the regulators and constituents like us should get together and say, "this gives rise to problems as I have discussed." We have to think about some ways to mitigate it.

Thank you very much.

Chapter 7
Regulatory Initiatives

Jim Ross, Robert Colby, Jonathan Kellner, John Ramsay, and Dave Weisberger

ROBERT SCHWARTZ: Jim Ross is a big guy with a lot of really interesting ideas. He is also my close personal friend. Over the years, we've discussed and debated market structure *ad finitum*. We've agreed and disagreed on many topics. I'm very much looking forward to this panel with Jim as the moderator.

JIM ROSS: Back in the 1980s, it was my great pleasure to read some fascinating papers by Bob Schwartz on all-electronic equity markets. At the time, I was at Instinet Crossing, and I recall being thoroughly amazed at Bob's ideas. To be actually speaking here today at one of his conferences is a great honor.

Bob, you've a great big heart. For those of you who only know him as a hard-working, insightful and popular professor, I'll offer you his sobriquet, if you will. When Bob is not waxing philosophic with his students, he's out sailing as Captain Bob on his boat, *Seabatical*, on Long Island Sound, and no doubt enjoying the refreshing liquidity!

Our panel is well timed. As you know, this is a very exciting year for regulatory initiatives. I'm really impressed with the people who have joined the panel. One of our earlier panelists today, Rich Repetto of Sandler O'Neil, noted some of the topics that came up at the Sandler O'Neil conference back in June. The broad proposals on regulatory reform by Mary Jo White, Chairwoman of the Securities and Exchange

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R. A. Schwartz et al. (eds.), *Equity Trading Round-Up*, Zicklin School of Business Financial Markets Series, https://doi.org/10.1007/978-3-030-51015-2_7

Commission, at the June conference, will inform some of our discussions on this panel.[1] No doubt, as she noted, trading technology, and competition, evolve together, and shape the dynamic of our marketplace today. But the challenge that we have, and that Seth Merrin of Liquidnet mentioned earlier at this conference, is the issue of regulation. Has it kept up; has it become stale, is it as relevant today?[2]

It's not surprising that the proposals and the debate that Mary Jo White initiated at that June conference, touches pretty much every major legislative initiative, dating to Reg ATS and as far back at the Order Handling Rules.[3] That's pretty amazing. We're talking about many critical market structure issues, including Reg NMS, decimalization, widening the tick, and ATS governance. So it's pretty impressive we've come to this point.

I've boxed these proposals into market or regulatory themes for discussion on this panel. First, we'll examine market quality, transparency, simplicity, fairness, stability, and then finally, efficiency. I will also talk about the regulatory initiatives connected to these themes.

Let me start with Bob Colby of FINRA. Bob, how does a regulator come to address these issues? Is it a holistic approach, a little bit like Seth Merrin was saying earlier at this conference? That is to say, do you tear down the whole market structure, so to speak? Do you address these market structure issues incrementally? Or, in some cases, do you let free market forces dictate the design? How do you think we should tackle such a broad challenge from a regulator's perspective?

BOB COLBY: Rule writing in a complex area involves each of the approaches you mention. A rule writer must think about the broader issues, and what overall rule framework would address those issues. The writer must also look at the narrower immediate issues, and figure out how to solve those issues near term. And, in addressing the broad framework and the immediate issues, the writer must anticipate that the market will respond with competitive changes that are difficult to foresee. The rules must be flexible enough to withstand these competitive changes. In contrast, the European regulators seem to try to force the market into their rule framework.

ROSS: Jon Kellner, on the industry side, running a global agency brokerage firm, as you do, the approach by the regulators will have a direct effect on your business, your clients, and how you operate. Your thoughts about how the regulators might address these broad challenges?

JON KELLNER: I suppose the challenge of looking at it holistically will take a very long time. And, in the meantime, the regulators are busy doing many other things. We're not likely to get much resolution. But on the positive side, it will be

[1] *Enhancing Our Equity Market Structure.* Chair Mary Jo White, Securities and Exchange Commission. Sandler O'Neill & Partners, L.P., Global Exchange and Brokerage Conference. New York, NY. June 5, 2014 https://www.sec.gov/news/speech/2014-spch060514mjw

[2] See, *A CLOSER LOOK AT HOW TO IMPROVE AND REPAIR MARKET STRUCTURE.* Chapter 6. Seth Merrin, CEO, Liquidnet.

[3] Ibid.

grounded in data, which I think is important.[4] We must be careful as we try to make incremental change, and run things like a small-cap pilot program (which I know is beaten to death).[5] But it's important to understand that there is a large cost to the industry. We must be careful which ones we choose. We can select pilots effectively, such as limit up, limit down, which I think was implemented rather efficiently and can really add value.[6]

We have to be careful of the unintended consequences when we implement something. Clearly, who would have thought that banning locked and cross markets would have the impact it had.[7]

At the same time, it's important for us to look elsewhere to see what other people have done. I may not necessarily agree with what Seth said about Australia and Canada.[8] But I do think it's important to look at what other jurisdictions are doing. In Canada, for example, spreads are being narrowed; in the USA, we're looking at expanding spreads.[9] We need to be careful that we remain a competitive market.

ROSS: Dave, we're on a very, very fast moving train, and making changes holistically, incrementally.[10] It can have impacts on the business process.[11] What concerns do you have about the regulatory impact?

DAVE WEISBERGER: I'm actually not all that concerned about the SEC trying to change the aircraft engine while the plane is flying, as it were, based on everything the chair at the SEC, Mary Jo White has said, and the dialogs I've heard from

[4] Referring to data gathered by regulators for studies and research.

[5] Referring to a proposed pilot program for trading small-cap stocks in wider minimum increments. The pilot eventually was approved by the Securities and Exchange Commission. See, *SEC Approves Pilot Program to Assess Tick Size Impact for Smaller Companies.* Center for Financial Stability, May 7, 2015. *http://centerforfinancialstability.org/wp/?p=5987*

[6] See, NASDAQ Frequently Asked Questions: https://www.nasdaqtrader.com/content/MarketRegulation/LULD_FAQ.pdf

[7] "Market makers may not enter quotes that would lock or cross the market. A locked market is one where the bid and offer are equal in price. For example, if another market maker came into the above listed market for XYAD, known as market maker 6, and entered a bid of 15.05 or an offer of 15.00, the bid or offer entered would lock the market. A crossed market is one where a bid is entered that is higher than the offer or, one where an offer is entered that is lower than the bid. If market maker 6 entered a bid of 15.10 or an offer of 14.95, the bid or offer would cross the market. A market maker who has an order that would cause them to enter a bid or offer that would lock or cross the market must make an effort to trade with all the market makers whose bid or offer they would lock or cross. The NASDAQ's Market Center Execution System helps alleviate most locked or crossed markets" Source: Investopedia.

Regarding the ban on locked and crossed markets, see, *To Lock or Not to Lock.* Terry Flanagan. MarketsMedia. July 07, 2014. http://marketsmedia.com/to-lock-or-not-to-lock/

[8] See, footnote 2.

[9] Ibid.

[10] Referring to the idea that the industry and regulators are making changes in market structure, by regulation and structural design, in piecemeal fashion.

[11] In a follow-up interview, the moderator cited unintended consequences among one of these impacts.

the SEC. The issue really is more about Capitol Hill forcing action from the SEC. I am sure more people in this room are almost certainly worried about that.

I always start these panels with a simple point. If you listen to Seth Merrin, you would think, "Oh, my God, the market must be really broken!" But the reality is exactly the opposite.[12] The US market in equities is dramatically cheaper to trade in compared with the rest of the world. There's a statistic I've shared now for a year and a half at conferences. Every time I share it, someone's mouth opens wide. In terms of the percentage of market cap and large cap stocks in the USA, we literally trade three times the percentage of the market cap of the G8.[13]

Now this directly impacts every single transaction cost model that is out there. Because the percent of average daily volume, or ADV, that an order represents is actually the primary input to almost every model that predicts how much it will cost for the trade.[14] At my former firm, Two Sigma, we would estimate per dollar the USA is 50% cheaper than markets such as Canada that we are now being told we should emulate, or are concerned about. That's a staggering number. If you think about it from a Hippocratic Oath perspective, of thou shalt not cause harm, we should be extremely worried about making changes which could potentially do that.[15]

To their credit, the trading and market staff at the SEC are extremely concerned about making changes. We need to understand that. That said, the point of this panel is going to be about what we should change. I am not saying that we can't make changes. What I am saying is that we should be mindful of the fact that the market is functioning quite well, so potential changes should be justifiable from a cost benefit point of view, and not just because it might "fix" something that some people don't like. In point of fact, I am sure you'll hear several comments from panelists later that will address the current one-size-fits-all approach.

ROSS: When we go into market quality, SEC Chair, Mary Jo White, stated that exact point, that this is not a one size fits all market. She does not believe in that. If that is the case, John Ramsay, if it isn't a one-size-fits-all market, if we need a different type of market for small-caps versus other caps, if we need a different type of market for institutional versus retail, how do we coordinate that without the industry creating an unfairness aspect?

JOHN RAMSAY: With respect to the overall kind of holistic review, I'd echo Bob Colby's outlook. There are a lot of things the regulators should be looking at

[12] See, footnote 2.

[13] The G8, succeeded by the G7 from 2014 because of Russia's suspension, was an inter-governmental political forum, started in 1997 with the participation of the world's eight major industrialized countries.

[14] In a follow-up note, Weisberger explained: "Every transaction cost estimation model I have seen uses the percentage of average daily traded volume that the order being evaluated represents, as a major input to the model. Put simply, if a stock trades 1 million shares per day, an order to buy 100,000 shares (10%) will cost more than if the stock trades 10 million shares per day (1%)."

[15] Referring, metaphorically and colorfully, to the oath, formerly taken by those beginning medical practice, for the proper professional conduct of doctors.

and rethinking, and assumptions they should be challenging such as Reg NMS.[16] But as far as I can tell, there is a relatively broad emerging consensus on improved transparency initiatives that can be undertaken now without a lot of number crunching, or data analysis. Certainly, improved order routing, more disclosure about dark order flow, both in the ATS arena and internalized order flow, come to mind. More disclosure by exchanges of how they're using data, for example, also come to mind.

The Commission has already been sort of prodding the industry and exchanges in that direction.[17] There are private sector initiatives on order routing which, hopefully, will be helpful and also help to inform the public sector initiative.[18] I think all of those things can go forward even as you are continuing to look at the bigger picture.

I don't think the market structure fixes that need to happen short-term have to be heavily segmented by retail versus institutional order flow. For example, even though the changes might impact each a bit differently, I think the ultimate objective is the restoration of investor confidence.[19] And you want to create a higher level of understanding and transparency as to how the decisions are being made; and how they are, or are not serving the interest of investors.[20]

ROSS: I want to examine innovation against the backdrop of regulatory mandates. IEX, for example, is an innovation, not a regulatory mandate.[21] I'll juxtapose it to the tick test pilot, which is a bit of a regulatory mandate, assembled and assessed under the dictation of regulators, not by the SROs, but certainly with the assistance of the SEC.[22] What's better here? Do we need both?

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[16] In a follow-up interview, John Ramsay elaborated by saying that in the case of Reg NMS, this was a reference to "questionable" speed advantages available to some market participants because of this regulation. This point clearly is related to "latency" advantages offered to high-speed trading firms, when they co-locate their computer boxes near stock exchanges, so that they can rapidly receive sensitive market-moving data.

Reg NMS (Regulation National Market System) was adopted by the Securities and Exchange Commission in 2005 and introduced two years later to further advance the ideals of a national market system. The regulation includes the order protection, or trade-through rule; access rule (fair access) to market data including quotations; rules on sub-penny trading and on market data.

[17] In a follow-up interview, the speaker noted that by the time of the conference, the chair of the Securities and Exchange Commission, Mary Jo White, had already delivered an important speech on the topic in regard to scrutinizing exchange filings more carefully, and in how order types are designed, and on exchanges being more transparent about order types.

See, footnote 1, Mary Jo White speech.

[18] In a follow-up interview, the speaker noted that at the time of the conference, there were private initiatives by the Investment Company Institute and others, to come up with a "template" for the disclosure of order routing by broker dealers which in a sense had been overtaken by SEC's subsequent proposal about this.

[19] Readers should note that investor conference was still at a low ebb at the time of the conference, some six years after the financial crisis of 2007 and 2008.

[20] Referring to how brokers are making decisions about where to route orders.

[21] See, IEX, the Investors Exchange. https://iextrading.com/about/

[22] SROs is short for Self-Regulatory Organizations.

RAMSAY: I firmly believe that most of what needs to happen in market structure reform can be done in the private sector. And the most significant changes, in fact, should be done through private sector initiatives. There's only so long that people can allow that to play out before the political pressure becomes too great.

Apart from the kinds of transparency enhancements I mentioned, I'm very proud of what's happening and of the innovation at IEX. We think that will have a healthy impact of driving market practice in one direction. But we have no monopoly on innovative ideas. Other firms can create their own models that are investor friendly.

When people talk about market structure reform, rethinking or undoing significant elements of Reg NMS (for example), the potential for unintended consequences is huge.[23] The most meaningful and long lasting changes can occur from market participants voting with their own wallets, and with their feet. That is to say, voting for models they prefer if they have the right kind of information about the choices they're being asked to make.

ROSS: Jon Kellner, Instinet was something of a pioneer, the grandfather as it were, introducing electronic trading. What's your view on the historical legacy of Instinet as an innovator? What's the responsibility of the firm in that regard?

KELLNER: You need both regulation and innovation. Regulation is the impetus for allowing people to adapt sometimes to innovation. Look at the other asset classes. Someone said earlier that the FX market is a better market than the equity market.[24] I don't agree. There has been innovation in the FX market, but we need some regulation to really push that forward. And that's true across other asset classes.

In the equity market, innovation happens, but there are times where you need regulation. In our current situation, that impetus has already happened. Now there are improvements that we can make. But the biggest impetus that allowed innovation has happened already. I think we can rely on continued innovation to improve the markets.

ROSS: Dave, you have been on the cutting edge from your previous work at LAVA and at Two Sigma. But that may be more on the technology innovation side.[25] How does technology fit into the equation?

WEISBERGER: Technology has been one of the major drivers. In 2003, when I was architecting Citi's market making system, I visited the floor of the New York Stock Exchange. After describing centralized risk books and how everything would work, the head of our floor trading, who's a lovely individual, looked at me and said, "Oh, so basically you're the angel of death." And I suddenly looked straight at him.

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[23] Reg NMS (Regulation National Market System) was adopted by the Securities and Exchange Commission in 2005 and introduced two years later to further advance the ideals of a national market system. The regulation includes the order protection, or trade-through rule; access rule (fair access) to market data including quotations; rules on sub-penny trading and on market data.

[24] FX is short for foreign exchange.

[25] *Citigroup to acquire Lava Trading.* Finextra. July 02, 2004. *https://www.finextra.com/news/fullstory.aspx?newsitemid=12111*

Two Sigma. https://www.twosigma.com/about/approach

I couldn't understand what he was really trying to say. He then added, "Well, because after you're done, for every ten people working here now, there will be one or fewer left." And for the next 4 years when he called me on the trading floor, he would literally say, "Hey, angel of death, how are you doing?"

The fact is, he knew what was going to happen. He understood technology, and where the driver was. Frankly, it's the same as in many other industries. What's the biggest difference now between the brokerage industry and, say, the travel agent industry? How many people use travel agents today to book them on anything? Does anybody complain? Well, of course not, your travel costs are 40% lower, and Expedia does a great job, so does Orbitz, and there's fierce competition.

The best estimate I know says that $20 billion of costs have been squeezed out of the US equity markets over the last 15 years. And we could talk a lot about unintended consequences. But I'm pretty sure that was intended. And that is not a bad thing from an investor's point of view.

ROSS: Bob, we've seen growth and explosion in two areas, the dark pool trading, as well as in the use of algorithms. And, with their growth has come a clamor for more transparency and disclosure.

Now I know FINRA and the SEC have started to ask for data. We now have the FINRA weekly ATS data.[26] What is the informational need? What information are we looking for? And what is it that we're trying to extract as a regulator for information to convey to people, to give them a sense of either confidence or insight into the market?

COLBY: FINRA is about to publish aggregate data on dark pool and non-exchange trading. It is important that observers have a common data set when they consider the amount of ATS, and other non-exchange trading in NMS stocks. This data are useful for obtaining an overview of where trading is occurring, including which dark pools do how much volume at any given time.

On occasion when a dark pool has a public relations problem, the data will show whether the dark pool lost trading volume, stock by stock. Similarly, the data will show when the trading volume of an internalizing dealer, like Two Sigma, rises or falls.

WEISBERGER: Two Sigma is a wholesale market maker. Yes, they would fall under the purview.

COLBY: The FINRA data would show the volume that Two Sigma did in Microsoft this week, compared to prior weeks. It doesn't tell you how to invest; it just gives you a better sense of what's happening in the less visible, non-exchange trading market.

