

THE ROLE OF REGULATION IN SHAPING EQUITY MARKET STRUCTURE AND ELECTRONIC TRADING

HEARING BEFORE THE COMMITTEE ON BANKING, HOUSING, AND URBAN AFFAIRS UNITED STATES SENATE ONE HUNDRED THIRTEENTH CONGRESS SECOND SESSION ON

EXAMINING THE INFLUENCE OF REGULATION ON THE GROWTH OF
MARKET STRUCTURE, THE SYSTEMS AND OPERATION OF MARKET
PARTICIPANTS AND THE DEVELOPMENT OF BUSINESS PRACTICES RE-
LATED TO HIGH-FREQUENCY TRADING, ELECTRONIC MARKETS AND
AUTOMATED TRADING

JULY 8, 2014

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TUESDAY, JULY 8, 2014

U.S. SENATE,
COMMITTEE ON BANKING, HOUSING, AND URBAN AFFAIRS,
Washington, DC.

The Committee met at 10:04 a.m., in room SD-538, Dirksen Senate Office Building, Hon. Tim Johnson, Chairman of the Committee, presiding.

OPENING STATEMENT OF CHAIRMAN TIM JOHNSON

Chairman JOHNSON. I call this hearing to order. Good morning. Today the Committee will examine equity market structure. It is a complicated topic, and a whole new vocabulary is needed to understand market structure and electronic trading. Words like “dark pool,” “high-frequency trading,” and “data feed” are pieces to understanding the market puzzle. Even experts disagree on the details of how the markets work and what issues and problems exist.

In less than a decade, the stock market has moved from being dominated by two exchanges to an extremely competitive but fragmented marketplace with 11 stock exchanges and over 40 private alternative trading centers, increasing complexity and instability in the system. However, many rules and market conventions date back to the days of less complex markets.

The regulatory environment has to recognize the new electronic trading landscape, one where institutions, individuals, market makers, and traders interact at high-speed over dozens of connected markets. The benefits of lower costs and more efficient trading are important, but fairness and market resilience are also vital and should continue to be examined.

Additionally, while we have seen a sizable stock market rally since the Flash Crash 4 years ago, we also hear reports of declining stock market investment and loss of faith by individual investors. Many reasons have been suggested, but doubts about market integrity and market stability are heard too often.

Although many market participants call for reform, they often disagree as to where that reform should occur. Any path to reform must be built on good data and the goals of preserving a competitive market and the interests of long-term investors, while protecting the market from future disruptions. I am encouraged to see the SEC move forward with a comprehensive review of market structure and an initiative for small company stocks that recog-

nizes one size does not fit all. But pilots and reviews are just a first step. I want to see urgent and thorough attention given to the market structure review so that any corrective measures that would help restore trust in the fairness of our markets are taken as quickly as possible.

I look forward to the witnesses' testimony today as the Committee examines whether today's market structure has the right kind and amount of regulation to maintain a stable, competitive, and efficient marketplace and what additional measures would be useful.

With that, I turn to Ranking Member Crapo for his opening statement.

STATEMENT OF SENATOR MIKE CRAPO

Senator CRAPO. Thank you, Mr. Chairman.

The U.S. capital markets are vital to the continued growth of our economy. I have repeatedly stressed the need for the U.S. financial system and markets to remain the preferred destination for investors throughout the world. This hearing will examine the role of regulation in shaping today's markets as well as whether these markets are as resilient and stable as they should be, given the rising different types of technology and automated trading.

Recent news about the practices of certain market participants and automated trading has raised concerns as to whether the stock market is rigged against small investors. SEC Chair White recently stated her view that the market is not rigged, but there is a need to review the current equity market structure, and such a review should be disciplined and conducted in a data-driven manner.

While much has been made recently of the potential dangers of automated trading, what is often forgotten is that technology and innovation has benefited investors by leading to tighter spreads, lower costs, and more efficient markets.

Today an individual retail investor has an easier time participating in our stock market than at any time in the history of these markets. With fees under \$10 a trade, the spreads between bid and ask prices for most stocks as narrow as they have ever been, and with trading being done in a matter of sub-seconds rather than minutes, retail investors have been able to enjoy greater involvement in and access to the markets.

To continue this level of investor participation, we must ensure that the markets have the resiliency and the capabilities to handle the evolving speed and complexity of today's trading world. I am encouraged by speeches and comments given by SEC Chair White and other SEC Commissioners acknowledging both the positive and negative roles that SEC regulations played in shaping today's market structure, as well as an appetite to address unintended consequences of those regulations.

As evidenced by today's testimony and by the academic discussions of the U.S. markets, many of the concerns raised by market participants and investors are the outgrowth of the SEC Regulation NMS and the overall patchwork approach to market trading infrastructure and stability taken by the SEC in the past.

It is important and prudent for regulators to periodically review the regulations to ensure that they are still appropriate in today's

automated world. However, any such holistic review of regulations should be based on empirical analysis, should be data driven, and incorporate the input of market participants, industry, and the investors who make the investments. Everyone should have a seat at the table in this important discussion, and everyone must be willing to roll up their sleeves to find the right solutions.

I am particularly interested in the panel's views on whether the benefits to the market participants and investors from the rapid expansion of various trading venues and increased competition have been outweighed by the strain to the market infrastructure. I am also interested in what can be done to build better markets for smaller companies. And what further measures do market participants and trading venues need to take to minimize market disruptions and increase the resiliency and durability of the systems?

Investor confidence is the key. Our markets cannot afford another Flash Crash or major market disruption. I look forward to hearing from today's panelists about their thoughts on potential enhancement to market structure and integrity and hope to hear from them about what changes they believe are appropriate.

Thank you, Mr. Chairman.

Chairman JOHNSON. Thank you, Senator Crapo.

Would any of my colleagues like to make a brief opening statement?

Senator HELLER. Chairman Johnson?

Chairman JOHNSON. Senator Heller.

STATEMENT OF SENATOR DEAN HELLER

Senator HELLER. Thank you very much. Mr. Chairman, also thanks to the Ranking Member for this hearing today. I want you to know that in my previous life I worked as a trader on the Pacific Stock Exchange, specifically the L.A. Floor, which goes to show you how old I am. That floor, because of progress, does not even exist anymore. Needless to say, I may be one of only a handful of Senators here serving currently that has passed the Series 7 exam.

Recently, SEC Chair Mary Jo White stated that "the U.S. markets are the strongest and most reliable in the world" and that "the retail investor is very well served by the current market structure," and I end the quote with that. While I have concerns about the potential bubbles in the equity market caused by quantitative easing, structurally today's markets are very beneficial for retail investors with spreads for many stocks, typically a penny or less, and access to markets has never been easier, and commissions to trade are at all-time lows.

While there has been much debate about the new methods of trading, I would caution any desires to roll back the technology clock. With every new Internet-based technology, I believe that we must ensure proper safeguards while maintaining an environment that continues to promote new financial technologies and innovative growth.

U.S. markets have changed greatly since I left the trading floor, and this hearing will help the public better understand today's competitive modern markets, and I look forward to hearing from our witnesses on what can be done to increase investors' confidence and further promote market stability.

Mr. Chairman, thank you for the opening statement.

Chairman JOHNSON. Thank you.

Would anybody else like to make a brief opening statement?

Senator MORAN. Mr. Chairman?

Chairman JOHNSON. Yes.

Senator MORAN. Mr. Chairman, thank you. I just want to welcome fellow Kansan Joe Ratterman who will be on the second panel testifying this afternoon. I appreciate you including him in today's hearing.

Chairman JOHNSON. Yes. Before we begin, I would like to apologize to my colleagues and the witnesses on the second panel, but I will have to excuse myself after the first panel due to a prior engagement. I thank my good friend Senator Reed for agreeing to take over the gavel for the second panel and will follow up with the witnesses later if I have any further questions.

With that, I would now like to introduce our witnesses on the first panel.

Mr. Jeffrey Sprecher is the Chairman and Chief Executive Officer at Intercontinental Exchange.

Mr. Kenneth Griffin is the Chief Executive Officer at Citadel.