ROSS: Dave, Getting insight into the practices and operations in the dark pools, and how these things operate is critical. People are asking for more insight. We heard this spoken earlier, the problem here is just the exposure of IP business,

[26] For more on FINRA ATS weekly volume data, see, http://www.finra.org/industry/otc-transparency

strategic insights and the like.[27] What's the relationship there? Where do we find that balance between getting the information out but, at the same time, also protecting the intellectual property business information?[28]

WEISBERGER: To be blunt, I think most of that is a bunch of crap. I don't believe that there is any IP that is going to be denoted by a buy-side firm getting the order and execution data for their particular orders from a sell-side firm. I thought the SEC chair was brilliant in the way she expressed herself in the June speech at Rich Repetto's conference.[29] Because Mary Jo White basically said, look, the buy-side has the right to order routing data, and they should be able to analyze it to help understand how their brokers performed, and what it cost them to trade.[30]

What's important is that the vast majority of buy-side firms don't really know what questions to ask. And that's a legacy problem. I wrote my first transaction cost model, StockFacts Pro, back in 1997, and it was widely used for portfolio trading.[31] At the time, I talked to buy-side firms and best execution to them was like, "Yes, that's a box I have to check." Frankly, when something is a pass/fail, market participants don't really give it a whole lot of attention.[32] And that has gone almost unimpeded until today. Now there are a few people out there saying, "Okay, we need to change this." There are people like Larry Tabb of the Tabb Group, and others in the industry, who are now requesting change. Frankly, there's no reason why the buy-side shouldn't be able to get it.

In this regard, I'm going to introduce a very simple expression. In order to evaluate this data, it's all about context. Context-sensitive market analysis is necessary. There are lots of examples. I will give you one. There's a notion in the original Rule 605 called realized spread. It's basically measuring the adverse selection, or what happens after I bought stock.[33] And it basically lumps together 100% of all your executed shares, which makes zero sense to anybody who trades in the market. We all know that it's context sensitive. For example, if I were crossing the spread to take liquidity and I'm 100% filled, I literally shouldn't even look at what happens to the stock after that in terms of evaluating that venue. Because I wanted to buy that stock

[27] IP refers to intellectual property.

[28] The idea Ross is expressing is the concern about protecting proprietary data and intellectual property of ATSs in the operation of their business, the moderator explained in a follow-up interview.

[29] See, footnote 1.

[30] Ibid.

[31] Weisberger describes Stock Fact Pro as a software-based product that offered a model that analyzed the trade lists of clients, reporting both the characteristics of their trades and the estimated costs.

[32] In other words, they feel it does not require their close attention to detail, and the matter is practically an afterthought.

[33] It was originally Rule 11ac1-5 requiring market centers to report monthly data and statistical information related to stock trading, such as effective and quoted spreads.

See, Securities and Trading Commission, Division of Trading and Markets: Responses to Frequently Asked Questions Concerning Rule 605 of Regulation NMS. February 22, 2013. https://www.sec.gov/divisions/marketreg/nmsfaq605.htm

and I bought it. On the other hand, were I to fail to buy stock when I went to cross the spread, I care a great deal about what happens to the price on the unexecuted portion of the order. Yet right now we lump this altogether.[34]

Actually, the realized spread gets at the exact opposite. It does it only on the executed side. Flip that to when I'm posting orders. I care a great deal about what happens next when someone fills me and I'm sitting at the bid, because if I'm only buying when the stock is about to drop, it's a bad fill. I would be losing money on every trade done. Do I care what happens if it never prices at my stock? No, not really, because it was my choice. So, I would say that putting execution metrics in context is necessary for those metrics to provide value.

However, few people do so, they prefer to ask irrelevant questions such as who did I trade with in the dark pool? That, quite literally, doesn't matter in the situation where a broker is routing an aggressive order that crosses the bid offer spread, and gets completely filled on the order. In that situation, the broker chose the price and was successful trading there, so why do you care who you traded with? It does, however, matter a great deal when the broker chose to trade and at what price, and how much of those orders were executed. What really matters is looking at the data, analyzing it, and doing something smart with it.

ROSS: Is there a need then for some transaction cost standards? I know we've got MIDAS for trade quality.[35] I mean the industry doesn't have any standards per se, other than what the industry has generated?

WEISBERGER: My quick answer is I'm terrified of prescriptive standards because once they set a standard, they become a ceiling and not a floor. Market participants will then think that once they satisfy the standard, they have done enough. I don't have to do anything else. The standards have to be the types of information that should be available upon request. So that when Jonathan gets, say, 300 different requests and questionnaires for how you route orders, he doesn't have to answer 300 different questions.[36] He should be able to answer with a common template for this, and he should be able to provide information with a common template. With a common template, people who want help can ask for ideas on the best way to analyze it. It's funny that people who know me would say that I always think I'm right. That's actually not true.

Yes, I believe I could do a good job designing execution analytics. But I am sure there are many other people who could do the same if they had access to the

[34] In a follow-up note, Weisberger elaborated by offering this example: "If one tries to buy 1,000 shares at $50, but then only receives 100 shares, and the stock moves to $51 before you buy more, it is absurd to call that a good execution, because the 100 shares were bought at a good price. Compare that to a trade where you bought 1,000 shares at 50.25. The execution was 25 cents more expensive, but it is better since the 900 shares NOT executed would cost 51, making it worse, but ONLY when the unexecuted trade is included."

[35] See, Securities and Exchange Commission, Market Structure, Research and Analysis, for more on MIDAS. https://www.sec.gov/marketstructure/research.html#.Wl0E7TdOmUk

[36] This refers to how FINRA conducts their own survey and examinations, which vary between standard exams and "sweeps."

information. So, the standards really should be about information access. And then the industry will gravitate toward standards that make sense, much like the industry adopted the effective spread divided by quoted spread, as the key metric provided by Rule 605.

KELLNER: I think we have to be careful. Transparency is clearly a popular topic these days. But the buy-side and some members of the buy-side have been looking at all of these things for a very long time, and also doing a lot of analysis of their execution data and evaluating execution equality. I can tell you via those examples, there is not one standard. There is not a one size that fits all in terms of how we're going to, and how clients are going to, and how they should evaluate execution quality.

I agree, standards in terms of reporting the information, would be very helpful. We need to use the transparency we're getting now more from a qualitative standpoint, in terms of understanding tendencies. Maybe try to evaluate if, in fact, there is some broker conflict, and how can we eliminate it. What are our brokers doing with our order flow?

ROSS: Would you say though that the 605/606 data needs to be updated?[37]

KELLNER: That is one place where we could look to say, okay, let's improve that, at least the information going out there. From a qualitative, high-level perspective, we need to understand what brokers are doing with the order flow. It can definitely use an overhaul.

WEISBERGER: 605/606 probably should be changed. It's 15 years old. Most of the market structure that exists today didn't exist back then. But, frankly, that's the single sector of the market right now that's best served. At least retail execution quality can be measured. One might start by getting rid of a lot of the exemptions that are in 605, or maybe have different categorizations, that might work. But it's a question of what you wish to do.

KELLNER: Might you also want to think about an institutional solution? It is good for retail, but clearly the institutions don't benefit from it.

ROSS: John Ramsay, you'd mentioned concerns about the order routing practices, and the transparency thereof. How has that affected the IEX? Do you guys have outbound routing as well?

RAMSAY: I certainly wouldn't limit it to IEX, or our well-being. What we hear from institutional clients we talk to—and I don't think they're just saying the same thing to us—is that they don't have any kind of clear window into the decision making process that their brokers use for routing different kinds of orders to different marketplaces. Ideally, a particular buy-side client should have a set of metrics that show how the different market centers perform on a variety of different metrics, for different kinds of orders of a particular size. How often are they executed at the midpoint; what kind of block trades are done? How often at the near, how often at the

[37] See, Division of Trading Markets Disclosure of Order Execution and Order Routing Information (Rules 605 and 606 Reg NMS) [formerly Rules Ac1-5 and Ac1-6].
https://www.sec.gov/divisions/marketreg/disclosure.htm

far, etcetera.[38] That should be standardized and clear across all of those venues, so they can enter into reasonable discussions with their brokers. For example, this broker seems to send a large part of orders like mine to different venues than you do. Why is that? Is it based on the kind of execution that's being provided? That is the kind of information that they clearly need, and are looking for. It's not a simple matter to agree on what the metrics are. As I said earlier, there already has been a lot of effort in the private sector to try to come up with some consensus ideas about that.

ROSS: We heard earlier about the issue of the 50-plus order types, maybe there are too many, maybe they are too customized and specific. In dealing with them from a regulatory perspective, can we actually address the complexity of order types by reducing them, without then also dealing with the matter of fragmentation? That is, without dealing with the underlying cause of the need for these order types? And is it enough for us to say, okay, let's limit order types?

COLBY: I'm a complete agnostic on order types. I don't even think order types are the right topic for discussion. They are a symptom of trading idiosyncrasies, not the base problem. On that note, I will turn the floor over to John who will be able to talk about this more helpfully.

RAMSAY: I don't know if I have anything useful to say. But I actually do have a point of view about that. I mean, in a sense I agree with Bob Colby. I do think that the order types that grow up are a byproduct of a lot of other factors. Maybe if you're able to attack those factors more frontally, some of the order types that seem to be problematic to some people will go away.[39] But it's important to hold exchanges to a fair level of rigor in justifying the different kinds of order types they're putting into the marketplace, and how these order types are being used. Allow me a little bit of self-criticism, at least on the part of the regulators generally. This was true before I came to the commission and also during my time there.[40] The reaction to rule filings by exchanges on new order types was reasonably deferential by the commission. It was based on an analysis of whether there is some apparent group of people in the marketplace who would find that particular order type useful. That probably has changed. Listening to Chair White's speech about order types.[41] I would go further than she suggested. I think it's reasonable, aside from the standard kind of order types that Seth Merrin mentioned in his speech, to require exchanges to justify all the order types that they want to keep based on an analysis of the functions that they are performing now, not just on what they said they thought they would do at

[38] "Near" and "far" are common terms in the trading markets, another way to say "bid" and "offer."

[39] In a follow-up interview, the speaker was referring to the idea that if there is more fulsome transparency about how order types work and are designed, some of them would go away because they would be hard to "justify" in terms of market fairness and structure.

[40] Prior to joining IEX in 2014, John Ramsay was the acting director at the Securities and Exchange Commission's trading and market division. His comment here was a reference to his former career as a regulator.

[41] See, footnote 1.

the time the filings were made.[42] That kind of more rigorous review would be healthy. Whether it will happen or not, I don't know.[43]

WEISBERGER: I have a pretty strong opinion on this. It's a symptom of two things: The first thing that people need to understand is the locked/crossed market rule in Reg NMS.[44] The reason that was done in the beginning was because people were afraid of the duopoly.[45] For those who remember the New York Stock Exchange, and the way it once basically ignored the regional exchanges and the ITS, that was why the locked market prohibition was put in.[46] They didn't want New York to be able to ignore other markets.[47] That's gone, and there's no need for that now. The vast majority of all the order types are about hide not slide; it's all about price sliding when you accept orders.[48] Exchanges really don't like rejecting orders. If they get an order at a price which is not legal for them to display, because somebody else is offering there, based on Reg NMS, they have to reject it.[49] So they created a whole slew of order types in order not to reject it. Get rid of locked markets, and those all disappear.

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[42] In a follow-up interview, the speaker elaborated, by saying that his point was that exchanges should be doing an ongoing retrospective review of their order types, based on how they are actually performing in the marketplace. So, by this approach, when an order type is introduced by a market player, for example, this player should be more transparent about the objective of the order type.

[43] At the time of writing in early 2018, that kind of broad review has not occurred.

[44] Reg NMS (Regulation National Market System) was adopted by the Securities and Exchange Commission in 2005, and introduced two years later to further advance the ideals of a national market system. The regulation includes the order protection, or trade-through rule; access rule (fair access) to market data including quotations; rules on sub-penny trading and on market data.

[45] Refers to the once dominant market share of the New York Stock Exchange and NASDAQ in stock trading. This was prior to the regulatory and trading changes that ultimately saw then upstarts like BATS and Direct Edge lure away much of the business of the "duopoly."

[46] *Let's Talk Locked and Crossed – Lock Stock and Two Smoking Barrels*. Themis Trading. December 09, 2013.

http://blog.themistrading.com/2013/12/lets-talk-locked-and-crossed-lock-stock-and-two-smoking-barrels/

Intermarket Trading System (ITS):

Electronic communications network linking the *trading floors* of registered exchanges to permit trading among them in *stocks listed* on either the *New York Stock Exchange*, or the *American Stock Exchange* [now defunct at time of writing], and one or more *regional exchanges.* Through ITS, any *broker* or *market maker* on the *floor* of any participating *exchange* can reach other participants for an *execution* whenever the nationwide *quote* shows a better price available. A *floor broker* on the exchange can enter an ITS order to assure excecution of all of an *offering* or *bid*, instead of splitting it with competing *brokers*. Source: NASDAQ definition.

[47] Ibid.

[48] *See, 'Hide Not Slide' Orders Were Slippery and Hidden. It's good when the victim of a market-structure abuse is called Trading Machines. Lets you know the stakes. Matt Levine. Bloomberg. January 12, 2015*

https://www.bloomberg.com/view/articles/2015-01-13/hide-not-slide-orders-were-slippery-and-hidden

[49] See, footnote 23.

The second major cause of order types has to do with posting and the rebate, and post only. We can talk about maker-taker until the cows come home. But the reality is that it is also a symptom of one size fits all. People say the tick size is a penny. Well, not really, because our effective tick size is not a penny when the exchange fees and rebates are taken into account. When considering those also, inverted exchanges that rebate for taking are well less than a penny. And on maker-taker exchanges, the effective tick size is closer to 1.6 cents.[50]

The fact is we do have variability. Most of what has occurred is the reason why we have 11 exchanges in the USA now. It is the same reason why NASDAQ kept multiple exchanges with its purchase of the Philadelphia Stock Exchange and the Boston Stock Exchange. It was done so multiple pricing models could exist; so that we would not have a one-size-fits-all structure.

If you get rid of one size fits all, you'd probably get rid of a lot of the justifications for maker-taker, which is the cause of order types such as post-only.

Finally, for anybody who believes that high-frequency traders are the ones who demand these extra order types, you are wrong. It's exactly the opposite. High-frequency traders use post only, post orders, and the normal take orders.[51] They rarely use any of the sliding orders. In point of fact, high-frequency traders are the

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[50] "Most US exchanges collect a "taker" fee for each incoming trade that immediately executes against a standing buy or sell order posted on the exchange, removing it from the exchange's order book. Meanwhile, the exchange pays a "maker" rebate to the firms that posted those orders in the first place. The idea of the model, called "maker-taker," is to encourage firms to quote more competitive prices for the securities traded on the exchange.

"In contrast, an inverted exchange pays rebates for incoming trades that execute against standing orders, while charging the firms that posted those orders— the opposite of maker-taker." Source: *Wall Street Journal*, February 28, 2017.

For complete article see, 'Inverted' Model Said to Be Considered for NYSE's Newest Exchange. Such exchanges flip the standard fee model of U.S. equities trading. Alexander Osipovich. https://www.wsj.com/articles/inverted-model-said-to-be-considered-for-nyses-newest-exchange-1488277981

[51] In a 2009 filing, NASDAQ said that the "the Post-Only Order is designed to encourage displayed liquidity, and to offer NASDAQ users greater discretion and flexibility to post liquidity on NASDAQ." NASDAQ also noted that a similar order types already existed on NYSE Arca and BATS.

Themis Trading was sharply critical of this order types. In a blog posting, the trading firm stated: "What Nasdaq failed to highlight in this original filing was that in addition to displayed orders, post-only orders would also not interact with **non-displayed liquidity**. In other words, if a post-only order was entered at a price which would lock or cross an existing non-displayed order, **then that post-only order would not trade,** and instead the **price would be slid** either one tick below for buys, or one tick above for sells."

See, *Seven Years of Order Information Leakage.* http://blog.themistrading.com/2016/09/seven-years-of-order-information-leakage/

For more, and broader insight on these order types see, Decimus Capital Markets letter to the Securities and Exchange Commission, September 15, 2014. *https://www.sec.gov/comments/s7-02-10/s70210-420.pdf*

Rosenblatt: No Order Type Conspiracy. Peter Chapman. *Traders Magazine*. August 23, 2013. http://connection.ebscohost.com/c/articles/89688633/rosenblatt-no-order-type-conspiracy

ones who really hate those sorts of orders, because it makes it very hard to make the books predictable.[52]

As for the allegation constantly made that the high-frequency guys are the ones who demand these order types, it's the exact opposite. They're the ones who would prefer them to disappear. And it's typically the algorithmic shops and the other investors, the day traders, who want most of these other order types.

ROSS: Jon Kellner, what is your clientele usage of these more complicated orders? For example, the hide not slide-type orders? Do you find an adoption of them, is there a top ten list, if you will?

KELLNER: Yes, we're typically using the top ten. In response to what David said, a lot of the order types you see are a result of technology efficiencies. In other words, the market and the exchanges see high message traffic because a client needs to do something. They meet with that client and try to understand how they make the market more efficient by giving an order type so that you—the client—don't have to constantly cancel and correct and reprice. So that's a lot of the reason behind the order types.

You know, reviewing order types isn't necessarily a bad thing. There are probably a couple of order types out there that you have to be careful of, such as an ISO order type, which could be dangerous.[53] But generally speaking, I don't think it's a bad thing that we have a lot of order types. I'd question what's the issue. We live in a world where we can spend money on technology. We find efficiencies through technology. Step back to Dave's point about looking for airline tickets to reflect on this. I'm sure they get creative in how you can find different airline tickets, given all the filters in trying to find the exact match for customers. Should we limit that to five filters because it's too complicated? We have the advantage that technology is easy. We can be efficient with technology, and we don't have to impact the end client.

ROSS: Let us switch to the rule-writing process on an exchange, having worked on an exchange myself.[54] Let's talk about the complexity of rule writing when you're at an exchange. Can we streamline the rule writing process the exchanges must face so that they can compete, adapt, and be more nimble in responding to opportunities and offerings?

RAMSAY: Once we're an exchange I'm sure I will be arguing that point vigorously.[55] I think the answer is yes. The reason exchanges are held to a fair level of

[52] In a follow-up note, the speaker explained: "The sliding orders make the book less predictable, since they can't be seen on data feeds."

[53] Intermarket sweep orders, or ISO orders, sweep several market centers. ISO orders have attracted criticism from some sides of the market.

No Day ISO: Tradebook Calls for SEC Review of Proposed Day ISO Order Types. September 24, 2014. Bloomberg Professional Services.

https://www.bloomberg.com/professional/blog/day-iso-tradebook-calls-sec-review-proposed-day-iso-order-types/

[54] Jim Ross as the founder of NYSE MatchPoint, served as its CEO and vice president at the New York Stock Exchange.

[55] IEX became a fully fledged stock exchange in 2016.

rigor and scrutiny in the rule-filing process is that you want to make sure, as much as you can, that people are being treated equally. It is also to ensure that the exchange is holding itself up to what it says it's trying to do.

I don't think there is all that much in the rule filing process that holds up the ability of exchanges to proffer useful innovations, other than perhaps in a few circumstances where there are clearly strong competitive issues involved. But you're not going to eliminate the public notice and comment process. That process is important. It informs the market what the exchanges are about, as long as we hold onto the idea that national securities exchanges should have some broader public responsibility to public markets and participants. I would not revamp the process. As I said, after we become an exchange, I may argue very much the other way.

ROSS: Let's talk about ATSs, Alternative Trading Systems, and the issue of a value proposition in having a regulator beat up your rules that you're submitting—to make sure your rules are proper and well-thought-out. Do we need to step up the regulatory process for ATSs, formalize it further, when they are filing a change in their business?[56]

COLBY: This is a complicated topic. There was a time when the Commission had a clear view of what activities constituted an exchange. An exchange was a place that brought together orders from multiple parties, with clear and consistent rules of priority for the execution of these orders. Typically, exchanges executed orders based on time of receipt. Where orders were essentially received simultaneously, such as in person on a trading floor, or at an opening auction, orders could be prioritized on time or size, with an overlay of priority for public orders.

These priority rules meant that you knew what treatment you would get when you came to an exchange. These priority rules created a baseline standard. The SEC understood that exchanges might give market makers some privileges to encourage them to provide liquidity, and to compensate them for the priority given to public limit orders. A lot of the SEC's review of exchange rules was to make sure that the exchanges conformed to these fundamental premises.

ATSs were different. Technically, they too may bring together orders with priority rules. But if the SEC treated them as exchanges, they would need to function as self-regulatory organizations, which was not their business model. There are many innovators who want to run new interactive systems (like Instinet once upon a time) but do not want to be an SRO.[57] Instinet wanted to create a system where traders' orders would interact instantly, and in a way that was more predictable than a block desk execution. But it didn't want to be viewed as an exchange.

So Reg ATS exempted alternative trading systems from exchange registration if they complied with three major requirements that were the essence of exchange regulation without the SRO component.[58] One requirement was accessibility by

[56] Ross was also referring to the idea of making the process of ATS filings with regulators more transparent to the public, he explained in a follow-up interview.

[57] Self-Regulatory Organization.

[58] See, Reg ATS. https://www.sec.gov/rules/final/34-40760.txt.

firms; the second was display of quotes for ATSs above a threshold; and the third was system reliability.

Under the Reg ATS approach, a trading venue that didn't want to be an exchange could register as an ATS. The SEC has the authority to require a large trading venue to register as an exchange or to prevent a large exchange from converting into an ATS.

Is Reg ATS optimal? It could be changed in several ways. More exchange requirements could be applied to ATSs. Or, ATSs could be required to disclose their operations in a comprehensive fashion, and in a way that their users can understand.

When I was in private practice drafting Form ATSs and submitting them to the SEC, my client's chief aim was to be as vague as possible to retain maximum flexibility.[59] If the Form ATSs that I drafted were made public, users would not learn much, they were not crystal clear.

ROSS: In the area of efficiency, we talk about the issue of price discovery, and the issue of fragmentation on price discovery. We have Reg NMS and the matter of locked and crossed markets as was described earlier. We have trade through and access fees. Let's talk about fragmentation. Has it exacerbated the kind of diminution of the quality of price discovery?

WEISBERGER: The data says no, that price discovery has not been diminished. The data on the reduction in bid offer spreads is quite compelling, and spreads are a key indicator of price discovery. Meanwhile, full day volatility, according to the analysis we did at Two Sigma, is much more related to market volatility than any market structure changes.[60]

I see it as competition, not fragmentation. Competition is good and bad. The bad part of today's competitive market is that the individual on the street doesn't understand how it works. While their trading costs are lower than ever, it is problematic that the general public, and many retail investors, don't understand how markets work. And this decreases public confidence. So there is an issue, but perception is the biggest one.

You know, there's so much misinformation out there. This notion, that because the average order size trade is about 188 shares in the dark pools, proves that dark pools do not execute institutional trades, is actually missing something important. The regulation doesn't allow the broker dealers who run their dark pool to cross the orders they receive against other orders at one time in one trade. This is due to Reg NMS, which limits such crossing to situations where both clients use the exact same reference price. So if there is a VWAP order on one side and a different benchmark

[59] "A form that is filed with the SEC as an initial operation report or an amendment to initial operation report, or a cessation of operations report for alternative trading systems. SEC Form ATS must be filed 20 days prior to the initial operation or before a material change to an alternative trading system."

Source: Investopedia.

[60] See, Automated equity trading: *The evolution of market structure and its effect on volatility and liquidity*. David Weisberger and Paul Rosa. Two Sigma Securities. June 2013. https://www.twosigmasecurities.com/uploads/TSS.White%20Paper.Volatility.June%202013.pdf

order on the other, you can't cross those orders holistically.[61] So, what the broker does is to have the trading algorithms on both sides, and then try to cross each small 100 or 200 share order that they would have sent to the stock exchanges.[62]

Now they may very well end up crossing thousands of shares on behalf of each individual parent order.[63] But you would never know that, and it doesn't show up in the data. I've asked pretty much every dark pool operator I know, at least all the big ones. They all say, yes, you're right, if we used our parent orders we probably would show a significantly larger size.

So it's hard to understand what the real dynamics are, because our regulation is such that it drove the participants to break things down into these microscopic things. I liken it to antilock brakes. I don't pump my brakes 60 times a second. I'm not that fast, but that's exactly what your antilock brake system does. When you trade in the market, most algos break orders down into really, really small pieces. But despite the fact that algorithms trade some 100 shares at a time, they are able to do so rapidly, often multiple times per second. As a result, the trading algorithms can trade very large orders efficiently. It's really a question of what the data show.

ROSS: Question?

ATTENDEE: Can someone explain who compensates the customer, the exchange, the broker, and the trader in terms of the rebate and maker/taker process? How does it work?

KELLNER: It's reflected in the costs that the end clients are paying. On the retail investor side, costs for retail investors are as low as they've ever been. Institutionally, the cost of execution has been driven down. So investors, in turn, through maker-taker, and through efficiencies, have benefitted from all the changes.

WEISBERGER: The rebates and access fees are actually determined at month end based upon volume tiers. You can't, on any individual trading day of the month, with absolute precision, say what the rebate is, what everything is. You can keep adjusting your commissions to be cost-plus, which means we pay a commission to the broker and they pass on the fees or rebates.[64] My old firm used to request that.

KELLNER: But even if you did that, the cost of execution changes every day.

WEISBERGER: Right.

KELLNER: And so they have an issue on the buy-side of fairness to each client. Are they allocating it accurately to each client based on investment decision? It gets very complicated. But that is part of these clients asking us what our costs are. That,

[61] VWAP is calculated by adding up the dollars traded for every transaction (price multiplied by number of shares traded), and then dividing by the total shares traded for the day. Source: Investopedia.

[62] Ibid.

[63] The "parent" order is regarded as the original starting order the trader is aiming to execute. For example, it could be a one million block share order but with only 100,000 shares put to work. The parent order is for one million shares.

[64] Cost-plus, Weisberger explained in a follow-up, is an arrangement where the broker passes on fees or rebates to their clients.

in turn, drives what commission rates are. So it is actually being passed back, just not directly based on maker-taker.

ROSS: One more question.

GEORGE HESSLER: [Deep Liquidity]. I have a question for Bob Colby. The biggest regulatory initiative in the last 10 years is Reg NMS.[65] In some ways we're all responsible for it. Everyone wrote Comment Letters. And, indeed, we're pretty happy to write and to advocate for the ISO, or Intermarket Sweep Orders, and to get the mid-point match.[66] But I can't think of anyone in the room who was more involved in the process than you, Bob. If you take into account what you were thinking at the time and how it all worked out, did it turn out as expected? Were there any real surprises in the whole implementation. In how the market is now relative to what you foresaw?

COLBY: The biggest equity market change agent wasn't Reg NMS, it was decimals. Moving to decimals was far more powerful than Reg NMS.[67] Reg NMS was a pretty good set of compromises for 2004. The problem is that it's 2014 now, and Reg NMS hasn't been updated.

Judging Reg NMS by current standards is difficult because the markets responded with vast competitive changes. It's difficult to recall what the world was like then. But remember, the New York Stock Exchange was floor-based and largely human dependent. Automatic executions were restricted to a very limited range of orders then. The change made by Reg NMS was to incent all the exchanges to shift to an electronic trading format. The exchanges had to make some compromises to get there. And then we've had enormous change since then.

Any rule gets old and needs to be updated. While Reg NMS was a good start, it needs some work now.

ROSS: This was a terrific panel. Thank you all very much.

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[65] See, footnote 23.

[66] See, footnote 53.

[67] "A system in which the price of a security is quoted using a decimal format rather than fractions. For example, a decimal trading quote would be $56.25; using fractions, the same quote would appear as $56¼. The US Securities and Exchange Commission ordered all stock markets within the US to convert to decimals by April 9, 2001. Prior to 2001, markets in the United States utilized fractions in price quotes. Since decimalization, all quotes appear in the decimal trading format."

Source: Investopedia.

Chapter 8
Unraveling the Complexity of Market Structure

Thomas Farley

ROBERT SCHWARTZ: It's a distinct pleasure to introduce and listen to our guest speaker. Tom Farley is here to present our closing address. Tom has moved into a changing environment, and he's part of the changes in market structure. It's changed for the New York Stock Exchange; it's changed for you, and hearing your thoughts, Tom, in this context, is of tremendous value. Tom, thank you so much for being with us today.

TOM FARLEY: About 2 years ago we agreed to acquire the New York Stock Exchange.[1] At that time I was with Intercontinental Exchange, and we were a bunch of futures guys. I was the guy tasked with learning about this foreign object called the equities market. One of the first things I did was to call Professor Schwartz who I had never met, buy you lunch, Bob, and ask you about 500 questions about the equities markets. From that day forward, I've been an expert.

It's an honor to be back here. The last time I was here I talked about the integration of the New York Stock Exchange into the Intercontinental Exchange, and at that point it was very much a work in progress. I'm excited to say that now it's largely complete, and that I can move on to other issues.

I will talk today about our views on market structure. I know you've had a lot of market structure today. I, unfortunately, couldn't be here earlier today because we have this thing called the opening and closing bell down at the exchange. But I did start my day with a vigorous market structure conversation (and at times debate), with Bob Colby of FINRA. I'm ending my day here with you talking about market structure. Basically, the rest of my day was just filler.

[1] *Business Insider. SOLD: NEW YORK STOCK EXCHANGE GETTING ACQUIRED FOR $8.2 BILLION. Linette Lopez. Business Insider. December 20, 2012, http://www.businessinsider.com/new-york-stock-exchange-acquired-2012-12*

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R. A. Schwartz et al. (eds.), *Equity Trading Round-Up*, Zicklin School of Business Financial Markets Series, https://doi.org/10.1007/978-3-030-51015-2_8

I also want to talk a bit about how we think you can make things less complex, you being the collective you, including us, in the equities markets, People don't trust that which they do not understand. If we can make the markets less complex, people will trust the market more than they do today, which will be good for all of us. While all of us may not share identical views about how exactly the equity market should be run or operated, we do share the view that we want a resilient market that's really good for long-term investors and issuers. With that common ground, I'm confident that we can work together to drive change that will strengthen our markets.

Some of the market structure changes will require changes in regulation, and, you know, those are more difficult. But there's a lot of change that doesn't require change in regulation, and that's where I've been spending most of my time, along with my colleagues at the New York Stock Exchange. If you understand the history of Intercontinental Exchange, we've been able to drive a great deal of change without regulatory intervention or government intervention. We introduced clearing in the credit default swaps market before it was required; we built the first clearing house in London in 100 years without any regulatory impetus. And, indeed, if you go back to the founding of ICE, we introduced electronic trading to the commodities markets, again, with no regulation. So, that is where our bias is. But I'm a pragmatist who realizes that to create massive change, regulatory changes may be required.

This is my first year as president of the New York Stock Exchange. I'm thrilled and humbled to have the role, and I've really spent time learning and talking to customers, issuers, traders, and experts in the market. I wanted to share some of those thoughts today, some of those observations, both the good and the bad.

Let me start with the good. A lot of people ask me about what I was doing, roughly 3 weeks ago, because it was an interesting story. I was on the floor of the New York Stock Exchange with possibly the most exciting entrepreneur I've ever met in my life, Jack Ma. He has a very exciting and innovative company, Alibaba, that's helping people not only in China but people all over the world. Indeed, his company is kind of improving the quality of life for many people in China and all over the world. From that meeting, I felt the full power of what an exchange can bring to bear in the capital formation process.

On that day, Alibaba raised money at a valuation of $240 billion, and they raised $25 billion in their IPO, both of those are the largest ever.[2] And that was very exciting. Our role at the New York Stock Exchange was to make sure that participants could find each other, buyers, sellers, and the intermediaries, and that they could open the price in a smooth way and trade in a smooth way. The stock opened at $92.70, it closed at $93.89, and the VWAP was basically right in line with the opening price. So it was great, it was great, it was probably the highlight of my career that single day. And it was a testament to the New York Stock Exchange model,

[2] *Alibaba IPO. Source: New York Stock Exchange*. *https://www.nyse.com/network/article/Alibaba-Lists-on-the-NYSE*

where we place much an emphasis on finding the right time and the right price to open the stock. It took us two hours and forty minutes, but that was the right time. And we opened at $92.70, and that was the right price.

And I don't want to take all the credit and make it sound like it was all due to the New York Stock Exchange; it's also due to the designated market maker involved on the NYSE. In this case, a major role was also played by Barclays, and the stabilization agent, which is really a core underwriter, and the underwriting consortium with respect to price stabilization, Goldman Sachs. They did a terrific job. They waited and waited, and they kind of saw where the book was, had a good sense of where the equilibrium between supply and demand was. Then magic happened. They traded at 4-1/2 billion dollars of value, 48 million shares, and that was an excellent completion, the full circle of that capital formation process.

Incidentally, that's the biggest IPO, and I like talking about it.[3] But that's how all IPOs work on the New York Stock Exchange. Indeed, that's how all opens and closes work, more or less, on the thousands of stocks that trade billions of dollars every single day.

That's enough of an advertisement for the New York Stock Exchange. I'll extol the value of our market model over competitors any day but, believe it or not, that's not why I'm here today. I'm here to extol the value of exchanges in general, all exchanges.

US exchanges will always be a critical part of capital formation. This is because they are regulated, transparent, and reliable, all the things that we seek in the marketplaces, for both the primary and the secondary trading of listed securities. We have those public exchanges but, as I am sure you've heard many times today (and it has been debated), and I even heard it on the last panel, the question has been raised: Is it good? Is it bad? But today the fragmentation is extreme. If you studied markets in this country, it is very much a history of fragmentation, followed by consolidation, followed by fragmentation. When they reach a tipping point of fragmentation, they tend to consolidate; when they reach a tipping point of consolidation, they tend to fragment. Today, we are at a tipping point, in my view, in fragmentation. There are over 50 venues that trade the same NMS securities. Each new venue creates more complexity, and each order type on each new venue creates more complexity.

I heard an argument made that order types in and of themselves, and their proliferation, aren't a problem. I do not agree. They are absolutely a problem. I say this as a guy who runs five markets and keeps track of order types and how they work and how they interact with one another, and how we're marketing them, and how they're regulated, and how people may be using them in a nefarious way, and what happens when there's a systemic problem; each little ounce of complexity is magnified many times over. This is problematic.

A National Market System linking together these venues was a worthy goal. And even a beneficial exercise, many intended benefits but, as I think Bob Colby said on

[3] *Ibid.*

the last panel, it warrants a rethink, a relook, because we've reached this point of complexity and fragmentation that I hope will be the tipping point.

Similar to how I wanted to point out that Reg NMS in and of itself had some positive benefits, off exchange trading has very positive benefits.[4] In fact, our parent company, Intercontinental Exchange, operates many, many markets and many, many asset classes, and, in almost all of those, we have some form of privilege and confidential trading for size transactions and meaningful price improvement.

That's not happening off exchange. There's very little price improvement. The vast bulk of trades happen at a de minimis price improvement. And, as was discussed in the last panel, they're not occurring as size transactions.

And so, you may believe that this fragmentation has reached a tipping point. You may believe that order competition is actually reduced, and that there is considerable competition among exchanges and intermediaries and ATSs, but that competition among orders is actually reduced. We could have greater competition among orders. The solution is quite simple: respect the primacy of a public quote. Whether it's on an exchange, a lit ATS, or some regulated venue. They're contributing to price discovery and we all agree that price discovery is a public policy good. That's how price discovery happens, so let's rally around that. Price discovery happens when somebody volunteers, and they put a price up that benefits the rest of the market. We need to celebrate that.