Mr. Kevin Cronin is Global Head of Trading at Invesco.

Dr. James Angel is an Associate Professor of Finance at the Georgetown University McDonough School of Business.

Mr. Sprecher, please begin your testimony.

**STATEMENT OF JEFFREY SPRECHER, CHAIRMAN AND CEO,
INTERCONTINENTAL EXCHANGE, INC.**

Mr. SPRECHER. Chairman Johnson, thank you for having me, along with Ranking Member Crapo and the Members of the Committee. I appreciate the opportunity to testify.

By way of background, in just 14 years my company, which is known as ICE, grew from a startup in Atlanta to become one of the world's largest marketplaces, and today we operate 11 exchanges and 5 clearinghouses in the United States, Canada, the United Kingdom, continental Europe, and Asia; and most recently we acquired the New York Stock Exchange. None of this would have been possible for us without our ability to raise funds in the U.S. capital markets, which I believe are the best in the world for entrepreneurs like me that seek to build companies. And much of our growth can be attributed to trying to make capital raising and risk management more accessible and more transparent. We have inevitably faced head winds as a result of challenging the status quo, but we believe very strongly in that vision.

The United States has a number of regulatory policies that were intended to improve markets but, we believe, need to be revisited in light of evolving industry practices. And so we offer five recommendations that we hope can be quickly adopted.

Number one, we believe we should enhance order competition by giving deference to regulated, transparent trading centers where orders compete with one another and contribute to providing price discovery information to all others.

Second, we would eliminate and ban maker-taker pricing schemes at trading venues. Rebates that were once used to encourage participants to quote have evolved and now add too much order

complexity and add the potential for conflicts of interest in our market.

Third, we would lower the statutory minimum cap on exchange fees that exist within Regulation NMS. So in combination with giving deference to regulated and transparent markets and eliminating maker-taker rebates, we believe that the SEC should require lower maximum fees, including on my company, the New York Stock Exchange.

Fourth, we should revamp the current market data delivery system to promote fairness. We support the SEC's examination of the current Securities Information Processors and the proprietary data feeds to adopt new policies.

And, last, we should require increased transparency by having the SEC demand that all trading centers report trade executions in real time and all routing practices be disclosed by trading centers and the brokers who touch customer orders.

So, in summary, my firm's proposed solutions are based on reducing complexity, reducing conflicts of interest, and treating people fairly when investing in the U.S. markets.

Thank you again for inviting me to testify, and I look forward to answering your questions.

Chairman JOHNSON. Thank you.

Mr. Griffin, please begin your testimony.

**STATEMENT OF KENNETH C. GRIFFIN, FOUNDER AND CHIEF
EXECUTIVE OFFICER, CITADEL LLC**

Mr. GRIFFIN. Chairman Johnson, Ranking Member Crapo, Members of the Committee, I am Kenneth Griffin, the founder and CEO of Citadel. I appreciate the opportunity to be here today to testify.

Citadel's experience as both an institutional investor and a leading market maker gives us deep insight into the strength, structure, and resilience of our markets today. I can say without hesitation that the U.S. equity markets are the fairest, most transparent, resilient, and competitive markets in the world.

Over the past two decades, a wave of innovation has swept through the markets in response to new technologies and thoughtful regulation. Simply put, today's markets are faster, they are better, and they are incredibly competitive. The cost of trading has plummeted for investors.

That said, we can further improve our equity markets. In my written testimony I have included a more detailed list of suggestions, but I would like to highlight a few.

First, we can and should take steps to increase the resiliency of our markets. The SEC should require mandatory exchange-level kill switches and ensure that exchanges have clear authority and responsibility to block and stop aberrant activity before it adversely impacts the markets. The activity of a large number of market participants intersects on exchanges, and exchanges are thus best positioned to efficiently and constantly oversee trading activity.

Second, we believe the SEC should require brokers to publicly report consistent, standardized execution quality metrics in a way that allows retail investors to easily compare performance. We can empower retail investors with information about brokers' execution quality and position them to make informed choices. We rec-

commend that the SEC require all execution quality reports to be comprehensive, understandable, and made available for at least 3 years. Investors can then track the quality of executions over time and hold their brokers accountable.

Third, dark pools should be subject to the same anti-discrimination rules that our securities exchanges are subject to and should be required to offer fair and impartial access to all market participants. In recent years, increasing amounts of trading have taken place on dark pools. While public quotes on exchanges are available to all investors, this is not necessarily the case for liquidity present on dark pools. In fact, dark pools may refuse access, give execution priority, and charge different fees to different market participants.

Dark pools should only be allowed to determine execution priority based on the characteristics of an order, such as price, size, and time of arrival, and should not be allowed to allocate executions based upon the identity of the participants.

For example, broker preferencing is a practice that could return our markets to the old boys' network of prior decades when who you were and who you know mattered more than the merits of your order.

Fourth, I agree with Jeff that the maximum fee of 30 cents per 100 shares that is charged to access exchange liquidity is now significantly greater than the cost of providing matching services by the exchanges and should be reduced to reflect today's competitive reality. We believe a reduction in the minimum tick size for the most liquid low-priced securities, combined with a reduction in the maximum permitted access fee, would best serve the interests of all investors.

There are other important steps that we should take to enhance market quality, improve market resilience, and strengthen investor protections. However, we must pursue this agenda without sacrificing the extraordinary achievements we have made for investors in terms of market efficiency, lower costs, increased transparency, increased fairness, and competitiveness over the prior two decades.

Thank you for the opportunity to testify before this Committee today. We commend the Committee and the SEC for taking a data-driven and comprehensive review of U.S. equity markets and look forward to a robust dialogue. And I would be happy to answer your questions.

Chairman JOHNSON. Thank you.

Mr. Cronin, please proceed.

**STATEMENT OF KEVIN CRONIN, GLOBAL HEAD OF TRADING,
INVESCO, LTD.**

Mr. CRONIN. Thank you very much for the opportunity to be here today on behalf of Invesco, a global asset management firm with \$790 billion of assets under management. We serve individuals who are saving for their retirement and other personal financial needs. These are long-term investors, and they are the cornerstone of our Nation's capital formation process. Retaining their confidence is fundamental to well-functioning U.S. equity markets.

We need to make sure that those markets are highly liquid, transparent, fair, stable, and efficient. Due to regulatory changes and developments in technology, there is robust competition among

exchanges and alternative execution venues. These changes have benefited investors in the form of lower commissions, spreads, and implicit transaction costs, which have in turn enhanced the liquidity in the markets.

But there are unintended consequences which have unlevelled the playing field. These include:

Market fragmentation. Markets have become too complex and fragmented, not because they need to be but, rather, because we have allowed them to become so. This complexity has contributed to a number of technological mishaps which shake investor confidence. Sophisticated participants can get an unfair advantage over ordinary investors, for example, when exchanges sell direct data feeds that allow certain market participants to more quickly act on trading information.

Fragmentation also means that the rules governing securities exchanges are very different for those governing alternative trading venues, including dark pools. Determining which execution venue will lead to the best trading outcome can be very difficult even for a firm like Invesco.

Conflicts of interest. As much as 35 to 40 percent of all trading activity today now takes place away from the exchanges, which has weakened the robust price discovery that is an essential element of an efficient market. The movement away from the exchanges is partly the result of broker-dealer routing practices such as internalization and the proliferation of alternative trading venues. Much of this is due to two inherent conflicts of interest.

The first is the broker-dealer's interest in capturing liquidity rebates associated with the so-called maker-taker pricing model and other inducements, including payments for order flow.

The second is a broker-dealer's interest in avoiding paying access fees to take liquidity from other trading venues. A broker tries to keep as many trades as possible within its own internalized system, including its own dark pools. This can drive order-routing decisions that may be at odds with their clients' best execution interest.

High-frequency trading. High-frequency trading is not bad in itself, but there are certain strategies that can be unfair. These strategies have arisen as a result of technology, market fragmentation, and a lack of uniform regulation. Also, high-frequency trading appears to focus primarily on large-cap securities. This increases trading volumes, but it is not clear that it creates real liquidity. Moreover, while market makers historically have provided valuable liquidity for mid- and small-cap stocks, they have not benefited from the evolution of market structure.