We also believe there should be increased transparency in the way markets operate. The average American, I'll say, or market participant, doesn't necessarily understand the nuances of the market, but I go back to what I led with at the outset of this talk, they trust what they can understand. They trust that which has transparency. Unfortunately, the average American doesn't trust the stock market as much as any of us would want them to.

I've spent most of my career (at least the latter half of my career) at the Intercontinental Exchange, and just recently at the New York Stock Exchange. When I tell people I went to the New York Stock Exchange, the instant reaction is wow, that's cool, that's a great company. It is a very positive brand. This reaction is in harmony with what's going on in the equity market. We want to increase the trust and the confidence that people have in the market.

The percentage of Americans who hold individual stocks is at a 16-year low. I have the privilege of meeting very senior executives in my job. I met with the CEO of a giant retail company recently. The market had hit an all-time high in regard to investors holding individual stocks, and I made a remark about that to the CEO. It was right around a month ago, maybe 6 weeks ago. And he lamented, I don't really care, my customers do not feel that at all. They're not participating in the market. We at the NYSE want to simplify the market; we want to increase confidence, and we want to bring as many people under the tent as possible.

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[4] *Reg NMS (Regulation National Market System) was adopted by the Securities and Exchange Commission in 2005 and introduced 2 years later to further advance the ideals of a national market system. The regulation includes the order protection, or trade-through rule; access rule (fair access) to market data including quotations; and rules on sub-penny trading and on market data.*

Confidence in the markets is vital. I know that's motherhood and apple pie, but it's vital for the sustainability of the US capital markets. It leads to job creation and to a stronger economy. We're encouraged by recent initiatives that will increase confidence by achieving increased transparency. This includes additional order type disclosure and the disclosure of trading volumes on dark pools and other alternative trading systems.

While we're moving in the right direction, there is still more to be done. We need more information on how brokers route their orders, how ATSs operate and perform, and the level of price improvement that retail customers receive.

It is each of our responsibilities to increase confidence in the functioning of the markets. For us, it starts at home. You can hold us accountable, as well. We are reviewing all our businesses to focus on improving transparency and to find solutions that decrease complexity. I can't share all of them with you, because not all of them are unwrapped yet, and it is a hypercompetitive space. For competitive reasons, I can't share all of them. But let me just rattle off five of the things we're working on.

One, we're building our next generation of trading technology. Today, we have five trading platforms, they have different lexicon. They all have different APIs that we require broker dealers to hook to. The same order type, the same named order type works differently across different venues. We will build one trading engine that has one hookup point, one set of order types, and it will have fewer order types, but it will be greatly simplified, again, lower operational risk and cost, increased transparency, and greater confidence.

Two, we're eliminating order types. We've eliminated a dozen, and there's more to come. This is just a step in increasing confidence. Does it hurt us, with respect to guys who operate a volumetric business model? We'll lose some volume, sure. It's not going to kill us, but it will hurt us a little bit. However, in the long run it's better for the market. We're taking something that's so simple at its essence and making it very complicated.

Three, for smaller companies, we've been working with the industry to help shape the tick-size pilot plan. Small and medium size companies are indeed the backbone of the economy, and Chair White has alluded to this.[5] We absolutely agree, and we want to do anything we can to improve the quality of the markets for the small to medium size companies. In addition to the tick-size pilot plan, we're actually working with our designated market makers on making changes that we think can increase market quality for the smaller cap companies.

The fourth involves market data. We have lots of different data products, and they're different by market. We're standardizing those as well. For example, on the New York Stock Exchange, we have a quote fee and separately have a trade fee. This is frustrating because people can't always reconstruct exactly what happened

[5] *Mary Jo White, Chair of the Securities and Exchange Commission, April 10, 2013, to January 20, 2017*

in the right sequence. We will combine those, and we're actually going to provide more information, and then it will be standardized, Arca and NYSE.

Finally, there is the SIP, which has been much talked about. We agree that the state of the SIP versus proprietary feeds creates concerns about market confidence. We're working with regulators, and we're working with exchanges and customers to ameliorate that. We're speeding up the SIPs that we operate. The NYSE is a SIP operator. For example, we operate the options SIP called OPRA.[6] It was 840 ms coming into this year to process, and we've committed to get to 50 by the end of next year. This is a significant investment on our part, but we think it's one of those things where perception is reality. 95% plus of our volume comes from people who take both feeds, the proprietary feed and the SIP feed. The concern I have is, what is the perception of the market? How can we increase confidence? Let's narrow the gap between them.

Since ICE acquired the New York Stock Exchange, I've been fortunate to spend a lot of time with issuers, member firms, and the buy-side. My favorite part of my job is discussing, not only what we can do to improve our markets but also all these issues you've been talking about today. What we hear is fairly consistent. I'm surprised by that; you may be surprised by that. The issues that give people heartburn are fairly consistent; the list is fairly consistent. And believe it or not, even the prescription for how to improve the markets is fairly consistent. This is amazing.

Where a broad coalition breaks down is when people have to decide how public they want to go to support it. You may have an issue where there are people in your organization who are concerned. Perhaps, they fear if this one thing happens, it would really impact their P and L. Even more frequently, you have firms who say, well, geez, I have customers who may disagree with this, or partners who may disagree with this, and so I'd rather kind of ride behind the scenes.

We have the same issues. We deal with this, all the time. We absolutely understand. And so it will take time, and we have to work at building a broad coalition. We, at ICE, prior to New York Stock Exchange, took great pride in this, being able to, like I said earlier, circle the wagons and get an industry to come together to solve industry problems or to improve markets. Case in point: the credit default swaps I referred to again, that was a big problem. There was a lot of credit risk out there in the world, and it had disastrous potential, and we were able to circle the wagons, introduce clearing, and lower that risk significantly.

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[6] *OPRA is separate from the SIP for equities. As described by the Options Clearing Corporation: OPRA (Options Price Reporting Authority, LLC) is a securities information processor that is registered as such in accordance with Section 11A(b) of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). OPRA's members consist of the national securities exchanges that have been approved by the Securities and Exchange Commission (the "Commission") to provide markets for the listing and trading of exchange-traded securities options. These exchanges have been authorized by the Commission pursuant to Section 11A(a)(3)(B) of the Exchange Act to act jointly as parties to the OPRA national market system plan, which is entitled "Limited Liability Company Agreement of Options Price Reporting Authority, LLC." This plan as amended from time to time in accordance with its provisions is often referred to as the "OPRA Plan," and the parties to the OPRA Plan as they exist from time to time are referred to as the "OPRA Participants."*

What might a broad coalition look like? In our travels we've returned to a number of different themes where there's somewhat broad support. I say "somewhat broad" because I'm hedging. It's not unanimous, and none of these will ever be unanimous. This is a big, diverse market. But there's enough for it to feel to us that, hey, maybe we could get some agreement here.

Number one, elimination of maker-taker pricing.[7] The buy-side has concerns about the appearance of conflicts of interest that are presented from maker-taker pricing. I am telling you that we would have a very much simplified offering to the market, without maker-taker pricing. A third to forty percent of order types in existence are solely there to capture the maker-taker spread. Similarly, we operate many exchanges. Our competitors operate many exchanges. Likely, the number of exchanges would decline, because maker-taker pricing is a reason in and of itself for exchange proliferation, even under one corporate umbrella group.

Number two, adoption of a trade-at rule with limited exceptions. Many of the market participants agree that while competition between intermediaries is at an all-time high, competition between buyers and sellers is on a continual decline. And, as a result of more executions occurring in dark trading centers, often times the guys who made the bid and offer who have the LIT price never get their fill. That doesn't feel right. In addition, not having a trade-at rule also creates proliferation/fragmentation which is a blanket of cost on the industry.

Three, reduce access fee caps for trading centers. Access fees are charged to some participants, and then they're rebated to others. And it's a misnomer to say they're rebated to people who provide liquidity. We operate markets, as I said, all over the world. In many, many asset classes, we operate maker-taker in precisely one, that's equity options. And our other markets, in many cases, are far more liquid overall. So these markets don't require maker-taker.

Fourth, establish a minimum market share threshold for trading centers' quotes to be protected. Several buy-side and sell-side firms have expressed support for such a proposal to limit the excessive growth and exchanges that maintain a very low market share. I can announce tomorrow that we're starting a new market, and everybody would be forced to hook to us. This number, this de minimis number, shouldn't be high. You don't want to thwart competition. But you want to create at least some small bar that somebody shows that they have worth in the world and that they're actually creating value before many of our customers and partners have to pay a lot of money to hook to those new venues.

There's a lot of items here that can be brought to the table, and that should be talked about. Those are four that we hear a lot about. There may be others to be specific, we're recommending a 12-month pilot that would reduce access fees considerably from where they are now (30 mils is the max), that would have a trade-at rule with limited exceptions, as I've described, and that would eliminate maker-taker

[7] *In a competitive program to encourage trading on exchanges, maker-taker fees offer a transaction rebate to trading participants who provide liquidity, charging customers who take liquidity.*

pricing.[8] We could do it throughout the market capitalization spectrum; and we could get some really good data to find out if this would indeed lower cost and would this increase order competition. It might increase the actual depth and liquidity that's available, and it could also inspire confidence in the markets. We would find out more about these issues.

I want to say one more thing before I conclude. The US equity markets are the greatest in the world. We had Alibaba list on us from China last month. We had Grupo Aval, the largest Colombian bank, list on us. Earlier this year, we had Performance Sports Group, a Canadian company, list on us. We had another one last week. That is a great company. Over and over again, companies are coming from around the world, and they're coming here because we have the deepest pool of liquidity.

That said, I reject the notion that we can't improve. I reject the notion that, hey, look at this country or that country and their bid/ask spreads are roughly equivalent to ours and we shouldn't do anything. That's like saying our education system is 18th in the world so we're actually better than, you know, a hundred other countries, so let's not make any improvements. We can do more, we need to do more, or we'll get passed by.

I'm encouraged by Chair White's action plan. I heard her speeches at the Sandler O'Neill conference and at the Economic Club![9] At both of those I was hanging on her every word, and we encourage her to continue with her investigations and with her initiatives. We think she's on the right track. And I just want to, again, thank Professor Schwartz and Baruch and for all of you for being an attentive audience. I'm happy to take any questions.

ALLAN GRODY: Tom, you have another constituent that you serve, General Motors, Procter and Gamble, etc.; you've been talking about your client as being the financial intermediaries, what about that constituency, what do they think?

FARLEY: Yes, the example I gave in the talk is a common theme. Anything you can do to increase participation in the equity markets will be good for us, whether it's a Procter and Gamble, or the retail company I was referring to, or Chrysler. Because they want to see, as the equity markets recover and as equity markets grow over time, 6–8% a year, that there's a wide strata of the market that's participating.

That's actually part of what shaped our agenda in the year before we closed the New York Stock Exchange deal going out and talking to issuers, and that was one common theme that came up. There is a second common theme, but it's not necessarily the subject of this conference so I didn't dwell on it. It's around the regulation

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[8] *"Exchanges have been lobbying US regulator the Securities and Exchange Commission (SEC) to introduce a rule that would force equities transactions onto lit exchanges unless dark pools or internalising matching engines operated by brokers could prove meaningful price improvement had been achieved." From The Trade News, reporting on the "trade-at" rule. May 13, 2014.*

[9] *Enhancing Our Equity Market Structure, Chair Mary Jo White, Sandler O'Neill Partners, L.P. Global Exchange and Brokerage ConferenceNew York, N.Y. June 5, 2014* https://www.sec.gov/news/speech/2014-spch060514mjw

of being a public company, the cost that's associated with it, taking a look at bits of Sarbanes-Oxley, that have become anachronistic and overly costly.[10]

The New York Stock Exchange has done a good deal of working with companies to improve the regulatory environment. We were a very big advocate (maybe the biggest advocate) for the JOBS Act.[11] The JOBS Act has been a historic success with respect to improving the regulatory environment of all the filings for IPOs. Since the JOBS Act was put into place, three-quarters of those have taken advantage of the provision that allows for confidential filing. I don't think it's a coincidence that we're on a record pace and that the US is out distancing the capital raising of other countries all over the world.

LEE VAN SLYKE: [Extraordinary Re.] We're a startup, so I'm intrigued with your comments about new capital formation. Obviously, $240 billion caps are bigger; it takes a whole lot of small ones to add up to one of those. But tell us more about what you think is happening for the small IPOs, and do you see anything coming. ICE has done wonders for creating a range of new products on the contract side. Do you see new ways of addressing the need to capitalize small businesses?

FARLEY: I'll go back to my answer to Allan's question; a primary problem with small companies in this country is you're a startup and you've got five competitors. You want to go public. In the old days, you had to file with the SEC, and you had to tell your competitor absolutely everything about what you were doing with your business, and then you could go through the process of getting ready to IPO. And the market could turn down, or you could realize there wasn't an appetite for your stock, and you are sitting there in a damaged competitive position.

I really think that the JOBS Act is a game changer. You know, I'm going to San Francisco next week, and there's been a couple of high-profile spokespeople out there who have said that the IPO for small companies is dead. If you look at the trend, you have Uber at a valuation of $19 billion and Airbnb at $12 billion. But these companies are choosing not to go public because the public markets are no longer attractive, and you have primary investors like the T. Rowes and the Fidelities of the world who are doing direct investment into private companies. This is all moving away from smaller companies doing IPOs. I tend to think that's all a bit of rubbish, I think there are some really great private companies that have chosen not to go public. But we're, once again, having a record year. We may have a record year; we're on a near record pace. By dollars raised, we will have a record year. We're seeing smaller companies, and we're seeing companies take advantage of the JOBS Act. You still need venture capitalists, they still need investors, we still need a monetization vehicle for many of their investments, and not everyone is an Uber

[10] *"The Sarbanes-Oxley Act of 2002 (SOX) is an act passed by U.S.Congress on July 30, 2002 to protect investors from the possibility of fraudulent accounting activities by corporations. The Sarbanes-Oxley Act of 2002, also known as the Corporate Responsibility Act of 2002, mandated strict reforms to improve financial disclosures from corporations and prevent accounting fraud." Source: Investopedia.*

[11] *Jumpstart Our Business Startups (JOBS) Act https://www.sec.gov/spotlight/jobs-act.shtml: Source: Securities and Exchange Commission*

or an Airbnb. So I'm going to San Francisco. I want to try to understand the arguments a little better. Hopefully I'll come back smarter, but I'm actually optimistic about the trend for smaller companies.

BILL HARTS [Modern Markets Initiatives]: If you could implement tomorrow your proposal about having a minimum size for protected quotes, how many exchanges do you think would fall below that minimum?

FARLEY: I don't know the answer. I'll tell you one of them is ours, the AMEX, so that AMEX (we call it MKT now) — the old American Stock Exchange — I think we have .2% market share, round numbers, and, if you set a de minimis test purely based on trading, likely .2% wouldn't make the mark. But there are one or two others that also wouldn't make the mark, maybe two or three others.

Again, this isn't about hurting competition. You know, IEX has done really well, and they've seen growing market share. You wouldn't want a company like that not to be able to achieve a protected quote at some reasonable point, whether it's a half a percentage point or a full percentage point or a couple of percentage points. But what about somebody who is just there forcing people to hook up and getting a rare trade and collecting some quote revenue from the CTA? It just doesn't feel to us like the benefits of forcing everyone to hook up outweigh the cost and complexity of having to do so.

BOB PISANI[CNBC]: I'm all in favor of reducing rebates and access fees, but I wonder if a pilot program is the right way to do it. We're just having a really difficult time getting a simple pilot program for small cap stocks off and out. There's a lot of resistance to it, particularly the cost associated with it. The firms are really pushing back on the small cap project that's been sitting around for 2 years now. It's not clear it's going to get out.

Your proposal is the right way. I'm in favor of doing anything that will drive more business toward the LIT market, including reducing rebates. But I wonder if anything will ever happen in a pilot program? Why can't we get the SEC to agree. What's magical about 30 mils? Why can't it be 5 mils? Why can't they by Fiat. My understanding is they could actually do that if there is just a broad agreement to do something like that.

FARLEY: I want to answer your question in two parts, Bob. First, we've said we would support a reduction in access fees coupled with some of these other provisions. So, I want to focus on and respond to the concept, which you weren't explicitly endorsing, the thought that we could try reducing access fees and not do any of the other things we described.

That would be a bad outcome for two reasons. One, the complexity that I'm describing, the 40% of order types that arise from rebate capture. If instead of giving a 28% rebate and charging 30, you can give a 3% rebate and charge 5, you still have maker-taker. People will still try to scoop those pennies off the ground. We're still going to have the add liquidity only order type and all the other order types, that are all about rebate capture and, also, the complexity that goes along with that.

Number two, selfishly, it would hurt our business significantly. But also, just as a policy matter, trying to step out of wearing my hat as the New York Stock Exchange, the likely impact would be that exchange spreads would widen because exchanges

would no longer have these big rebates to motivate people to make prices. And as exchange spreads widen, the spread reflected as NBBO widens. More flow would go off exchange, and that would be problematic. But that wasn't the core of your question. I just wanted to make sure that my comments weren't misconstrued, so I wanted to take that opportunity to clarify.

With respect to the best way to go about it, you've been around this game a lot longer than I have, and Bob, I'm taking suggestions. If that's the way to get to the preferred outcome faster, that's fine. A pilot strikes us as a pragmatic step that we can collect data from; we can do this with the understanding that we're dipping our toe in the water as opposed to going all the way in. I take your point, however, that that may not be any more difficult than just making a change.

BOB PISANI: The small-cap program has a trade-at component in it as one of the three tranches that they will investigate. Obviously, I think you're right to protect yourself a bit; you're going to need something like that. There are already dark pools that are talking about trading at the midpoint of the NBBO and then you get some price improvement.

I think it's not an easy solution. All I can tell you is now that this thing is out there for the small cap; all the firms on the street are pushing back saying do you know how expensive this will be for us to implement? Three different silos of a pilot project for 1 year on a small cap and they're getting pushback. We're finally at the door where this thing is going to happen, and now.

FARLEY: I've had several people say to me that, with this tick pilot, we're just going to trade at midpoint. Great. Amen. The customer just got a better price. If the outcome here is that the customer gets a better price and we never see another share, the SEC has won. Again, as policy matter, we want to create better markets that people have more faith in.

Moreover, the pilot will be a lot of work, and it is smaller stocks. I am empathetic with my colleagues at broker dealers who operate dark pools and ATSs, who have said a trade-at could push more business back onto exchanges. It would be nice to see that coupled with lower access fees. I understand that. But the tick pilot doesn't include that. And that's why, in my remarks today, I mentioned it as something we would support.

Nonetheless, the tick-size pilot originally wasn't about the trade-at bucket. It was about trying these wider ticks. We'll gather some data on that, and hopefully, it will be really helpful.

ATTENDEE: I want to go back to something you said a few seconds ago, because I thoroughly agree with it. You said that if we basically got rid of maker-taker and cut fees, that spreads would widen. Doesn't it bother you that widening that spread would actually hurt confidence? If I'm a retail investor and I watch my trade costs suddenly go up, I could think that the market may be easier for me to understand, but I'm also paying more.

FARLEY: No, I'm not. Nobody has given me a glowing, ringing endorsement of how confident they are at this moment in trading equities. On the contrary, they don't know what happens from the time they press an order; the order flies around and the fill comes back. It's that lack of transparency that troubles me.

I'll also note that the economic value of the spread is still the same. NMS doesn't take into account the rebate that the customer is paid. NMS is simply what's reflected on the exchange. The true economic spread should take into account the fee that somebody is paying, because of the rebate that somebody else is being rewarded.

ATTENDEE: For institutions, yes, but not the retail outlets. They actually trade flat.

FARLEY: No, but the economic value of the spread is the same. If you're telling me that the firms that are filling retail try to do the worst they possibly can based on what showed on the NBBO, I have a problem with that.

ATTENDEE: No, it's actually the opposite.

FARLEY: They should be trying to do the best they can. Economically, nothing changes if you get rid of maker-taker, and you have lower fees. You charge the buyer and the seller the same amount.

BRETT REDFEARN: [JP Morgan.] Hey, Tom.

FARLEY: I never get an easy question from you, Brett.

REDFEARN: A quick question about the maker-taker proposal. What I'm wondering is, for effectively bidding the rebates, is that something that you anticipate would apply also to DMMs, or designated market makers? If so, would it also apply to the market makers in the NASDAQ landscape? And, if so, do you have any concerns about the market making model?

FARLEY: I think it's a really great question, and it's something we need to focus on intently. When I say eliminate maker-taker, there's a follow-on paragraph that I didn't include in my talk. It says to charge the buyer and the seller the same amount, that's eliminate maker-taker. It's perfectly fine for a regulated trading venue to have a market-making program that's registered with the SEC. It has prescriptive obligations, and it requires that somebody to make prices in good times and in bad (which maker-taker does not do), and it could have things like negative obligations (e.g., that you can't sell when a market's falling or buy when a market's increasing). In return, it could provide some lower rate for the market maker or some other benefit. You would want to put transparency around that program to be able to demonstrate to the world that this is why this program exists. This is how we're bringing liquidity, to small-cap stocks. It is similar to what we do with our DMM program.

REDFEARN: I get it. So, in the NASDAQ world, as well, presumably we'd have to think about this market wide. Would that mean that, conceivably, maker-taker would be going away, but for market makers even in the NASDAQ landscape, rebates could potentially continue to exist? Then we really have a larger question that we also need to figure out. What is an appropriate market-making model going forward?

FARLEY: Why are you asking about NASDAQ, in particular? I mean, I'd rather not comment on that, but it is appropriate for our markets, too.

REDFEARN: The reason I'm asking is, if you are going do something that has an exception for a market maker, or some other different pricing, it has to be market wide. Otherwise, it would be highly beneficial to one venue and not another. So I'm sure you wouldn't propose that.

FARLEY: Oh, no, I'm envisioning that it would just be for our markets. In other words, we would say that with a transparent program, if you come, again, similar to the DMM model or SLP model, that, if you come, and if you make two-sided markets and if you agree to be there in good times and in bad, and you meet these obligations, then you can get some benefit, lower fees or something of that sort. That wouldn't be for shares that traded on, say, NASDAQ. And it would be market wide.

REDFEARN: You're saying it would be market wide. Conceivably, for the market wide, whatever is a registered market maker, there still could potentially be a rebate in that scenario?

FARLEY: Yeah, like rebate being lower fees, that would be an example of a rebate. Or, you could pay them money. Is that what you mean by rebate?

REDFEARN: I'm just trying to understand this because we have a larger question. What is a market maker in today's world and NASDAQ? Obviously, there are obligations and advantages that existed 10 years ago that aren't the same as they are today.

FARLEY: Right.

REDFEARN: So I'm wondering, as we do that, and as we create a differential pricing mechanism for different market participants, it seems like we may have another thought piece that we need to figure out in terms of what is that role if they have differential pricing.

FARLEY: It is important that it be transparent. It must be easily understood who qualifies for this, just why they qualify, what their obligations are, how everything is measured, how productive it is, how helpful it is.

JOE ROSEN [RKA,Inc.]: Tom, a question that you know I'm going to ask (and I'm surprised no one else asked it) is about the future of the floor.

FARLEY: One of the approaches Intercontinental Exchange has, and we've done many acquisitions, is we run lean. We have far fewer layers, and that's just how we feel we can be more responsive to customers. We can be a more efficient organization. That said, we're spending more time thinking about how we grow the floor, as opposed to cutting the floor.

When we agreed to do the deal 2 years ago, I came into it as a guy who candidly shut the New York Board of Trade floor. So, it was certainly in the playbook to shut a floor, particularly an expensive floor. But I have seen the light. That floor is hugely valuable. You see it on that Alibaba IPO day. If you look at NYSE IPOs, they are much less volatile, and if you look at our markets generally, bid/ask spreads are tighter. Both of those come from the interaction of humans and technology and the presence of the DMM. Then, if you look at the media exposure that our 2400 companies can get by being on that floor, there is nowhere else in the world you can get it.

Yesterday, Fiat listed their stock. They brought nine cars up in front; they had that LaFerrari $1.7 million super car; the media was all over it, snapping photos. They rang the bell. They did press on CNBC, Bloomberg, and Fox Business. We can do all that for them because of that floor. When you combine the fact that it's really great for trading, tighter spreads, less volatility, it's why we're becoming the global venue for listings. Increasingly, we are the large-cap listing venue largely because

of how we open stocks. It's a no-brainer to preserve that incredible slice of Americana.

ANTHONY FORTUNATO: Tom, I applaud you for wanting to make the markets less complex. I just have one question. About a month ago you guys announced that you were going to add a day ISO order to your repertoire.[12] Can you explain how that's making it less complex? It seems to be one of the most complex and potentially abusive order types.

FARLEY: I'm glad you asked that question. This particular order, every exchange has it, and all of our exchanges have it except one. You have a decision with respect to order types: Are you going to throw it in the trash, or are you going to embrace it and say, hey, for simplicity purposes we're going to have it on all exchanges? The approach we've taken is to throw out as many order types that are superfluous or may have some small meaning but are not really needed. The ones that we need to compete, let's have them on all of our markets. And that was the decision that we made with day ISO.

I would welcome the day when we could remove day ISO orders and compete effectively. To get there, I will need help from those of you in the industry.

Thank you.

SCHWARTZ: I thank you, Tom. I also thank all of you who have been here. It's been a great day for me, and I hope it has been for all of you. However, we're not finished. We have liquidity drinks out there. Please join us.

[12] "*An ISO order (intermarket sweep order) is an order type designation that provides an exemption from Reg NMS, with regard to protecting the NBBO. Reg NMS provides that under normal circumstances, one cannot by stock at $10.01 unless one has already exhausted the displayed liquidity at $10.00.*" *Source: Themis Trading.*

Chapter 9
A Liquidity Program to Stabilize Equity Markets

Nazli Sila Alan, John S. Mask, and Robert A. Schwartz

Financial markets are an integral part of the operations of firms and markets, and equity markets are foundation players. Illiquidity and price instability, however, are Achilles heels of financial markets in general and of equity markets in particular. A program that would bring needed liquidity to the equity markets would convey major benefits for market participants, listed companies, an exchange, and the broader economy. In this paper, we consider such a program, one that was originally set forth by Schwartz (1988). In so doing, we present empirical results obtained by simulation analysis on the daily cash flows generated by running such a program for a sample of 30 DOW stocks (27 NYSE and 3 NASDAQ) and 30 Deutsche Börse DAX stocks for the period, January 2, 2008, through December 31, 2012.

In an ideal world, share prices would respond quickly and efficiently to new information, but real-world markets are characterized by noise that translates into prices that are excessively volatile over brief intervals of time (e.g. intra-day and from day-to-day). By "excess volatility," we are referring to price changes that can be attributed to price formation dynamics that include the bid-ask spread, market impact, and price discovery noise. The first two, spreads and market impact, do not appear substantial enough to account for the magnitude of excess volatility that has

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been documented in the literature.[1] We attribute much of the excess volatility to price formation being a dynamic, noisy process, replete with investor herding, overreacting, and mean reversion. An inherent dynamic of the marketplace is that buying begets buying and selling begets selling. The opposite also applies: sellers can step aside when buying momentum heats up, and potential buyers can step aside when selling momentum heats up (who wants to step forward and catch a falling knife?).

Various proposals have been set forth in response to the high bouts of volatility that have been experienced in recent years. Imposition of a special transaction fee imposed on trading (the so-called Tobin tax) is one such proposal. Alternatively, the MiFID II Regulation proposed that orders have minimum resting times. The idea has also been advanced that additional capital be injected by/for market makers so that they might provide greater liquidity and hence enhanced price stability when a market is under stress. Each of these proposals has been greeted with criticism. With regard to market makers supplying supplemental liquidity, additional compensation in the form of privileges would have to be offered to these firms, and it is not at all clear how this might be appropriately arranged.

In this paper, we consider an alternative approach that calls for the inclusion of listed companies as suppliers of liquidity. We note that price formation has public goods attributes that, as is true of public goods, are undersupplied by a free market, and we suggest that the listed companies are in the best position to be the suppliers of this public good. We empirically assess Schwartz's (1988) proposed program that is designed to supply liquidity and enhanced price stability to the markets without preventing share values from adjusting appropriately to new information. The program calls for listed companies to establish supplemental liquidity (SL) funds that will buy back their shares in a falling market and sell their shares in a rising market.

Using simulation analysis, we have back tested the SL procedure using closing price data for 30 DOW stocks and 30 DAX stocks for the period January 2, 2008–December 31, 2012; we also repeated the tests using the open, midday, and closing auctions for the 30 DAX stocks. Comprehensively assessed across stocks and years, the program has generated cash flows that are predominantly positive. These findings suggest that short-run prices are indeed excessively volatile and that the SL program, rather than operating at a cost, could generate profits for a firm that institutes it.

The article is organized as follows. In the next section, we present a broad-brush description of the SL program. In the two sections that follow, we respectively, address the SL program's public-goods attributes and then describe our analytic context. Next, we present our empirical assessments of the cash flows associated with the procedure, following which we contrast the SL program with traditional market-maker operations. Our final section offers our concluding remarks. In an appendix, we present further rules, consider five issues relating to compliance with

[1] See Schwartz and Whitcomb (1977), Hasbrouck and Schwartz (1988), Lo and MacKinlay (1988), Fleming and Remolina (1999), Stoll (2000), and Bessembinder and Rath (2008).

local regulations, discuss the relationship between call auction prices and equilibrium values, and assess the possibility of an SL program being subject to gaming.

The Supplemental Liquidity (SL) Proposal

Formally structured and maximally transparent, an SL program should be established by an issuer, managed by a third-party broker-dealer intermediary, and both hosted and monitored by an exchange. An issuer would allocate both funds and shares for the purchase and sale of its stock at pre-announced price points. In so doing, the fund would commit capital to buying shares in a falling market, and it would receive proceeds from selling shares in a rising market. The parameters for the determination of its orders would be set well in advance and would be publicly known.[2] As we will explain, the SL purchases and sales are to be made in an exchange's call auctions only.

A properly structured SL program could convey major benefits for a listed company and its shareholders. Bringing more efficient price discovery to the market will translate into higher share values and, correspondently, into a lower cost of equity capital for issuers. A listed company is in a far better position than a traditional market maker firm to provide the optimal quantity of the public good that a broader population seeks: liquidity that results in price discovery that is reasonably accurate. As we discuss further below, a traditional market maker firm is not able to provide an equivalent amount of liquidity in an equivalently effectual way. Traditional market maker operations are geared for the continuous market, while a periodic, price discovery call auction is the appropriate venue for the provision of supplemental liquidity (SL). The capital requirement for running an SL fund would be small relative to the value of a company's shares outstanding; this is largely because the very market dynamic that calls for the institution of an SL fund (i.e., excessive share price volatility and its associated mean reversion) can yield returns for the fund. Thus the program, when running, can be largely self-financing.

Price Discovery Is a Public Good

Our SL proposal is founded on the public goods properties of price formation in the equity markets. Market produced prices convey benefits to a far broader public than the participants in a trade, as the uses of an exchange produced price include marking-to-market, derivative pricing, valuations of mutual fund cash flows, estate

[2] This design feature would put our proposal above and beyond the level of transparency already established as "Accepted Market Practice" in France, Portugal, Netherlands, and Italy. (Source: http://www.esma.europa.eu/page/accepted-markets-practices)

valuations, and dark pool pricing. As noted by Alan and Schwartz (2013), "Because the beneficiaries include a wide range of people who are not participating in the transactions that establish a price, an economist would refer to an exchange produced price as a *public good*".

Regarding the various proposals that have been made in response to the high bouts of volatility that have been experienced in recent years, we suggest that their viability be assessed in light of the public goods attributes of greater price stability and the sharper price discovery that enhanced liquidity can provide.[3] The intention of the recent proposals is to ensure that sufficient liquidity be available during times of stress.[4] For instance, addressing those market makers who allegedly withdrew their liquidity when the market needed it most, the MiFID II Regulation has proposed that orders have minimum resting times. The idea has also been entertained that additional capital be injected by/for market makers so that they might provide greater liquidity and hence enhanced price stability when a market is under stress. Both of these proposals apply to continuous market operations, and they both require that market makers improve the quality of their markets for a considerably broader population.

Neither proposal is an efficient way to achieve a better output of the public good. No profit seeking, market maker firm operating in a continuous trading regime can be expected to act voluntarily as these proposals intend them to. When it is not in their own, profit maximizing self-interest to provide additional capital, market makers require additional perks, and it is not at all clear how best to do this.

Listed companies, on the other hand, are far better positioned to supply the public good. The value that greater price stability and sharper price discovery provides to a listed company is not trading profits per se, but the higher share values and correspondingly lower cost of capital that will be attributed to enhanced liquidity. From a public policy perspective, the listed companies best represent the interests of the broader public, and hence they are in the best position to supply the public good.

[3] See Schwartz (2009) for an earlier mention of the public good attribute of price formation that likens the public good provided by an exchange produced price (it sheds light on share value) and the public good provided by a lighthouse (it signals the location of a harbor or the presence of a rock).

[4] One proposal is a "Tobin" tax on trading, the primary objective being to discourage participants from flipping quickly in and out of positions. We see irony in this. First, HFT players have been thought of as the new market makers; if indeed they are, why make it more difficult for them to enter their orders in the first place? Further, in light of the considerable regulatory attention which has been given over the years to lowering transaction costs by reducing commissions and bid-ask spreads, why should government then impose a tax on trading that raises transaction costs?

Analytic Context

Because our empirical analysis is based on historic data, in our simulations the SL trades cannot impact the companies' share prices (i.e. the share prices are exogenous). In contrast, in a live market, the intension of the corporate buybacks in a falling market is to curb price declines and, in so doing, defend against market collapses. Equivalently, in a live market, the corporate sales are intended to contain price increases and, in so doing, defend against speculative bubbles. Accordingly, the liquidity brought by the corporate purchases and sales should combine to disinflate excessive price volatility without impeding the efficiency with which new information is translated into share values (we discuss this further in section "Call Auction Prices and Equilibrium Values" of the Appendix). The magnitude of these desirable price effects can be assessed; however, only after a program has been instituted.

Price paths in historic data typically exhibit both mean reverting and trending behaviour. Mean reversion is cash flow generating for any market maker as purchases are made at lower bids, sales are made at higher offers, and net revenues are realized as price mean reverts between these lower bids and higher offers. Trending, on the other hand, is costly for a market maker who seeks to keep his inventory within predetermined bounds; shares sold in, e.g., a rising market, have to be bought back (or marked-to-market) at a yet higher price when the inventory is rebalanced. Hence, as is the case for any market maker, the trading cost of running an SL program depends on the relative strengths of these two pricing dynamics (mean reversion and trending). We capture the cost of trending by marking any long or short inventory position to market at the end of a simulation run.