To be clear, there is much about today's markets that benefit all investors. However, Invesco advocates that regulators take steps to address certain unintended consequences. To restore a level playing field in the markets, and to restore investor confidence in the fairness and transparency of the markets, we recommend: requiring broker-dealers to provide greater disclosure about order routing; ensuring the market data is fairly disseminated to all participants; eliminating the maker-taker pricing model and reducing access fee caps; harmonizing the regulation of all trading venues; requiring that all high-frequency traders be effectively regulated; in-

stituting a pilot program for a comprehensive trade-at rule; and facilitating market-making activities for mid- and small-cap stocks.

Thank you again for your attention to these important issues, and I look forward to answering any questions that you may have.

Chairman JOHNSON. Thank you.

Professor Angel, please begin your testimony.

STATEMENT OF JAMES J. ANGEL, Ph.D., CFA, ASSOCIATE PROFESSOR OF FINANCE, GEORGETOWN UNIVERSITY MCDONOUGH SCHOOL OF BUSINESS

Mr. ANGEL. Thank you. And, first of all, I want to thank the Committee because you are asking exactly the right questions. If you get regulation right, the regulators will get the details right, and you will not have to worry about whether the kill switches are properly designed or not.

The problem is we have a very fragmented and broken regulatory structure. We have literally hundreds of different financial regulatory agencies at the State and Federal levels, and they do not always play nicely together. Stuff falls between the cracks. There are turf battles. Nobody with a clean sheet of paper would design a regulatory structure like we have now.

Let me give you just a few examples of this dysfunction. And, first of all, I want to state very clearly it is not the fault of the people who work at the regulatory agencies. Most of them are very smart, hard-working people, diligently trying to do what Congress has told them to do.

But look at the JOBS Act, a bipartisan bill to create jobs. Everything in the JOBS Act could have been done by the SEC with its own pre-existing authority, but they chose not to. You know, as an institution, they were incapable of understanding the problems and acting on them in a timely manner.

If you look at the implementation of the Volcker rule, there are four different agencies trying to figure out how to implement it.

If you look at the Flash Crash, look at how long it took to try to figure out what happened in that situation. And there is controversy that they still have not figured it out.

But when we have a regulatory system that cannot enforce existing laws, when investors complain to the SEC about obvious rule violations and nothing happens, that zaps investor confidence more than anything else.

In my written remarks, I provide a few details about a case of which I have some personal knowledge, the case of W2007 Grace Acquisition I. To make a long story short, for over a year there has been an issue proceeding at the Commission as to whether this company should be required to file financial statements. You know, under the rule, if they have more than 300 shareholders of record, they should be filing financial statements.

Well, you would think that the SEC would be able to count to 300 in less than a year, and, you know, there are many other apparent violations going on there, but when investors report rule violations, legal violations, and nothing happens, that kills investor confidence.

Now, as far as the equity market structure goes, what we have today is pretty much what Congress ordered in 1975 in the Na-

tional Market System Amendments to our Exchange Act. Congress said: Give us competition among exchanges, between exchanges and off-exchange trading platforms, a place where investors can trade with each other without going through a dealer. And so what we have today is something that is an open architecture market, and that is a good thing. Any innovator can plug in a new system if they think they have a better solution, because the trading problem has not yet been solved. Trading is a lot more than just matching limit orders. And we need a system where we can continue to have a lot more innovation and experimentation.

Now, the rest of the world, if you look around the world, they are copying our market structure. You know, they are going to a competitive system where you have for-profit exchanges, because if you do not want a monopoly, you need competition. If you want competition, profit is a great motive. But they are not copying our regulatory structure.

Now, there are a lot of market practices that are very controversial. I would like to add that using high-speed computers is neither good nor bad. Some of the strategies, like market making and ETF arbitrage, help low-frequency retail investors like me. Others, you know, like order ignition and excess cancellation strategies, are harmful and should be curtailed.

We need regulators who are smart enough to understand what is going on, to know the difference between the good and the bad, and have the resources to get the bad out while keeping the good in.

Now, as far as technical stability goes, we are in trouble. Our market is a complex technological system. There is nothing we can do about that. That is the modern world. And complex technological systems fail in weird and strange ways. Most of the regulatory focus has been on making individual parts work well, but not in dealing with what happens when the parts do not work together nicely. So more work needs to be done there.

So there is a lot more that needs to be done, but the most important thing Congress can do is start the process of overall structural reform. But in the meantime, what you can do is you can make sure that our regulators have the resources they need to do their job. If you look at how much we have spent on the SEC since the beginning of time, it is less than investors have lost from one Bernie Madoff. But you need to monitor them to make sure that they spend those resources properly. You need to make sure that they have enough people with degrees in economics, business, engineering, computer science. You need to make sure they have more people who have passed the Series 7, they have more people with real work experience, more people who are CFAs or CPAs. They have got enough lawyers. They need people with market experience.

So I have got plenty of other things, but I would like to finish up by saying, hey, if we do not fix regulation, we will be saddled with a system which is more expensive than it has to be, both in terms of direct cost to the taxpayer as well as compliance costs; we will have a system which will not protect investors as well as it should; we will have a system that will not permit capital formation, and that means less jobs.

Thank you very much.

Chairman JOHNSON. Thank you all.

As we begin questions, I will ask the Clerk to put 5 minutes on the clock for each Member.

Mr. Sprecher, as the operator of equity and derivatives markets while maintaining a competitive marketplace, what can the equity markets learn from the derivatives markets?

Mr. SPRECHER. That is a very good question. I think the main difference in U.S. equity markets and U.S. commodity and derivatives markets is that in U.S. commodity and derivatives markets, investors can choose where they trade. While we all have talked a lot about the competition in U.S. stocks with many different trading venues, the reality is neither you nor I can choose where our orders are routed. And as a result of that, we have third parties that are making those decisions for us, oftentimes potentially not in our best interest.

What we have seen in the commodities markets is that when investors have a choice, they want obviously low transaction costs, honest brokers, and also they want to find the most buyers and sellers. So they tend to gravitate to a fewer number of highly competitive exchanges and trading venues. It is competitive but it is not fragmented.

In the equity markets, because you and I and even institutional managers like Mr. Cronin do not have an opportunity to choose where we trade, consequently we have a lot of other interests that cause fragmentation.

Chairman JOHNSON. Mr. Griffin, do you think market-maker obligations should be revisited?

Mr. GRIFFIN. Market makers have obligations that are mandated by each exchange on which they trade, and today in the U.S. equities market, if you are a NASDAQ market maker, for example, you must provide a continuous two-way quote.

The largest market makers also have a commercial reality that they service the important retail investors, institutional investors in the United States, and those investors have a very high expectation of continuous liquidity being provided, and it is done so by the largest market makers.

Chairman JOHNSON. Mr. Cronin, what do you think?

Mr. CRONIN. Market makers are invaluable participants in the market structure. Efficient markets are made from the participation of all kinds of different participants. While I might recommend that investors like ourselves are probably the most important component, having a robust market-making structure is very important as well. We are concerned that the one-size-fits-all proposition that the market structure is today does not appropriately address the needs of mid-cap and small-cap stocks. So as part of our recommendations, we would like to work with regulators and market makers and other market participants to really get to some ideas that will facilitate that.

Today we know that there are a lot of people who portend to be market makers, but it is unclear to us whether this is really just trading volume or if it is real liquidity. And we need to ensure that our markets are liquid at all levels and all market capitalizations.

Chairman JOHNSON. Professor Angel, what are we learning about market structure from recent regulatory actions?

Mr. ANGEL. Any particular actions you are interested in, sir? I could talk a lot on this.

[Laughter.]

Chairman JOHNSON. The most significant actions.

Mr. ANGEL. OK. The most significant actions were the tremendous changes in market structure that have occurred over the last 15 years. Twenty years ago, we had a very different market structure for small-cap companies. The old NASDAQ world was very different from the old NYSE world, and listing companies had a choice. But now over the years, you know, a very well meaning Commission, through a series of decisions, has now given us a one-size-fits-all market where the market structure for tiny little companies is basically the same as for large-cap companies. And what we are learning is that one size does not fit all.

One of the reasons why we have half as many U.S. companies listed on our exchanges is our public markets are no longer welcoming to small- and mid-cap companies. And, you know, I think this is a problem for capital formation and for job growth going forward.

Chairman JOHNSON. Mr. Cronin, many have pointed out that additional disclosure by non-exchange trading centers would be helpful. What kind of additional disclosure would influence your trading decisions?

Mr. CRONIN. Well, there are two dimensions of that. One is about the execution facility itself, so we would like to know as much as we can about the order-routing practices of those facilities, the kinds of order types that reside within them, who the people who are interacting in these various dark pools, for example, are. That helps us determine whether or not we want to use those destinations, so we need to have that information.

The second part gets to the executions itself. We need more information to ensure that the execution quality that we need to achieve for our clients is sufficient enough to really make those determinations. Today we do not have enough information. As it was recommended by Mr. Griffin, there is more of a requirement that should be made standardized to all participants in the marketplace.

Chairman JOHNSON. Senator Crapo.

Senator CRAPO. Thank you, Mr. Chairman.

This question is addressed to the whole panel, and basically I am just asking you to prioritize for me. Given your respective roles and work, where do you think the greatest weakness in today's market structure is? And if you do not want to limit it to one thing, that is OK. But where should we look at the greatest weakness to focus right now? Mr. Sprecher?

Mr. SPRECHER. The market is too complex. While we all support competition—and, in fact, I would not be here in front of you if—I started with nothing and have built one of the largest exchanges in the world, so I am pro-competition. But there is a difference between competing to get you, the investor, the best price and simply all the intermediaries, exchanges included, trying to split up commission dollars. It is great that we compete for those commission dollars, but we have lost track of getting the best price for a company that is trying to raise capital and an investor that would like

to meet a company. And I think if we just look at holistic practices to do the right thing for investors, we will land on the right public policy.

Senator CRAPO. Thank you.

Mr. Griffin?

Mr. GRIFFIN. In my opinion, the issue of complexity is dwarfed by the issue of resilience. The impact of the Flash Crash or the events that took place in Knight securities dwarf the day-to-day issues around complexity in the marketplace. And putting in place the appropriate infrastructure that allows for the market to not undergo moments of chaos and panic is of the utmost importance to protecting the confidence that we should all have in the functioning of the U.S. equity markets.

Senator CRAPO. Thank you.

Mr. Cronin?

Mr. CRONIN. My biggest concern probably gets around investor confidence. As I suggested earlier, investor confidence is the key that we are all really trying to solve for. All good things come from higher levels of confidence from market participants. Where I get concerned is there are certain elements of our market that are not where they should be. So, for example, the price discovery mechanism, which has historically defined our markets as the most robust and best in the world, has been under assault because so much activity is now trading away from those markets. We think that, frankly, why we supported Regulation NMS is because we thought it would facilitate more price discovery, that there would be more interest in institutions and other investors in posting their bids and offers. And we are concerned that that has not happened and that there is at this point really not a lot of incentive for activities to facilitate more posting of bids and offers. So we are concerned about price discovery.

If I may, the other thing that is concerning to us is just making sure that the markets are fair. Here is a low—you know, high-impact, sort of low-effort kind of thing that we can do. If there is unfair dissemination of data, let us make the dissemination of data fair. Right? I think everybody would agree that if there are smart people who can process that data at speeds that none of us can comprehend, that is fine. But in the first instance, let us make sure that everybody gets the data at the same time. That would seem to be a very good fundamental start.

Senator CRAPO. Thank you.

Dr. Angel?

Mr. ANGEL. The biggest problem is that our regulatory structure as a whole is too slow, too cumbersome, and just does not really understand what is going on in the markets quickly enough to craft appropriate solutions, that instead what we get are hyper-complex rules like NMS that just add to the complexity of the markets without solving the underlying problems.

Senator CRAPO. Thank you. I actually have questions on each of these issues, the complexity, the resiliency, the disclosure, and so forth. I am going to have time for one more question, and so I am actually going to pick resiliency. And so I will come back to you, Mr. Griffin, on that, and others can jump in on this if we have time, too. But this issue has been mentioned already. What further

changes do we, the SEC, industry stakeholders, or others need to undertake to strengthen market integrity and prevent future market disruptions like the Knight trading error or the Flash Crash? Do you want to start, Mr. Griffin?

Mr. GRIFFIN. I do. So if we look at both the Flash Crash and what took place at Knight, it concerned orders of undue size or quantity entering the market without appropriate checks and balances. The broker-dealers that route orders into America's exchanges need to have solid and robust fail-safes to prevent such orders from being routed into the marketplace.

But of equal importance, the exchanges should act as the last line of defense to prevent such orders from entering the marketplace and creating disruption. We need both the broker-dealer community and the exchange community to work hand in hand to prevent aberrant orders from having an undue and unfortunate, in fact, devastating impact on investor confidence.

Senator CRAPO. Thank you. I am out of time. I know, Dr. Angel, you wanted to give a quick response. Could I do that?

Mr. ANGEL. Yes. And, in addition, we know that sooner or later all systems break in some unanticipated way. So what we need is a market-wide holistic view of the entire national market system. Current rules and current thinking is to make sure every individual little widget keeps working. But what happens when they are all working individually but they do not as a system work properly? And so what we need is better thinking about what happens when the next tsunami of market information, you know, overwhelms the market and it starts behaving erratically?

That is where insufficient work has been done and a lot more needs to be done to, you know, prevent the next disruption from turning into a catastrophe.

Senator CRAPO. Thank you.

Chairman JOHNSON. Senator Warren.

Senator WARREN. Thank you, Mr. Chairman.

At a Subcommittee hearing a few weeks ago, I noted that high-frequency trading is not really trading in the traditional sense. While regular traders have days when they make money and days when they lose money, high-frequency traders almost never lose money. In its recent IPO filing, the high-frequency trading firm Virtue disclosed that in its 1,238 trading days, it had made money on 1,237 of those days. That means that in nearly 5 years of trading, the company had come out ahead on its trades every single day save one.

Now, that is not trading. High-frequency traders are not making money by taking on risk. They are making money by effectively charging a small fee to investors on millions of transactions. And in that circumstance, the question is whether they are providing a valuable service in return for that fee or they are just skimming money off the top of these trades.

So at a prior hearing, I asked Andrew Brooks, the head of equity trading for T. Rowe Price, and Jeffrey Solomon, CEO of the investment bank Cowen and Company, a simple question: Does high-frequency trading provide any valuable service in exchange for the money it sucked out of the markets? And they both said no. In particular, they disputed the often repeated claim that high-frequency

trading is valuable because it provides liquidity to the market. So I want to push on the liquidity question since they had rightly raised it.

Mr. Griffin, your company has run a fund for several years called the "Tactical Trading fund," and this fund relies primarily on high-frequency trading strategies, and it has been very profitable. Just for context, can you tell me what the average holding period for securities is in that fund?

Mr. GRIFFIN. So, Senator Warren, I am not sure of the source of the information that you have on our Tactical fund, but our Tactical fund's largest source of profitability, to the best of my recollection, over the last several years has been from fundamental equity long/short trading.

Senator WARREN. So you are saying you do not do high-frequency trading?

Mr. GRIFFIN. No, I am not. I am saying that within our Tactical fund—

Senator WARREN. Well, do you have a fund that does high-frequency trading?

Mr. GRIFFIN. The Tactical fund conducts high-frequency trading but conducts it along with a variety of other trading activities.

Senator WARREN. So you are saying it is just a mixed fund at this point, and it was never a high-frequency trading fund primarily or exclusively?

Mr. GRIFFIN. Starting from roughly January 1, 2009, it has been a mixed fund with equities being the single largest allocation of risk capital, equities trading through—

Senator WARREN. All right. So let me ask the question a different way, and I will just ask Mr. Cronin about this question. At an earlier hearing, Mr. Brooks, the head of trading at T. Rowe Price, said their average hold time was about 3 years. So my question is: What is the average hold time for a high-frequency trading fund? Mr. Cronin?