As a more robust test of the profitability/cost of running an SL program in the presence of trending, in our empirical tests we reverse the trending patterns by running the simulations both forward and backward for each company in our sample; any positive (negative) trend for the forward analysis becomes a negative (positive) trend for the backward analysis. For the forward analysis, we start with the earliest day in our sample period (January 2, 2008) and advance one day at a time; for the backward analysis, we start with the last day in our sample period (December 31, 2012) and proceed backward one day at a time. Profitable trading for both the forward and the backward tests would strongly indicate that mean reversion dominates trending as a pricing dynamic.

Empirical Analysis

In this section, we present to our empirical analysis of the corporate supplemental liquidity proposal. In so doing, we provide further details on how such a program might be structured.

Test Design

Our tests are conducted with three data sets: DOW 30 stocks using closing prices only, DAX 30 stocks taking account of the closing call only (DAX 1-auction), and DAX 30 stocks taking account of the opening, mid-day, and closing calls (DAX 3-auction).[5] Each of our three data sets spans the 5-year period, January 2, 2008, to December 31, 2012. The DOW sample includes the 30 stocks that were included in the index as of the end of 2013.[6] The DAX samples are formed by taking the 30 most consistently represented DAX constituents over our sample period.[7] We run all simulations both forward and backward, as described above.

We start a simulation for a stock with a pre-specified array of price points for SL buy orders and SL sell orders. For our forward simulations (the procedure for the backward simulations is comparable), these price points are located in relation to a *reference price* which is the first price in each of our three samples. When only closing auction prices are used, the reference price is the closing price on the first day of the sample period (this applies to both the DOW and DAX 1-Auction samples); when all three daily auction prices are included in the sample, the reference price is the opening auction price on the first day (this applies to the DAX 3-Auction sample).

With the initial reference price determined, SL orders to buy are entered at prices below it, and SL orders to sell are entered at prices above it. The array of established price points can be thought of as a ladder, with each rung of the ladder being a price point.

The price ladder remains intact until an SL order executes totally in a call auction. At that time, the execution price (not the price at which the order is submitted) becomes the new reference price, and the entire ladder of SL bid and offer prices shifts accordingly. The ladder shifts up following an SL sale, and it shifts down following an SL purchase. The distance between the array of price points (the rungs of the ladder) is set by a parameter that we refer to as the *SL spread*. Because there is no order entered at the rung corresponding to a reference price, the price difference between the lowest SL sell order and the highest SL buy order is twice the SL spread.

To illustrate, if a company has set an SL spread of 5% and its reference price is $50, the lowest priced (most aggressive) SL sell order will be at $52.50, and the highest priced (most aggressive) SL buy order will be at $47.50. If the SL buy order is hit and executes totally at a clearing price of $47.50, the new, most aggressive SL sell order is priced at (rounding off) $50, and the new, most aggressive SL buy order is priced at (rounding off) $45.

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[5] We would like to thank the Deutsche Börse Group for having provided the data.

[6] The composition of the DOW index was changed four times throughout our sample period; for the latest constituent list, 26 stocks were included in the index for more than 90% of our sample period.

[7] Including the most prevalent DAX stocks resulted in 29 of the sample stocks being included in the index more than 80% of the time.

We run the SL program using SL spreads ranging in one percentage point increments from 1% to 10% of the reference price. Lower SL spread measures are expected to lead to more frequent order executions, but to lower profits per trade. We find that the SL program remains largely profitable across the SL spread range that we have used but, not surprisingly, that profitability decreases as the SL spread increases.

Further details of the procedure include the following. If the clearing price at the call is less than $47.50, the reference price and the price ladder shift further down to align with the new clearing price. If the order placed at a reference price does not execute fully, the unexecuted portion remains on the book for the next call auction, and neither the reference price nor the price ladder shift. (Partial execution does not occur in our simulation runs because we simply assume all or nothing executions.) If the clearing price at an auction has dropped to a yet lower value on the price ladder (e.g. $45), then the order at $47.50 will execute fully at the lower price, and the order at $45 will also execute, at least partially, at this price.

Each SL order is for a pre-specified number of shares (in our simulations, we have taken the number to be 100,000 shares). Order sizes can be modified as the SL program progresses. If, for instance, an SL fund has sold considerably more shares than it has purchased during a period when price has predominantly trended up, the size of its sell orders could be reduced until a desired inventory level has been regained. We call this procedure *tapering*. Specifically, the SL buy (sell) order size could be tapered when the SL inventory becomes unduly long (short). We have analysed tapering using 500,000 shares (short or long) as the taper trigger and dropping the SL's buy (sell) order from 100,000 shares to 50,000 shares when a 500,000 share long (short) trigger has been reached.

Test Results

Our simulations were run separately for each of our sample years (2008–2012) and for the 5 years combined. We seek two insights from the runs. First, we wish to assess the general level of profitability/loss associated with an SL program. Second we are interested in the sensitivity of the profitability/loss results to (1) different approaches to measuring P&L (straight forward total dollar assessment versus marked-to-market total dollar assessment) and (2) parameter settings (the size of the SL spread and the inclusion or not of tapering).

Exhibit 1 presents, based on a 5% SL spread, (1) the average cross-stock simulation results for realized profit and for profit with inventory positions marked-to-market and (2) the number of buy and sell transactions and ending inventory. Panels A, B, and C of Exhibit 1 present, respectively, the simulation results for the DOW, DAX 1-Auction, and DAX 3-Auction samples. Results for the forward and backward analyses are shown in separate columns for each year, and for the 5 years combined, while results without and with tapering are shown in separate rows. Throughout, positive profit results are shown in bold italics.

Exhibit 1

Simulation results by year

	Forward						Backward					
	2008	*2009*	*2010*	*2011*	*2012*	*08–12*	*2008*	*2009*	*2010*	*2011*	*2012*	*08–12*
Panel A: DOW sample												
No tapering												
P&L, realized (mil$)	−9.40	***27.54***	***14.57***	***13.08***	***16.16***	***61.95***	***43.94***	−9.83	−5.79	***1.89***	−6.35	***23.08***
P&L, M2Mkt (mil$)	***5.68***	***5.86***	−0.95	***0.73***	−1.51	***9.81***	***1.48***	−3.03	***1.28***	***0.72***	***0.68***	−0.08
No of Buys	22	12	6	9	4	52	17	16	8	10	5	55
No of Sells	17	16	8	10	6	58	22	13	6	9	4	55
End Inventory (‘000)	450	(37)	(253)	(420)	(660)	(660)	(83)	573	313	163	127	(83)
With tapering												
P&L, realized (mil$)	***0.14***	***24.50***	***6.77***	−1.30	***5.50***	***35.63***	***25.32***	***2.89***	−4.80	***3.40***	−5.96	***20.38***
P&L, M2Mkt (mil$)	***5.95***	−1.08	−0.86	−0.45	−2.15	***1.41***	−0.32	−2.19	***0.76***	***0.91***	***0.67***	***0.06***
No of Buys	22	12	6	9	4	52	17	16	8	10	5	55
No of Sells	17	16	8	10	6	58	22	13	6	9	4	55
End Inventory (‘000)	200	(320)	(418)	(403)	(485)	(485)	(273)	82	222	113	122	(273)
Panel B: DAX 1-AUCTION sample												
No tapering												
P&L, realized (mil€)	−26.38	***20.67***	***14.10***	−1.81	***26.14***	***32.71***	***80.10***	−3.38	−3.62	***15.70***	−14.62	***74.19***
P&L, M2Mkt (mil€)	−2.42	***11.10***	***3.13***	***15.65***	***5.15***	***32.62***	−14.01	−18.68	***3.28***	***7.90***	***7.50***	−0.60
No of Buys	24	14	8	16	7	69	16	17	9	13	10	65
No of Sells	17	18	10	14	11	70	25	15	8	17	7	72
End Inventory (‘000)	1,008	660	560	872	584	584	(600)	656	400	216	400	(600)
With tapering												

	Forward						Backward					
	2008	*2009*	*2010*	*2011*	*2012*	*08–12*	*2008*	*2009*	*2010*	*2011*	*2012*	*08–12*
P&L, realized (mil€)	−11.31	***20.69***	***7.07***	−1.11	***21.22***	***36.56***	***45.64***	***4.85***	***0.26***	***19.65***	−13.36	***57.04***
P&L, M2Mkt (mil€)	−1.88	***4.72***	***3.95***	***11.25***	***1.31***	***19.36***	−11.38	−4.80	***5.77***	***3.97***	***7.48***	***1.04***
No of Buys	24	14	8	16	7	69	16	17	9	13	10	65
No of Sells	17	18	10	14	11	70	25	15	8	17	7	72
End Inventory (‘000)	470	(4)	(20)	120	(100)	(100)	(420)	218	288	148	376	(420)
Panel C: DAX 3-AUCTION sample												
No tapering												
P&L, realized (mil€)	−27.73	***21.98***	***14.58***	−3.36	***27.16***	***32.64***	***82.61***	−4.14	−5.16	***17.05***	−15.67	***74.68***
P&L, M2Mkt (mil€)	−2.44	***11.56***	***2.41***	***16.91***	***6.97***	***35.42***	−8.11	−19.14	***2.86***	***9.46***	***6.83***	−0.55
No of Buys	32	19	9	20	8	88	23	22	12	16	12	84
No of Sells	24	23	11	17	12	89	34	20	10	20	8	92
End Inventory (‘000)	1,032	668	552	904	608	608	(548)	776	464	232	448	(548)
With tapering												
P&L, realized (mil€)	−11.99	***22.20***	***6.80***	−0.26	***21.44***	***38.18***	***43.90***	***6.41***	−1.72	***23.19***	−14.05	***57.73***
P&L, M2Mkt (mil€)	−1.68	***4.44***	***4.00***	***13.98***	***1.27***	***22.02***	−11.71	−6.30	***5.85***	***7.15***	***6.86***	***1.85***
No of Buys	32	19	9	20	8	88	23	22	12	16	12	84
No of Sells	24	23	11	17	12	89	34	20	10	20	8	92
End Inventory (‘000)	464	(42)	(30)	114	(84)	(84)	(396)	222	340	140	414	(396)

Note: This table presents simulation results by year, using 100,000 shares as the SL order size, and 5% as the SL spread. The italicized bold cells indicate the positive P&L scenarios. P&L realized and P&L M2Mkt denote, respectively, the realized and marked-to-market profit/loss values in million dollars/euros for each simulation run. No of Buys and No of Sells indicate the number of buy and sell order executions during each simulation run. End Inventory is the number of long or short shares in the SL inventory by the end of each simulation run denoted in thousands. No Tapering means that the SL order size is fixed at 100,000 shares regardless of the inventory level. With Tapering indicates that the SL buy order size is halved to 50,000 shares when the inventory exceeds long 500,000 shares, and that the SL sell order size is halved to 50,000 shares when the inventory exceeds short 500,000 shares

Regarding the overall level of realized P&L profitability presented in Exhibit 1, the values are of mixed sign but are predominantly positive: In Panel A, of the ten DOW forward and backward simulations without tapering, six are positive, and the combined 2008–2012 P&L is positive for both forward ($61.95M) and backward runs ($23.08M). The results with tapered SL orders are stronger, with seven of the ten simulation runs being positive, and the combined, overall sample results staying positive at $35.63M for forward runs, and at $20.38M for backward runs. The marked-to-market P&L values are also mostly positive, with seven out of ten simulation runs being positive without tapering, and four out of ten being positive with tapering. Regarding the 5 years combined, the forward simulation runs yield a $9.81M and $1.41M marked-to-market P&L for, respectively, the no tapering and with tapering scenarios. The only negative profit observed for the overall sample is much smaller than the positive P&L values, at −$0.08M for backward runs without tapering (this P&L is a positive $0.06M with tapering).

The DAX 1-Auction results in Panel B of Exhibit 1 and the DAX 3-Auction results in Panel C are similar, yet stronger compared to those for the DOW. Of the ten forward and backward simulations for the DAX 1-Auction and the DAX 3-Auction, five have positive realized P&L without tapering. With tapering, the number of positive P&L simulations increases to six for the DAX 3-Auction and to seven for the DAX 1-Auction. Both with and without tapering, the DAX marked-to-market P&L values are positive for seven out of ten simulation runs. With one exception, the overall 5 year results are all positive (as we observed for the DOW stocks, both DAX samples have negative marked-to-market P&L for the backward run without tapering, but the amount was less than one million euros). Across all of the runs for 5 years combined, realized P&Ls for the DAX 1-Auction (DAX 3-Auction) range from a minimum of €32.71M (€32.64M) for the forward run without tapering to €74.19M (€74.68M) for the backward run without tapering. For all three samples, tapering tightens the range over which P&L varies. Lastly, for all three of our samples, the positive profitability results shown in Exhibit 1 are considerably greater in magnitude than their negative counterparts.

Exhibit 2 presents the results for the 5 sample years combined for different values of the SL spread that ranges from 1% to 10%. The Exhibit shows the average cross-stock simulation results for realized profit and for profit with inventory positions marked-to-market, as well as the number of buy and sell transactions and ending inventory positions. Panels A, B, and C of Exhibit 2 present, respectively, the results for the DOW, DAX 1-Auction, and DAX 3-Auction samples. Results for the forward and backward analyses are shown in separate columns.

In all three panels of Exhibit 2, the forward simulation run results for all three samples indicate that the 5-year combined profitability values, regardless of the chosen SL Spread, are positive. As expected, the realized P&L values decrease monotonically as the SL spread is widened. For example, for the DOW sample with no tapering, realized P&L decreases from $285M at a 1% spread to $27.66M at a 10% spread. This can largely be explained by a lower number of trades occurring at higher SL spread levels. The backward runs also indicate positive results for all no-tapering scenarios. And, even though a number of negative P&Ls are observed when prices are marked-to-market, the negative profits are far smaller in magnitude than the positive profits which are observed across the board.

Exhibit 2

Simulation results by SL spread, averaged across 2008–2012

	Forward										Backward									
	1%	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*9%*	*10%*	*1%*	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*9%*	*10%*
Panel A: DOW sample																				
No tapering																				
P&L, realized (mil$)	***285.05***	***143.33***	***96.25***	***78.81***	***61.95***	***46.57***	***40.12***	***39.28***	***32.05***	***27.66***	***216.22***	***80.22***	***39.34***	***27.37***	***23.08***	***15.72***	***15.09***	***8.08***	***9.63***	***9.26***
P&L, M2Mkt (mil$)	***62.34***	***28.93***	***18.99***	***12.29***	***9.81***	***10.61***	***8.78***	***6.32***	***6.02***	***6.12***	−2.09	−0.68	−0.18	−0.15	−0.08	−0.02	−0.04	***0.01***	−0.01	−0.03
No of Buys	299	168	105	73	52	39	30	25	20	17	315	174	109	76	55	42	33	26	22	18
No of Sells	317	179	113	80	58	44	35	29	23	19	301	169	108	75	55	42	33	26	22	18
End Inventory (‘000)	(2,873)	(1,640)	(1,063)	(893)	(660)	(507)	(440)	(443)	(340)	(277)	(2,093)	(677)	(180)	(147)	(83)	(20)	(40)	10	(13)	(27)
With tapering																				
P&L, realized (mil$)	***63.05***	***44.52***	***39.65***	***37.80***	***35.63***	***33.46***	***32.08***	***31.82***	***28.16***	***25.93***	***50.01***	***33.62***	***28.15***	***26.07***	***20.38***	***16.65***	***16.26***	***12.40***	***11.28***	***10.16***
P&L, M2Mkt (mil$)	***48.60***	***18.43***	***8.11***	***2.72***	***1.41***	***2.37***	***1.77***	***1.35***	***2.08***	***3.08***	***19.13***	***3.82***	***0.28***	−1.27	***0.06***	***0.82***	−0.68	***0.83***	***0.82***	***0.53***

(continued)

	Forward										Backward									
	1%	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*9%*	*10%*	*1%*	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*9%*	*10%*
No of Buys	299	168	105	73	52	39	30	25	20	17	315	174	109	76	55	42	33	26	22	18
No of Sells	317	179	113	80	58	44	35	29	23	19	301	169	108	75	55	42	33	26	22	18
End Inventory (‘000)	(163)	(357)	(440)	(492)	(485)	(450)	(423)	(408)	(348)	(297)	(283)	(395)	(397)	(370)	(273)	(210)	(193)	(127)	(118)	(100)
Panel B: DAX 1-AUCTION sample																				
No tapering																				
P&L, realized (mil€)	***133.99***	***67.21***	***46.43***	***40.70***	***32.71***	***28.55***	***23.75***	***17.70***	***14.51***	***15.32***	***445.07***	***210.14***	***127.20***	***91.58***	***74.19***	***57.47***	***52.35***	***48.40***	***42.39***	***35.95***
P&L, M2Mkt (mil€)	***178.20***	***80.35***	***56.38***	***38.79***	***32.62***	***28.06***	***25.58***	***20.93***	***19.75***	***16.45***	−4.31	−1.93	−1.00	−0.65	−0.60	−0.38	−0.39	−0.35	−0.28	−0.29
No of Buys	330	195	130	92	69	53	43	34	29	24	330	194	126	88	65	50	41	33	27	22
No of Sells	332	197	131	93	70	53	43	34	28	24	330	198	132	95	72	55	46	38	32	26
End Inventory (‘000)	3,768	1,796	1,088	780	584	456	436	432	420	300	(4,312)	(1,928)	(1,000)	(652)	(600)	(376)	(392)	(352)	(284)	(288)
With tapering																				
P&L, realized (mil€)	***157.02***	***81.95***	***55.57***	***41.58***	***36.56***	***30.74***	***28.33***	***23.86***	***21.20***	***20.64***	***197.45***	***109.70***	***78.41***	***68.65***	***57.04***	***47.54***	***41.85***	***38.31***	***34.24***	***30.43***
P&L, M2Mkt (mil€)	***133.61***	***62.19***	***34.47***	***22.81***	***19.36***	***19.90***	***18.50***	***16.13***	***15.98***	***14.05***	***63.01***	***24.27***	***10.02***	***5.44***	***1.04***	***0.36***	***0.07***	−1.20	−0.06	−1.69
No of Buys	330	195	130	92	69	53	43	34	29	24	330	194	126	88	65	50	41	33	27	22