Mr. CRONIN. I do not have personal knowledge but I know it is one heck of a lot less than 3 years.

Senator WARREN. Under a month?

Mr. CRONIN. Under a month, probably under—

Senator WARREN. Under a day?

Mr. CRONIN. Under a minute.

Senator WARREN. Under a minute, OK.

Mr. CRONIN. Yes.

Senator WARREN. OK. So I want to ask the question then about liquidity. If you are buying a stock and turning it around and selling it within a minute, within a second later to someone else, how does that provide liquidity to the markets? Couldn't the original seller have just sold the stock to the ultimate buyer 1 minute later?

Mr. CRONIN. We are worried about excessive intermediation in the markets. We are also worried that we are probably all not in a great position to truly understand all of the HFT activities that take place. It might be easy for me to say that some of it is good and some of it is bad. I think we should not be in the business of conjecture. We should be in the business of data.

We recommend that there be a specific regulatory regime that is in charge of high-frequency trading so that we can all be better informed.

Senator WARREN. Well, Mr. Cronin, I appreciate that, and I appreciate that you want to see more regulation here, and that is something we certainly should talk about. But I at least want to ask the question how it is that—this is the principal claim for high-frequency trading, is that it provides liquidity in the marketplace. And all I am saying is it takes place in a very short space where someone jumps in ahead of a trade and buys and then turns around and sells. And I am trying to figure out how that adds more liquidity to a market if that seller would have found that buyer, only found them a nanosecond later or 2 seconds later.

Mr. CRONIN. Senator, that is why we make a distinction between trading volume, which is exactly what you describe, and real liquidity. Liquidity provision is a far, far different concept, and that is what we are trying to protect and promote. But some of these high-frequency trading strategies are inconsistent with that.

Senator WARREN. All right. I am out of time. Thank you, Mr. Chairman.

Chairman JOHNSON. Senator Shelby.

Senator SHELBY. Thank you, Mr. Chairman.

Mr. Sprecher, you mentioned that the market is too complex. Is that because of the electronic growth, the use of electronics as we have seen a technological change? I have seen it in my 28 years here on the Banking Committee, and you have seen it in the marketplace. Is it too complex because of that? Or is it too complex because of what?

Mr. SPRECHER. I think there are actually two reasons. One is that because the decision where your trade goes is made by a third party, it is legal, lawful, and accepted right now that that third party can route that trade to their own wholly owned trading venue where they can make additional profit, theoretically. So we have now seen every major broker-dealer either create their own dark pool or come up with some relationship with another market maker that would allow them to participate in trading. So that is number one. It is the person that makes the routing decision.

Second, Regulation NMS, which was intended to try to bring the markets together as a single whole, suggests that any new entrepreneur like me that starts a venue, everybody must connect to it. So it is a law that says if you open a store, everybody must walk through your store and at least check on shopping there. So it makes—it lowers the bar for entering the market, and as a consequence, we have a lot of trading venues.

Senator SHELBY. Dark pools, Mr. Griffin. Dark pools have grown, according to my information, from approximately 16 percent of all trades in 2008 to over 40 percent of all trades last month. Why have they grown so fast? And is it—it is obviously lucrative, but what is driving all this? Is it technology?

Mr. GRIFFIN. So, Senator, the exact statistics that you have are somewhat off. The numbers that you referred to are probably an approximation of the proportion of trading that takes place off exchanges, both at retail-oriented wholesale market makers, such as Citadel, and on dark pools. So retail orders in the United States

are handled differently than most other orders. A handful of market makers compete vigorously for this order flow and, based on their execution quality, are allocated more or less order flow by the various major retail brokerage houses.

American retail investors benefit from the trading acumen of the wholesale market-making community. Dark pools, which are generally run by the large broker-dealers, were created to facilitate block trading and to provide a low-cost means of trading in competition with the exchanges.

Now, over the years we have seen the rise of algorithmic trading. Large block trades occur less frequently. Large trades are broken into small trades of hundreds of shares—100 shares, 200 shares, 300 shares at a time—and these trades are still executed in dark pools.

I would concur with Mr. Sprecher that the dark pools do add a layer of complexity to the marketplace. They are not subject to the same anti-discrimination provisions of the exchanges. We should level the playing field between the exchanges and the dark pools, and the dark pools that compete on the merits should have vibrant businesses.

Senator SHELBY. I assume you are familiar with this, and if you are not, tell me. On June 25th, just a few weeks ago, the SEC announced a 1-year tick size pilot program in conjunction with FINRA which would allow some small capitalization companies to trade in 5-cent increments instead of the traditional 1-penny increments. Commissioner Piwowar of the SEC has been advocating for such an initiative, saying in January, and I will quote him:

As the one-size-fits-all approach to market structure is not currently working for small capitalization companies, I support such a pilot and would like to see it implemented.

What is the effect of this? Are you familiar with that, Mr. Griffin?

Mr. GRIFFIN. I am.

Senator SHELBY. Good.

Mr. GRIFFIN. My personal belief is that the larger tick size will actually erode liquidity. As the tick size increases, transaction costs go up, and investors shy away from trading equities with a high transaction cost.

But here is the good news. We will know the answer at some point in the next 1 to 2 years when the SEC completes the study, and I applaud the SEC's data-driven approach to analyzing what is taking place in our equity markets.

One thing to keep in mind is that smaller issues in the United States are suffering from the consequence of the rapid rise of concentration of holdings by large asset managers. The gentleman to my left, for example, speaks to how they manage—was is 700 and change billion?

Mr. CRONIN. \$790 billion

Mr. GRIFFIN. \$790 billion. It is difficult for an institution that manages \$790 billion to focus on investing its resources, its time and energy on the issuers that have a market capitalization of a few hundred million. So we need to think about how do we encourage the development of more mutual funds and more investment

vehicles that specialize in growth opportunity stocks and in the small-cap and mid-cap issuer space.

Senator SHELBY. I think both the gentlemen want to comment.

Mr. CRONIN. Yes, Senator Shelby, thank you. So I would just add, institutions like Invesco do want to have more ownership of small company stocks. What prevents us from doing that is that the way that they trade does not facilitate liquidity in a way that makes it allowable for us to invest in more. We have a number of funds that are focused on small-cap stocks, so we recommend—and we were very happy to see that there was a pilot program, because we actually think the opposite might happen. We do not worry about spread. The 5-cent spread is not what determines the value of implementing an idea in our portfolio. The very fact that you have more people willing to post bids and offers might well incur, frankly, from an institutional perspective, far less cost. So we are very encouraged that the pilot is taking place and very happy to see what the results are.

Senator SHELBY. Professor, have you got a comment, quickly?

Mr. ANGEL. Yes. I am strongly in favor of evidence-based regulation. We should have a culture of innovation and experimentation so that the SEC is regularly running pilots on a variety of things to see what happens. It is far better to have hard data to know what we are doing rather than to just say, well, I think it is a good idea.

Senator SHELBY. Thank you, Mr. Chairman.

Chairman JOHNSON. Senator Menendez.

Senator MENENDEZ. Thank you, Mr. Chairman. Thank you all for your testimony.

It seems to me that to make our equity markets the best place in the world to have investors invest in companies to raise capital, the SEC in trading venues has to balance some fundamental market structure tensions. Notably, investors receive better information about market prices when they have more transparency regarding pre-trade quotes and post-trade prices. But there may also be times when investors obtain better execution for their own trades by providing less transparency to the market.

For example, if an institutional investor wants to sell a large block of shares, it might be concerned about its sell orders driving down market prices before it has completed the sale of the entire block. So what I would like to hear from the panel is what do you think is the appropriate way to balance this tension between wanting to know about everyone else's trades, but sometimes not wanting anyone else to know about your own.

Mr. SPRECHER. Thank you. I talk to my staff a lot about the fact that everybody wants to know how much everybody else is paid—

[Laughter.]