	Forward										Backward									
	1%	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*9%*	*10%*	*1%*	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*9%*	*10%*
No of Sells	332	197	131	93	70	53	43	34	28	24	330	198	132	95	72	55	46	38	32	26
End Inventory (‘000)	380	70	(48)	(52)	(100)	(34)	(14)	32	56	20	(302)	(362)	(466)	(410)	(420)	(326)	(312)	(280)	(226)	(230)
Panel C: DAX 3-AUCTION sample																				
No tapering																				
P&L, realized (mil€)	***121.50***	***78.62***	***55.81***	***43.12***	***32.64***	***26.97***	***22.93***	***19.62***	***17.02***	***12.99***	***471.09***	***195.89***	***127.25***	***89.30***	***74.68***	***66.05***	***59.86***	***49.96***	***46.44***	***40.76***
P&L, M2Mkt (mil€)	***175.66***	***89.06***	***55.56***	***42.63***	***35.42***	***27.37***	***23.26***	***19.86***	***17.99***	***14.76***	−4.62	−1.50	−0.92	−0.56	−0.55	−0.48	−0.44	−0.36	−0.32	−0.36
No of Buys	639	310	185	122	88	66	51	41	34	28	657	313	183	122	84	63	50	38	31	25
No of Sells	657	316	189	124	89	67	52	41	34	27	649	315	192	128	92	70	56	44	37	30
End Inventory (‘000)	4,040	1,548	924	696	608	512	472	420	384	356	(4,616)	(1,500)	(916)	(560)	(548)	(476)	(444)	(360)	(324)	(356)
With tapering																				
P&L, realized (mil€)	***150.93***	***88.20***	***62.52***	***46.23***	***38.18***	***32.67***	***30.13***	***26.27***	***23.74***	***19.11***	***186.49***	***106.95***	***77.21***	***63.06***	***57.73***	***51.45***	***45.65***	***40.11***	***36.55***	***31.69***
P&L, M2Mkt (mil€)	***127.20***	***64.39***	***39.68***	***27.06***	***22.02***	***18.57***	***17.02***	***15.37***	***15.58***	***12.53***	***81.73***	***29.38***	***12.09***	***5.63***	***1.85***	***0.36***	***0.13***	−0.93	−0.64	−2.22
No of Buys	639	310	185	122	88	66	51	41	34	28	657	313	183	122	84	63	50	38	31	25

(continued)

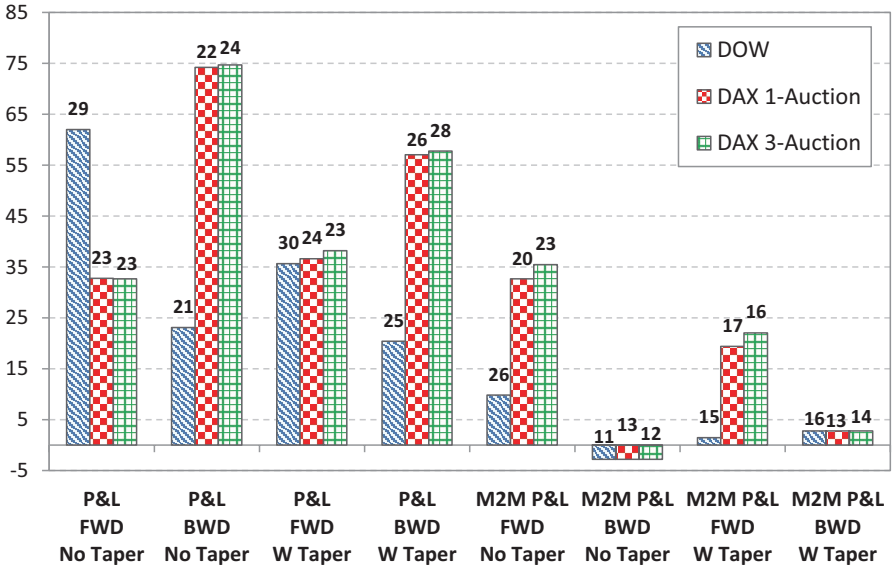
	Forward										Backward									
	1%	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*9%*	*10%*	*1%*	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*9%*	*10%*
No of Sells	657	316	189	124	89	67	52	41	34	27	649	315	192	128	92	70	56	44	37	30
End Inventory (‘000)	418	10	(98)	(96)	(84)	(78)	(54)	(22)	0	24	(86)	(276)	(418)	(350)	(396)	(380)	(332)	(300)	(268)	(246)

Note: This table presents simulation results over January 2, 2008–December 31, 2012, by SL Spreads ranging from 1% to 10%, using 100,000 shares as the SL order size. The italicized bold cells indicate the positive P&L scenarios. P&L realized and P&L M2Mkt denote the realized and marked-to-market profit/loss values in million dollars/euros for each simulation run. No of Buys and No of Sells indicate the number of buy and sell order executions during each simulation run. End Inventory is the number of long or short shares in the SL inventory by the end of each simulation run denoted in thousands. No Tapering means that the SL order size is fixed at 100,000 shares regardless of the inventory level. With Tapering indicates that the SL buy order size is halved to 50,000 shares when the inventory exceeds long 500,000 shares and also that the SL sell order size is halved to 50,000 shares when the inventory exceeds short 500,000 shares

Exhibit 3 presents a summary, based on a 5% SL spread, of all 5-year combined P&L and M2M P&L values for all four scenarios of our simulations (forward and backward, each without and with tapering). The numbers above each column show the number of stocks in each sample of 30 that have a positive P&L for the scenario.

The columns, being predominantly positive, indicate that the SL mechanism is mostly profitable. The only negative profits we observe are the marked-to-market profits for the backward runs without tapering for all three samples. Even in that scenario, over one third of the stocks in each of the samples exhibit positive profits.

Exhibit 3



Simulation results: average profitability for DOW (mil $), DAX 1-Auction (mil €), and DAX 3-Auction (mil €) for all 5 years combined

Note: This chart presents the average profitability for DOW (in million dollars), DAX 1-Auction (in million Euros), and DAX 3-Auction (in million Euros) samples using 100,000 shares as the SL order size, and 5% as the SL spread. P&L is the realized profit & loss, M2M P&L is profit & loss marked-to-market. FWD and BWD denote the simulation results from forward and backward simulation runs, respectively. No Taper and W Taper indicate simulation results with tapering off and on, respectively. All P&L values are in millions. The numbers above each column indicate the number of stocks out of 30 that have a positive P&L value

Relatively definitive conclusions for the sensitivity analysis are more difficult to achieve, but we point out that the different profit/loss measures give generally consistent results, and that tapering does, as one would expect, control the maximum absolute inventory accumulations.

Regarding the parameter settings, the 5% spread appears reasonable for the representative stock in our three data sets. However, the optimal SL spread and tapering parameters would undoubtedly differ from firm-to-firm depending on the general level of volatility for the firm's stock, on the profitability measure that the firm feels is most relevant, on whether or not (and how) a firm may wish to include tapering to control its SL inventory fluctuations, and so on.

The SL Program Vis-à-Vis Traditional Market Maker Operations

By posting bids and offers, the program brings liquidity to the market much as would a market maker. And, as would a more traditional market maker, the corporate fund profits as prices bounce between lower bids and higher offers. There are important differences, however. We next consider these, and suggest why the listed companies are better situated to be the suppliers of supplemental liquidity.

Traditional market maker operations, on the other hand, are designed for continuous market trading, not call auction trading. In contrast, SL purchases and sales will be made in call auctions only, a feature that brings liquidity to the market without forcing the SL orders to execute at disequilibrium prices as typically occurs in the continuous market. The purpose of the corporate purchases and sales is not to generate market maker profits per se, but to bring meaningful liquidity and stability to the market, and the primary benefit should be that a corporation's shares will be more attractive to investors (and, accordingly, its cost of capital will be lower). Further, the SL market maker benefits as its orders, by their very presence, curb excessive price moves, and an SL fund can realize this benefit without actually trading. A traditional market maker firm, on the other hand, can profit only when its bids are hit and its offers lifted and, accordingly, it wants to trade. Traditional market makers like opacity; in contrast, the corporate share buyback and issuance procedure should be maximally transparent for one reason in particular: the value of the SL procedure lies in good part in the public knowing that a company will be in the market as a buyer of its shares if the share price falls to a buy trigger and that it will be in the market as a seller of its shares if the share price rises to a sell trigger. Consequently, all parameters of the corporation's trading also should be publicly known (most importantly, the prices at which its buy and sell orders have been entered, the sizes of its orders, and the length of time that it is committed to adhering to its stated parameters).

For four reasons in particular, a listed company should step forward and take on a market maker-type role:

1. The listed companies are better positioned than traditional market makers, for their own private incentives, to support an optimal provision of the key public good that attends enhanced liquidity: sharper price discovery.
2. The company's shareholders would be the program's primary beneficiaries. Bringing supplemental liquidity to the market will translate into higher share values and, consequently, into a lower cost of equity capital for the listed company.
3. The capital required to run an SL fund should be relatively small. Moreover, the very market dynamic that calls for the institution of an SL fund (i.e. excessive share price volatility) will, through the mean reversion that excessive volatility implies, yield returns for the fund, as cash obtained from selling shares in a rising market will be used to buy back shares in a falling market when price mean reverts. Equivalently, shares bought in a falling market will be sold in a rising market when price mean reverts. By buying low and selling high, the program can generate positive revenues, as our empirical findings presented in the preceding section suggest. Thus the program can be largely self-financing.
4. As we have noted, traditional market maker operations are geared for the continuous market while a periodic, price discovery call auction is the appropriate venue for the provision of SL capital.

Conclusion

We have considered a supplemental liquidity (SL) procedure that does not attempt to distinguish, on a case-by-case basis, between price changes attributable to new information and price changes attributable to noise. The procedure simply states, in a totally transparent, informationless way, that prepositioned SL buy orders will execute in a falling market, and that prepositioned SL sell orders will execute in a rising market.

To get a better sense of how the SL procedure can dampen accentuated volatility, consider the following. Assume that a stock has been trading at the $42 level, that the company has entered an SL buy order for 100,000 shares at $40, and that price is declining towards $40 and possibly below. Public knowledge that the corporation has an order to buy 100,000 shares at $40 can encourage other potential buyers to step forward and enter their own purchase orders in the close neighbourhood above $40. Consequently, price in the continuous market may not fall to $40. However, if the share price does cross the $40 level and a clearing price of $39 is set in the next call auction, the company's SL order will execute at $39, not at $40 (as will all other buy orders submitted to the call that were priced at $39 or higher). Importantly, if the corporate order had not been entered at $40, the clearing price at the next call could have fallen below $39. Note that the power of the corporate order to retard a

price decrease will not have been wasted; that is, the benefit of the corporate stabilization effort will not have been squandered by making purchases at a disequilibrium price (i.e., a price above $39). It is largely for this reason that we propose that the SL orders be entered for execution in a call auction only.[8]

An SL order entered in a call auction will set neither a price floor nor a price ceiling; it is simply another input into the determination of a market clearing price. Like any other order, an SL order is of limited size (for our simulation analysis, we have taken the order size to be 100,000 shares). As might any large order, an SL order can effect price (this is indeed the intention), but it will not *peg* price. For instance, if a price decrease from $40 to $39 (or a rise from $40 to $41) is justified following a major news release, the clearing price in the call auction should (and will) move to $39 (or $41).

In the short-run, prices at times over-adjust to fundamental information change and, at other times, they under-adjust. When price over-adjusts, an SL order will dampen the short-run price volatility; in a falling (rising) market, a pre-positioned SL buy (sell) order will help to stabilize price. This is the main objective of the SL program. However, when price under-adjusts, an SL order can slow the attainment of a new equilibrium value. This effect, which can attend an SL program, is undesirable. Which of these two effects outweighs the other is an empirical question. Our tests (along with a number of academic studies) indicate that, in the short-run, over-adjusting (and mean-reversion) is more dominant than under-adjusting (and trending).[9] This is why the supplemental liquidity procedure, without distinguishing on a case-by-case basis between news-justified price changes and price changes that are noise, keeps short-run prices, on a probability basis, in better alignment with longer-run equilibrium values.

Our tests are comprehensive in that they were run for 5 years, for thirty DOW and 30 DAX stocks, and both forward and backward, for a total of 600 different stock/year observations. As shown in Exhibit 1, for the forward runs without tapering, over the period 2008–2012, realized profitability (in millions) is $61.95 (DOW), €32.71 (DAX 1-Auction), and €32.64 (DAX 3-Auction). The results are similar when we run the simulations backward, and/or with tapering.

In light of these findings, exchange listed companies should consider supplying supplemental liquidity to the markets for their shares. The superior quality of price formation that can be achieved when adequate supplemental liquidity is provided is a public good, and the listed companies are in a far better position to supply this

[8] In call auction trading, liquidity provided stability and reasonably accurate price discovery are brought into alignment in a way that is not possible to achieve in continuous market trading, as we discuss in section "Call Auction Prices and Equilibrium Values" of Appendix. It is important to emphasize that, when this alignment is achieved, excess volatility can be dampened without perturbing a proper adjustment of prices to new information.

[9] The SL tests derive power because they do not presuppose any specific pattern of mean reversion or trending (such as would a more standard autocorrelation test). This is important because correlation patterns shift over time, both in terms of sign and duration, and because stock returns can reflect a mixture of autocorrelation patterns of first and higher orders.

public good than is any third party, broker-dealer intermediary. The listed companies should have a clear incentive to participate, and they ought to have sufficient capital for their efforts to produce economically meaningful results.

While our empirical analysis has shed light on the net cash flows realized from running an SL program, we are not able to quantify the impact that SL orders would have on realized transaction prices; live trading would be required for this assessment to be made. Moreover, for such a test to be properly conducted, a sufficient number of firms would have to be actively running an SL program. This is because the desired impact of SL orders on the dynamic behaviour of share prices would be more substantial, the larger the number of firms that undertook such a program.

Four constituencies will benefit from the institution of an SL program: Issuers from their share prices being more stable and, accordingly, their cost of equity capital being lower; the investing public from enhanced liquidity and sharper price discovery; an exchange from the more consolidated order flow that will be directed to its call auctions, and from the improved quality of the markets for its listed stocks; and third party broker/dealer firms from revenues gained from advising on and running an SL fund.

In conclusion, listed company involvement in liquidity provision is critical. Our empirical findings are encouraging, and we suggest that additional steps be taken to refine, further test, and implement the SL procedure.

Appendix: Further Considerations

In this appendix we turn to four further topics of considerable importance.

Additional Rules for Implementing an SL Program

The parameters of the SL procedure should be established individually by each participating company and be made public. To have the intended stabilizing effect, traders must know in advance that a listed company will be participating in the next auction. This knowledge can temper herding and over-reacting, while encouraging contrarian orders to be more forthcoming. Moreover, transparent and publicly known parameters will help guard against market manipulation and other forms of foul play (we discuss the possibility of gaming in section "An SL Program and Gaming Possibilities" of this Appendix).

Participants in the supplemental liquidity program should adhere to the following:

1. **Neutrality:** Execution is managed by a third party.
2. **Predictability:** The parameters for execution that are selected by the listed company must be publicly known.

3. **Transparency:** Advance notice of a parameter change is required. Once instated, a parameter should be maintained without change for an extended period of time (e.g. 6 months).
4. **Reliability:** The supplemental liquidity fund is supplied with capital from the company in an amount sufficient to cover repurchases if the price were to decrease to zero (or to an otherwise pre-specified amount). This assures the market that executions will occur as announced. Sufficient shares have to be kept available "on the shelf" to support sales as price rises to higher levels.
5. **SRO Regulation:** Program should be under surveillance by the listing exchange.
6. **Value Retention:** Cash contributions to the stabilization fund may be invested in host nation bonds, if necessary, as a means of securing shareholder value (i.e. avoid/minimize opportunity costs).
7. **Profitability:** A company may withdraw funds if its cash account sufficiently exceeds the minimum required to cover a potential price decrease.
8. **Investment Vehicle:** Cash raised from the sale of shares in a rising market is deposited in the listed company's stabilization fund. Each firm must have its own, separate fund. Likewise, shares are repurchased using capital from the stabilization fund. Adjustments to the fund may be necessary to ensure sufficient capital for price decreases (i.e. to cover the minimum number of repurchases).

Compliance with Local Regulations

Depending upon the Accepted Market Practices of a host nation, certain aspects of the liquidity program should be evaluated to ensure compatibility with local regulations:

New Share Issuance and Repurchase: Companies wishing to issue new shares or to buy back existing shares could possibly utilize the apparatus established by the stabilization program as a mechanism to do so.

Free Float: To ensure that rules governing minimum free float requirements are not violated, a constant calculation should be maintained to assure that a company buy back will not violate a free float constraint.