Mr. SPRECHER.—but nobody wants to disclose what they make after they negotiate their raise.

I think you have hit on a very salient point. We have been advocating that in today's world where the smart order routers are breaking big trades up into little digestible bites, there is very little difference between you and I as a retail trader and Mr. Cronin as an institutional trader in terms of what the exchange and the matching engines see. We see little bits and bytes. But it is fair

that a large institution should have the opportunity to find another large institution and do a large-size trade without moving the market.

And so I think if we could develop a standard by which we had an agreed trade size that would be somehow excluded from being in the public markets, that would be a fair tradeoff. Right now there is no such differentiation, and so we see tiny little trades being traded off exchange.

Senator MENENDEZ. Anyone else? Does anyone else believe—do we have the right balance here?

Mr. ANGEL. This is a very difficult issue that people have been debating for years. What is the right amount of transparency? And this is why I think experimentation is the answer, because we all have ideas on how it should work and how we think it should work, but, you know, the proof is in the pudding. So, you know, I think that we should experiment with different transparency regimes to see what happens.

Senator MENENDEZ. Mr. Cronin.

Mr. CRONIN. Senator, as a large institutional investor, I can tell you that our responsibility is to make sure that our clients' best interests are protected. To facilitate that, we need different kinds of execution venues that allow us to trade large blocks. As you might guess, when you have 500 shares to buy, it is a fair different way you approach the order than when you have 5 million shares to buy. So we have to balance trying to make sure that the price discovery process is as robust as it can be. And, by the way, we are more than happy to trade in the public markets, but we have to balance all the different complications that the market structure brings to us.

For example, there are a number of participants in the marketplace who would love to get wind of that 5-million-share orders you might guess and try to take advantage of that. We are trying to protect and preserve as much value of our transactions into our clients' hands as possible. So we need tools like dark pools. Dark pools have lost their way to be clear, when the average trade size is 200 shares when it was proposed to be a block trading system, something is broken. Our belief system around what is broken is that brokers have a conflict of interest in how they route our orders. They break them up into tiny pieces, as Mr. Sprecher describes, but they also send them to destinations which actually are serving to maximize their own economic best interests but may not be serving our best execution interest.

So we would encourage more disclosure around that practice. We have advocated for getting rid of these incentives like maker-taker which promote activities which may be incongruent with our shareholders, and other things that will promote fairness and integrity.

The last point is that we need to make sure that there are incentives for people like us to post our bids and offers in the markets. That robust price discovery mechanism must be protected.

Senator MENENDEZ. Let me ask you all, is competition between trading venues currently producing the right balance for investors? And if not, what do you think should change?

Mr. SPRECHER. I think it has gone too far, honestly. I think data that we have seen showed that years ago there was a low point in

terms of execution costs, but more recently the true cost of execution has been increasing as the markets have fragmented and people are no longer able to find the best price for their shares.

Senator MENENDEZ. Anyone else?

Mr. GRIFFIN. I think to add to that answer, though, we have seen a disruptive innovation in the form of Regulation NMS. The arc of disruptive innovation is generally the rapid entry of many new competitors. We have seen many new exchanges form since the introduction of Regulation NMS. We have seen many new market-making firms come into being since the introduction of Regulation NMS. And what are we seeing today? We are seeing rationalization. We have seen an exchange just recently cease to function. They shut down their business.

We have seen countless high-frequency trading firms shut their doors because of their inability to generate profits. We are seeing the arc of disruptive innovation play out, and we will see a logical rationalization of our markets take place on the back of this. It takes time. It is hard to imagine how much the equity markets have changed in just 7 years, in the blink of an eye. And so I think that many of the issues that we are concerned about will be addressed as competition plays out in a fair and orderly way over the years to come.

Senator MENENDEZ. Thank you, Mr. Chairman.

Chairman JOHNSON. Senator JOHANNES.

Senator JOHANNES. Thank you, Mr. Chairman, and thank you to all the witnesses.

Let me, if I might, just follow up with a question or two on the high-frequency trading issue. Let us say that this Committee finds that high-frequency trading is not doing much, if anything, for liquidity. Maybe we find that we cannot figure out where it is benefiting the market. Would anybody on the panel recommend that we ban it, just say you cannot do it anymore? Just a simple, straightforward yes or no.

Mr. GRIFFIN. No, absolutely not. And can I add just a few sentences?

Senator JOHANNES. Sure.

Mr. GRIFFIN. All right. What has been lost in the dialogue around high-frequency trading today is the important role that it places—that it facilitates fairness between the prices of securities in the marketplace. When you buy or sell an S&P 500 futures contract, you are buying and selling 500 underlying stocks in one fell swoop. And somebody needs to keep the market in Chicago in line with the markets in New York, and that is done by high-frequency trading firms, who literally buy and sell 500 stocks when the futures move in price.

When you trade XLF or spy or the diamonds or any number of ETFs, you do not ask yourself what is the underlying net asset value of that ETF. You know the price that you are going to trade-off at is fair because the high-frequency trading firms continuously arbitrage between the ETFs, which are a very important retail trading vehicle and the underlying common stocks. This all happens, in fact, at an incredibly low cost in the context of our capital markets.

Senator JOHANNES. Mr. Cronin, would you suggest we ban it?

Mr. CRONIN. I would not suggest that we ban it because I think it is too prescriptive that high-frequency is all one kind of behavior. I think as Mr. Griffin describes, there are kinds of trading activities that are pursued by firms that would be defined as high frequency which are very helpful to efficiencies in markets. There are others which probably are harmful. We need to be in the business of being able to understand which is which.

Senator JOHANNIS. Professor?

Mr. ANGEL. I would not ban high-speed trading. There has always been a race for speed, and even if you put in speed bumps, people will race to be as fast as they can to jump around those bumps. Some of the high-speed traders, as was pointed out, do good things. I am a retail investor. When I buy an exchange-traded fund, I trust that the price of that fund will match the stocks that it represents. Those arbitrageurs, those high-frequency traders doing that in and out, buy and sell, are making sure that those prices are aligned.

Senator JOHANNIS. So the panel is unanimous on that.

That kind of takes me to my next point. Pre-2005, if you were an exchange, man, thing were pretty darn good, right? I mean, virtually everything is moving through the exchanges and life is good and you are happy and why be more innovative. You have got all the business, right?

Isn't part of what we are seeing here the fact that people are looking for a better way, a faster way? Mr. Cronin, on behalf of your clients, you want these options. You want dark pools. You want a whole host of opportunities to maximize the return on your clients' investment and, to be very honest about it, maximize your income. And somebody made a point here that I think is a very valid point, and that point is this: We work in a very cumbersome way here. Even if we were firing on all eight cylinders, which I would argue we are not these days, we are cumbersome. We were meant to be cumbersome. Our Founders wanted us to be cumbersome.

Isn't this whole debate and trying to figure out what best to do best left with the regulators? And focus on that question. Wouldn't we be better to make sure that they are properly empowered, which I would argue they are, and then do evidence-based regulation to try to figure out what is the best approach? Professor, I will start with you and go across the table.

Mr. ANGEL. I agree 100 percent that, you know, if the regulators are capable, we should trust them. And, indeed, they do have adequate authority to do what they need to do. But do they have the adequate resources, you know, not just the monetary resources but the human capital resources? I think you need to monitor them closely to make sure that they have the ability to do their job well.

Senator JOHANNIS. I am out of time. If I could just ask each of you to give me one or two sentences, and if you want me to know more about this, call me, OK?

Mr. CRONIN. Yes, I think there is a balance to be struck between the regulators and market participants. I think that is how we manage the good things that regulation can bring, but at the same time manage the unintended consequences which we all fear.

Mr. GRIFFIN. I concur with your sentiments.

Senator JOHANNNS. OK. Thank you.

Mr. SPRECHER. I think the market participants themselves have an obligation to take on some this. That is why we have been very open about wanting to make changes.

Senator JOHANNNS. And others are doing the same, such as TD Ameritrade has indicated they—

Mr. SPRECHER. Well, there is actually pretty much unanimity on this panel with a number of things that we all agree should be done.

Senator JOHANNNS. Thank you.

Chairman JOHNSON. Senator Brown.

Senator BROWN. Thank you, Mr. Chairman. There are a number of people—and I assume the four of you are among them—who object to the characterization of our financial markets as being “rigged” against ordinary investors. But the concerns raised about equity markets coincide with accusations of manipulation in LIBOR and the foreign exchange setting. My Subcommittee has done hearings on aluminum and zinc and gold and silver and oil and electricity markets, what has played there. Professor Angel notes in his written testimony that the lack of financial crisis-related prosecutions has also undermined investor confidence, and I would hope—and I am not asking for a response on this part, but I would hope that you would at least understand, regardless of agreement or disagreement, that consumers and investors and users feel that certain well-connected institutions enjoy special privileges in the financial markets. Again, whether you agree or disagree with that, I hope you at least understand that large numbers of people in all those groups feel that way.

Mr. Sprecher, my question or first set of questions is directed at you. You have been outspoken about high-frequency trading. We appreciate your sharing constructive solutions as you have. But since at least 2012, former high-frequency traders have been expressing concerns about exotic order types that technically comply with SEC regs but which allow high-frequency traders to jump the queue and exploit price advantages that come from latencies. The New York Stock Exchange has actively sought to address the issue by announcing in May it was eliminating 15 order types, if that number is correct; however, ICE estimates there could be as many as 100 different order types. I have heard concerns that the stock exchange continues to allow high-frequency traders to use some predatory order types, like Post No Preference Blind, in which high-frequency traders’ bids remain blocked from the market and then, as I said, jump to the head of the queue.

Mr. Sprecher, when is the stock exchange going to terminate hidden order types like Post No Preferences Blind? The critics have been saying for more than 2 years that it helps high-frequency traders. What are you going to do?

Mr. SPRECHER. Well, we have owned the stock exchange for 7 months. I have been the Chairman for maybe 3 months, and as you say, I am uncomfortable with having all these order types. I do not understand why we have them, and I have started unilaterally eliminating them.

The problem that we have is that orders today are—decisions on where orders go are not made by humans. They are made by com-

puters that are so-called smart order routers. And many of these order types exist to attract the orders, and I am trying to balance cleaning up my own house—I live in a glass house, and I am trying to clean it up before I criticize others. At the same time, I cannot make the New York Stock Exchange go to zero. It would be bad for this country for the New York Stock Exchange to no longer have trading activity.

So it is why I have been outspoken. I hope that other exchange leaders will follow my lead. I would like to get us all working together to eliminate these types. I would be happy if we can do it as a private sector initiative. I would be happy if the SEC ordered us to get rid of them. I would be happy if Congress took action. Any way we can reduce them, I would be happy.

Senator BROWN. So if you came back here 6 months from now, ICE would have owned the New York Stock Exchange for a little over a year then. You would have been its CEO for 9 months by then. What number would—where will we see progress? How do we quantify that and measure that?

Mr. SPRECHER. Well, let me say this: I very much appreciate the IEX exchange, which is the exchange that is the subject of the “Flash Boys” book. They have four order types. I would love to get the four order types. They also have less than 1 percent market share. It shows me how four order types are dealt with in the market. I cannot take the New York Stock Exchange to 1 percent, but I appreciate your allowing me to talk about this publicly to you all and to the camera and a microphone, because I think that I need to put pressure on all my colleagues to follow my lead.

Senator BROWN. Mr. Cronin, in my last couple of minutes, let me ask you a question. One broker-dealer testified before Senator Levin’s Subcommittee that virtually all the trades eligible for rebates in the first quarter of this year, numbering in the millions, as you know, were executed through the trading venues that offered the highest rebates. You said in your testimony:

Investors are given only limited insight in how and where broker-dealers route their orders. As a consequence, it is very difficult for investors to make informed decisions about the quality of executions they have received.

You have a duty, as you know, to act in the best interests of your clients to protect the retirement savings of millions of working Americans. How can you be sure you are meeting this obligation without that information?

Mr. CRONIN. Yes, sir. So we spend a lot of time and energy, as you might guess, trying to make those determinations. Transaction cost analysis, which is what we perform to understand how our trades have been handled, is not perfect, right? And it has evolved pretty dramatically over the years, and I think we have a very good sense of where we are with respect to the quality of executions we receive. But we could do better. We could get more information that would be helpful to us.

For example, most of the transaction cost analysis information we get is just about the trades that we have received. Well, if you thought about it, our trades go to a number of destinations before they actually receive an execution. We have been trying to get the brokers to give us more information about where exactly the trades went that they did not get executed, because, quite frankly, you

might find that you are giving up a lot of information to all these different destinations that orders get routed to that actually give you no benefit whatsoever.

So we have been very vocal about the issue of the conflicts of interest that drive where brokers route orders. We think removing this conflict of interest is critical. But in the first instance, making sure that we have the right amount of information to make determinations is also a very, very important concept for us.

Senator BROWN. Thank you.

Thank you, Mr. Chairman.

Chairman JOHNSON. Senator Kirk.

Senator KIRK. Thank you, Mr. Chairman.

I would like to ask Mr. Griffin a question. This is a copy of "Flash Boys." When Michael Lewis wrote this, you being a leader in high-frequency trading, describe your conversation with Lewis when he wrote this book.

Mr. GRIFFIN. I have never spoken to Michael Lewis about this book.

Senator KIRK. So he never called you?

Mr. GRIFFIN. He did not.

Senator KIRK. All right. Thank you.

Thank you, Mr. Chairman.

Senator REED. [Presiding.] Thank you, Senator Kirk.

I was not here for the first panel because of a classified hearing with respect to the situation in Iraq and Afghanistan, and I respect the panel and thank them for their testimony. But if you are ready to move forward to the second panel—or is there anyone else seeking to be recognized?

[No response.]

Senator REED. In that case, gentlemen, thank you so much for your participation, and I am sure we will be back again and engage again on this issue.

At this point I would like to ask the second panel to come forward and take their seats, please. Thank you.

[Pause.]

Senator REED. Let me at this time introduce the second panel.

Our first witness is Mr. Thomas Wittman. He is the Executive Vice President and Global Head of Equities at NASDAQ OMX Group. Thank you, Mr. Wittman.

Next we will have Mr. Ratterman. Mr. Ratterman is the Chief Executive Officer at BATS Global Markets. Thank you.

And, finally, Mr. David Lauer is the President and Managing Partner at KOR Group.

Gentlemen, thank you all very much, and, Mr. Wittman, you can begin your testimony, please.

**STATEMENT OF TOM WITTMAN, EXECUTIVE VICE PRESIDENT
AND GLOBAL HEAD OF EQUITIES, NASDAQ OMX GROUP, INC.**

Mr. WITTMAN. Thank you, Senator Reed and Ranking Member Crapo, for the opportunity to testify today.

As my testimony points out, the efforts of SEC Chair Mary Jo White are to be commended, and we agree with many of her recent actions. You have my full testimony, but I wanted to quickly summarize my key points, and there are four.

Number one, the lit exchanges play a critical and indispensable role in the U.S. economy. Public companies and investors both need price discovery to feel that the market is working for them. Exchange listed public companies use stock issuances to expand their businesses and create jobs.

Number two, market structure needs to be re-examined with a goal to improve transparency and reduce fragmentation. It is clear from the debate that investors and listed companies view the current market structure as an impediment.

Number three, we must act deliberately to encourage transparency and price discovery so the best markets in the world can continue to be the engine for economic growth and job creation. The stakes are high.

Number four, all venues that trade stocks need to be brought into a system of well-conceived regulation and oversight. One idea that we are considering, which was not included in my written testimony, is whether there are ways to capture unique trading experience and needs of participants in dark venues. We want to look at the feasibility of translating those experiences and benefits into a more transparent and regulated NASDAQ venue.

We intend to proceed with this and other innovations because at NASDAQ we are committed to making the markets work better. NASDAQ is passionate about the role we play in capital formation and improving the performance of our marketplace. The SRO model and the U.S. market structure have been effective in protecting investors, but as technology and trading have evolved, so too must the regulatory environment in which markets operate.