Market Manipulation: Having the SL order placement algorithm established and publicly announced well in advance ensures that order placement under prescribed conditions will be predictable, cannot be manipulated, and that the main effect will be a dampening of excess volatility.[10]

Insider Trading: To avoid any potential violations of insider trading, listed companies would be required to engage a third party to conduct the execution of the SL orders.

[10]Vulnerability to gaming is considered further in Section "An SL Program and Gaming Possibilities" of the appendix.

Unprofitable companies: A company whose fortunes have turned and could be heading towards bankruptcy will not want to be committed to buying back its shares as its share price declines. No attempt should be made to prop up the company's share price or to impose a cost that could increase the probability of its demise. Under clearly specified conditions, a company in such as position should be relieved of its SL commitment.

Call Auction Prices and Equilibrium Values

As SL orders execute, they do not prevent price changes from achieving equilibrium values. This essential property of the procedure is achieved precisely because SL orders are entered for execution in the call auction facility only. To better understand this, it is necessary to distinguish between short-run and long-run equilibrium.

A well-known economic reality is that short-run responses are generally less elastic than long-run responses and, accordingly, that demand and supply shifts result in larger price changes in the short run than in the long run. This result holds for an equity market: in the short run, the relative thinness of a book (i.e. illiquidity) results in accentuated price changes and, accordingly, in heightened price volatility.

In call auction trading, buy and sell orders are cumulated to obtain downward sloping buy curves and upward sloping sell curves that are analogous to the demand and supply curves of economic theory. The intersection of these two curves establishes a clearing price that is an equilibrium value. As the curves shift, the equilibrium value changes. As it does, various short-run dynamics that characterize the order flow cause short-run price equilibrium to differ from long-run price equilibrium. For instance, momentum trading causes prices to over-react in the short run and then to mean revert back to more sustainable long-run values. Further, contra-side buyers step back when price sharply drops, and, similarly, contra-side sellers step back when price sharply rises. Additionally, effective demand (orders actually conveyed to the market) is generally less than *latent demand*, the volume of orders that would be placed in a frictionless environment. Lower effective demand translates into buy/sell curves that are less elastic, and, accordingly, this causes accentuated price volatility.

Call auctions naturally control volatility, and the price improvement that limit order placers can receive in a batched trading environment incentivizes more aggressive order placement. Nevertheless, in a world replete with trading frictions, potential traders do not all participate in any specific auction and, consequently, the price set in any call is a short-run, not a long-run, equilibrium. Accordingly, the SL program can be understood as a procedure that, through the liquidity it supplies, bolsters the elasticity of the short-run buy/sell curves. In so doing, this keeps short-run equilibrium prices in closer alignment with longer-run equilibrium values.

One might question how it is possible for an SL order to change a call auction clearing price without preventing that clearing price from achieving an equilibrium value. The answer is that the SL orders *change* equilibrium values. How might this

be? In an environment characterized by divergent expectations, the short-run equilibrium price is not an exogenous, fundamental value (and neither is a long-run equilibrium price, for that matter). Rather, it is the price that best balances all buy and sell orders that have been submitted to the auction. In standard economic terms, equilibrium is the value given by the intersection of the (effective) downward sloping buy curve and the (effective) upward sloping sell curve. If the inclusion of an SL order shifts a buy/sell curve, it alters the intersection point, and, in so doing, it changes the equilibrium price.

To clarify further, it is important to emphasize that, in an environment where participants in possession of the same fundamental information form divergent expectations, shares do not have exogenously determined fundamental values (if some participants think that shares are worth $45 while others think that they are worth $50, what is *the* fundamental value?). In a divergent expectations environment which is devoid of exogenously determined fundamental values, market clearing values can be determined only by participant orders meeting in the marketplace, and the SL orders would simply be one more input into price determination. Just as these orders might impact a call auction's clearing price, they can also affect the underlying equilibrium values. They can do so because they are one of the determinants of the equilibrium value.

Because of the malleability of an equilibrium price, an order that supplies supplemental liquidity to the market is able to dampen excessive short-run volatility (noise) without preventing share prices from achieving short-run equilibrium values. By bolstering buying (selling) in a falling (rising) market, the SL orders add elasticity-preserving liquidity to the market's buy and sell curves. The greater elasticity tempers short-run price swings and, in so doing, dampens excessive short-run price volatility.

An SL Program and Gaming Possibilities

While gaming is always a major consideration, we find it difficult to see how the SL procedure could be gamed in a way that would have undesirable consequences. However, we caution that, when it comes to gaming, one should never say never.

The possibility of gaming should be considered for two times in an SL cycle in particular: (1) when an SL order has been posted and (2) when, via its SL trading, a company has either purchased or sold a large number of shares, and the market has come to anticipate that the company will be undertaking a rebalancing transaction(s).[11]

The initial posting of an SL order should not be game-able because these orders are totally informationless, the procedure is fully transparent, and the prices at

[11] Given that the program executes based on price movement and not on inventory, there should be no cause for concern regarding any rebalancing activity. Additionally, cause for concern in the event of a hostile takeover and/or short-squeeze situation is also unwarranted, as this can be adequately addressed by the inclusion of a tapering function.

which the orders are pre-positioned are public information. No trading halt is triggered when an SL order price is reached and an SL order does not attempt to peg price. Thus an SL order does not establish an absorbing barrier. And, because it is entered for call auction execution only, if it does execute, it executes at the auction's clearing price, not at its own limit price (that is, the SL order can be price improved).

Because of the affect it may have on the placement of other orders, an SL order could, however, establish a reflecting barrier. Suppose an SL buy order has been entered at $40. Some public buyer, viewing this large order as a free put option, would be encouraged to enter a more aggressive buy order in the neighbourhood of $40 in the continuous market preceding the auction; if his order executes and he so wishes, he could (possibly) flip out of the position at a good price in the next call because of the SL order. Plus, if he wishes to buy and hold, he will have to price his order more aggressively so as to get the merchandise. On the other side of the market, a public seller will be encouraged to seek a higher price than he or she otherwise would in the continuous market preceding the call. And so, the presence of the SL buy order at $40 acts to increase both buy and sell prices in the continuous market, and thus it operates as a reflecting barrier. This response is desirable, however, and we do not consider it gaming.

Regarding the unwinding of an SL position, the procedure is structured so that a company need never have to unwind a position. This is critically important. A traditional market maker firm that has acquired an unduly large inventory position (long or short) will be looking to rebalance its portfolio. The market maker firm, of course, does not want public participants to know that it will be doing this and, accordingly, keeps its inventory positions hidden. In contrast, the inventory of the SL fund should be public knowledge. It can be totally transparent because, unlike a traditional market maker, an SL fund need never rebalance. Hence, the procedure cannot be gamed from this perspective.

To satisfy the no-rebalance condition, enough cash must be kept in a firm's SL fund to repurchase shares if its share price were to fall without bound, and the firm should maintain sufficient shares "on the shelf" to issue new shares if its price were to rise to ever higher levels. Because the SL orders, although large in the marketplace are small relative to the total value of shares outstanding, a company can acquire ever larger long/short positions at relatively low cost.[12]

Consideration needs also be given to the procedure by which a firm might periodically change the parameters of its SL program or, if it so chooses, terminate the program entirely. Our suggestion here is that the firm commit to the program and set its parameters with a specified frequency (e.g. quarterly) and that it preannounce its

[12] In one benign way, however, a company can, if it so wishes, rebalance its portfolio without decreasing the size of its publically announced SL orders: if it has an undesirably large short position, the company can rebalance by augmenting its SL buy orders; similarly, if it has an undesirably large long position, the company can rebalance by augmenting the size of its SL sell orders. Alternatively, it can taper its order sizes as we have done in our empirical tests.

forward commitment.[13] Other issues concerning the integration of an SL program with standard share issuance and buyback programs require further consideration.

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[13] Under certain conditions (e.g. the advent of potential bankruptcy or an unexpected hostile takeover), a company should be allowed to alter the parameters of its SL program without delay.

Chapter 10
Invited Editorial: Combatting Turbulence in the Equity Market—Get the Listed Companies on Board

Nazli Sila Alan, Timothy Mahoney, and Robert A. Schwartz

What participant in the equity markets could ever forget the month of October, 1987? It was a wild, turbulent time, and Monday, October 19, was a black day: the Dow Jones Average of 30 industrial stocks dropped 508 points on that day to close down 22.61%. But the dramatic plunge on the 19th is not what captures our attention in this piece. Rather, it is the sharp market swings of over a quarter of a century ago, and the fact that, to the current day, bouts of sharply accentuated short-period volatility continue to characterize our equity market.[1] How, we ask, might such turbulence be dealt with?

Our answer: get the listed companies involved in providing liquidity for their own shares. On October 19, over 604 million shares of NYSE-listed stocks traded; although this number was enormous relative to the NYSE's 1987 average daily trading volume of 189 million shares, it was only roughly one percent of the total

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[1] Following black Monday in 1987, the market reversed direction on October 20 and 21, with the Dow regaining 289 points to end the day 16.03% higher than its October 19 close. October 26 saw another big drop (156.83 points or 8.04%), after which the DOW continued to climb back for the remainder of the month.

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number of shares outstanding.[2] This very small percent suggests that a corporation could with relative ease bring meaningful liquidity to the market for its stock.

October 1987 was fraught with major economic uncertainties—concern about a federal budget deficit, a trade deficit, rising interest rates, a threat of renewed inflation, and, as the market opened on October 19, news that an Iranian oil platform in the Persian Gulf had been bombed by warships thought to be American. But the precipitous decline on October 19 was not attributable to fundamentals alone. In response to the falling market, portfolio insurance programs had kicked in, driving prices into virtual free fall as orders and quotes disappeared on the buyers' side of the market.

John Phelan, then CEO of the NYSE, recognized that the October 19 plunge was in good part a technical event driven by the portfolio insurance programs. To reassure investors and to stem a further decline, Phelan stepped forward—on October 20, he and his chief lieutenants at the Exchange hit the telephones, asking CEOs and other top brass at the listed companies to buy back their own shares. His efforts were successful. According to a report by the Division of Market Regulation of the SEC, close to 600 firms announced open-market repurchase programs during the 2 weeks following the crash.[3] With this corporate support, the market regained normality.[4]

And so a powerful idea was pushed to the fore—get the listed companies involved in providing liquidity for their own shares. Phelan, however, was not the first to think of involving listed companies in the quest for improved market quality. Recognizing the accentuated range over which share prices can fluctuate, in their classic book Graham and Dodd (1934) wrote,

> It follows that the responsibility of managements to act in the interest of their shareholders includes the obligation to prevent—in so far as they are able—the establishment of either absurdly high or unduly low prices for their securities.

Let us consider further the need to get the listed companies involved.

The Need to Enhance Market Liquidity and the Quality of Price Discovery

As it was dramatically underscored by the flash crash on May 6, 2010, markets are prone to unwarranted instability. And, on virtually a daily basis, intra-day price volatility has historically been and, currently, is elevated.[5] Hence, not surprisingly,

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[2] See *http://www.reuters.com/article/2012/10/19/us-usa-markets-blackmonday-idUSBRE89I0YA20121019* and *http://graphics8.nytimes.com/packages/pdf/nyregion/city_room/20071019_CITYROOM.pdf*

[3] See Division of Market Regulation (1988).

[4] Eventually, many firms did not actually carry the programs out, as discussed by Netter and Mitchell (1989).

[5] For further discussion, see Alan and Schwartz (2013).

on both sides of the Atlantic, a good deal of regulatory attention is being given to proposals for improving market liquidity and the quality of price discovery.

These proposals include the imposition of a special fee on trading, requiring that unexecuted orders remain posted for a minimum resting time and attracting a larger provision of market maker capital either by granting dealers subsidies or by giving them additional perks. Will regulatory approaches such as these accomplish their desired objective? Each of them has been subjected to criticism and we, ourselves, ask, are the regulators looking in the right direction?

To answer this question, it is important to recognize the following. (1) Accentuated volatility is caused by insufficient liquidity provision and by the complexity of price discovery. (2) In our continuous trading markets, liquidity provision and price discovery are achieved, albeit imperfectly, through orders placed by public limit order traders, by traditional market makers, and by a more recent breed of participants, high frequency traders (HFT) who are seen as fulfilling a market maker role. (3) In addition to the participants in the individual trades, a wide spectrum of investors is affected by intra-day volatility and the attending complexity of price discovery.

The regulatory proposals have, for the most part, been focused on controlling the limit order traders, dealers, and HFT participants. The proposals, however, fail to take into account an important reality: none of these participants, in acting out of their own self-interests, is incented to do that which is best for the market as a whole. Why? Because price determination in the equity markets is a public good. This is so precisely because investors who are not participants in the trades care about and are affected by the prices that have been established by the trades that have been made. Market produced prices are used, for instance, to mark positions to market, for derivative trading, estate valuations, mutual fund valuations, dark pool pricing, and by corporations to assess their costs of capital.

It is well recognized by economists that public goods are undersupplied by a free market. Attempts should not be made to overcome this reality by imposing cumbersome carrot and stick rules on standard market participants. Sound public policy should honor the fact that not one of them, neither the limit order placers nor the standard market makers nor the new HFT players is incented to supply adequate amounts of the public good. Why should they? But, if these participants are not so incented, who is? The listed companies themselves, as we will explain shortly. First, we consider the role of traditional market makers.

Traditional Market Makers

The standard view in the microstructure literature is that market makers are suppliers, not of liquidity per se but of immediacy, while liquidity itself is provided by the "naturals." That is, public buyers supply liquidity to public sellers (and vice versa). This is most understandable. Market makers certainly need to keep their inventories of shares in reasonable balance, and no market maker can continue to buy shares from public participants who are looking to sell, without re-liquefying by selling

shares to other public participants who are looking to buy (and vice versa). In this context, the bid-ask spread is recognized as the source of compensation to the market maker for providing immediacy to public participants.

Inadequate immediacy provision is not, however, the problem that is being addressed by the regulators. For large cap stocks, in any event, immediacy is largely provided by limit orders that have been placed in the book by public participants. The problem from a public policy perspective is the price turbulence experienced when the book becomes unduly sparse. Controlling this turbulence calls for the provision of supplemental liquidity.

And the economic function of a market maker has historically extended beyond the provision of immediacy. The NYSE specialists of old were responsible for making fair and orderly markets, and both specialists and Nasdaq market makers have played key price discovery roles. Accordingly, in today's turbulent environment, it is not surprising that regulators would look to traditional market makers for answers. It is unrealistic, however, to expect the traditional market makers to apply their capital with an intensity that is not profitable for them, and it is important to recognize that the public goods benefits that enhanced liquidity and price discovery bestow on the broader community are not monetized for the market makers. With this in mind, let us now turn to a market maker-type role that a listed company can play.

Listed Companies

A listed company may not think that a market maker function is in its bailiwick. An automaker, for instance, might view its business as producing cars, not making the market for its stock. This understanding, however, is unduly limited. A company should be involved, for it is better positioned than a traditional market maker, limit order trader, or HFT participant to internalize the public goods benefits that attend deeper liquidity provision and enhanced price discovery. This is because a corporation seeks not to realize profits from trading per se but to maximize the value of its shares. To the extent that poor price discovery and turbulent price changes have negative consequences for the broader array of market participants, the value of a company's shares can be impaired and hence its cost of capital can be raised.

Because, vis-à-vis blue chips, the markets for small and medium sized companies are generally less liquid, we would expect that smaller companies in particular would benefit from instituting stabilization programs. Moreover, because they typically have lower free float, smaller companies are more prone to being gamed with relatively less money. We also suggest, however, that the more widely these corporate liquidity-provided stabilization programs are used, the more effective they will collectively be in tempering broad market swings that include stocks of all cap sizes.

Precedents exist for companies having meaningful associations with the market makers for their stocks. Historically, NYSE specialists have maintained contacts with the management of the companies whose shares had been allocated to them. Currently, in five European countries (France, Germany, Italy, Netherlands and

Portugal) sellside intermediaries called "designated sponsors" contract with the listed companies (generally one or two to a company) to enter orders that, by reducing spreads, make the markets for the companies' shares more liquid.[6] And corporations have historically bought back their own shares, not simply because they feel the price is right from an investment prospective but also to stabilize their share values when a short-run price decrease, in their opinion, is not justified.

Schwartz (1988) and, more recently, Alan, Mask, and Schwartz (2015) have set forth a specific procedure by which a listed company could more directly provide supplemental liquidity for its shares. In brief, the proposal calls for a company to establish a fund that would be run by a third-party fiduciary to buy back the company's shares in a falling market and to sell its shares in a rising market. Importantly, the procedure would be totally transparent, with all parameters announced well in advance and with the companies committing to the program for a pre-specified, adequately long period of time.

When it comes to a listed company taking a more direct role in making a market for its own shares, a primary concern is the possibility that the firm will manipulate its share price. Alan et al. (2015) address this issue (along with the more general problem of gaming). They argue that the defense against manipulation (and gaming) lies in the high degree of transparency that their procedure calls for, along with requiring that all relevant parameters be pre-announced and that a third-party intermediary, along the lines of a designated sponsor, play an important fiduciary and advisory role. Moreover, the transparent presence of the large corporate orders would make it more difficult for other participants to game/manipulate the market.

Any specific plan to have a listed company bring supplemental liquidity to the market would, without question, require further thought and analysis. Nevertheless, one reality is clear: for the public goods benefits that additional liquidity would provide to be fully realized, the listed companies must be involved.

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[6] In practice, designated sponsors have supplied liquidity for the less liquid small-cap and mid-cap stocks, not for the blue chips.