We look forward to working with this Committee. Thank you for your invitation to testify. I look forward to your questions.

Senator REED. Thank you very much.

Mr. Ratterman, please.

**STATEMENT OF JOE RATTERMAN, CHIEF EXECUTIVE
OFFICER, BATS GLOBAL MARKETS, INC.**

Mr. RATTERMAN. Thank you and good morning. My name is Joe Ratterman, Chief Executive Officer of BATS Global Markets and one of the original founding employees. I would like to thank Chairman Johnson, Ranking Member Crapo, Senator Reed, and the entire Senate Banking Committee for inviting me to participate in today's hearing.

Let me say at the outset that I was encouraged by SEC Chair White's recent comments that our markets are "not broken, let alone rigged." I strongly agree with the Chair and appreciate her leadership in this area. The automation of the U.S. equity markets has resulted in significant enhancements in market quality for long-term investors. However, I also recognize that our markets are not perfect and that our efforts to improve them should never cease.

Our current market structure is largely the product of Congress' 1975 amendments to the Exchange Act and subsequent rulemaking by the SEC to implement a national market system as well as advancements in technology that have made our equity markets capable of processing order messages in timeframes unthinkable even a decade ago. The increases in speed and improvements in latency

found in today's markets have served to mitigate risk which benefits all investors in the form of lower risk premium, expressed as tighter spreads and lower transaction costs.

Today our equity markets are widely considered the most liquid, transparent, efficient, and competitive in the world. Costs for long-term investors in the U.S. equities are among the lowest globally and declining. The gains are quantifiable and have been noted by investors and experts alike.

In April 2010, Vanguard confirmed estimates of declining trading costs over the previous 10 to 15 years, ranging from a reduction of 35 percent to more than 60 percent, savings which flow directly to investors in the form of higher returns.

Three respected economists recently found that, between 2001 and 2013, the spread paid by investors had decreased by more than 70 percent for NYSE-listed stocks. In April 2014, Blackrock noted since 1998, institutional trading costs have declined and are among the lowest in the world. And just last month, ITG reported that between 2009 and 2013, implementation shortfall costs decreased from roughly 45 basis points to 40 basis points, following a drop from 63 basis points in 2003.

Moreover, the efficient operation of our market structure throughout the stress of the 2007–09 financial crisis indicates the systemic risks that have been reduced as a result of advancements in technology.

Efforts to address infrastructure risk since the Flash Crash of 2010 are producing further beneficial results. For example, the number of erroneous executions occurring on our markets is on pace this year to be nearly 85 percent lower than the previous 5-year average, results related to the recently enacted limit up/limit down rule. In addition, exchange system issues as measured by self-help declarations have dropped by more than 80 percent since the first years after Regulation NMS.

We must, nonetheless, remain squarely focused on improving market quality and stability in a coherent and responsible way. We are also keenly aware that investor confidence is important not only to helping Americans realize their investment and retirement goals, but it plays directly into the overall health of our country's economy. Simply put, when investors are confident enough to put their hard-earned capital to work in our stock market, entrepreneurs and corporations can grow and thrive as well. As such, we are fully supportive of the SEC's plan for a comprehensive market structure review, and we look forward to actively participating in that process.

Among other things, I see the following four areas as offering potential benefits without disrupting existing market quality gains.

First, institutional investors could benefit from incremental transparency related to the ATSS that their brokers route orders to, including the publication of Form ATS, which some of the ATSS have already voluntarily disclosed. Consistent and thorough reporting standards will create the greatest level of investor confidence, so additional regulatory direction may be required here.

Second, I support reviewing current SEC rules designed to provide execution quality and routing transparency. For example, Rule 606 could be amended to require disclosure about the routing of in-

stitutional orders as well as separate disclosures regarding the routing of marketable versus non-marketable orders and specific broker execution quality data.

Third, I continue to support initiatives to make the SIPs, also known as the “consolidated tape,” as fast as possible to address any perceptions of unfairness that can affect investor confidence. BATS has advocated this position since becoming an exchange in 2008.

And, finally, I support eliminating the ban on locked markets, which is a primary driver of excessive complexity in our national market system.

Thank you for the opportunity to appear before you today. I applaud the Banking Committee’s oversight efforts and would be happy to answer any questions.

Senator REED. Thank you very much.

Mr. Lauer, please.

STATEMENT OF DAVID LAUER, PRESIDENT AND MANAGING PARTNER, KOR GROUP LLC

Mr. LAUER. Good morning, Senator Reed, Ranking Member Crapo, and Members of the Committee. Thank you for inviting KOR Group here to testify today.

KOR Group is a market structure research and consulting firm focused on data-driven analysis. Healthy Markets is our nonprofit initiative that seeks to build consensus on a coalition of firms in the industry on substantive market structure reforms.

My name is David Lauer, and I am the president and managing partner of KOR Group. My background is in technology architecture and high-performance computing. I have designed and operated high-frequency, low-latency trading platforms. I have filed detailed written testimony and will only touch upon the key points here.

In our industry, we are used to hearing that “past performance is not indicative of future returns.” The same could be said about past technology failures. As much as we like to think we’re learning from our mistakes, past technology failures tell us very little about the next crisis on the horizon. To think otherwise is called the “fallacy of the broken part.”

I will begin by stating the obvious: Complex systems fail. They must be designed to degrade gracefully, not to crash. Technology should be invisible. Today’s markets are characterized by interconnectedness and speed. Regulations since 1975 have not only created complexity in technology, connectivity, and order routing, but have also created intractable conflicts of interest. It should be no wonder that we are confront concerns about market integrity in such a conflicted environment. It is only by peeling back some regulations and refining others that we can hope to simplify market structure, increase market efficiency, and prevent catastrophic technology failures.

Complexity is not necessarily bad, but unnecessary complexity certainly is. Today SROs still follow rules under the Exchange Act of 1934. It should come as little surprise that these rules are antiquated, a product of a time when electricity had reached just 70 percent of households, not an era in which a gigabyte of data can be transmitted around the world in seconds.

SROs are now for-profit organizations, owned either by public shareholders or broker-dealers, and in so many instances they act in their shareholders' interests and not for fair and efficient markets. Consider, as I do in my written testimony, the following actions which SROs have either neglected to take or have only taken as a consequence of regulatory intervention or catastrophic failure.

Firstly, why aren't exchange server clocks synchronized to each other? How can regulators understand or surveil markets with this? And why is regulation needed to make this happen?

Why wasn't the SIP infrastructure improved the same way as direct feed technologies? This need was identified by the SEC as early as 2001.

Why haven't order types been re-examined industrywide through a retrospective review? Why isn't detailed, objective market data available to academics? And why haven't SROs mandated industrywide disaster testing?

In each case, the need is obvious and the failure to act absurd. We also have antiquated best execution standards that allow brokers to operate their own dark pools while routing 90 percent of their customers' orders through them. The consequent level of fragmentation and off-exchange trading should not be surprising.

Fragmentation, conflicts of interest, payment for order flow, internalization, and maker-taker have collectively increased off-exchange trading and adverse selection on lit markets, making lit markets more fragile and less stable. This condition can be remedied by strengthening best-X, re-examining maker-taker, and considering a trade-at rule.

On a more systemic level, one of the greatest risks to market integrity is from regulators who lack the data and tools to understand or keep up with the rapid pace of technology change in markets. At the heart of this struggle is a shortage of appropriate technology resourcing and a failure to embrace the language and ideas of complexity and systems theory. This in turn contributes to the public perception that our industry is operating with reckless abandon and little policing. Regulators need to embrace technology-centric regulation and systems theory and to revamp the SRO structure to make it more efficient, less conflicted, and more data driven.

I have also been invited to follow up on the recommendations from my 2012 Senate testimony. At the time I advocated for market-wide surveillance and broad access to data to be driven by regulators. Unfortunately, MIDAS misses more than half of the activity in markets and lacks participant IDs. No centralized data store has been made available to academics, and the consolidated audit trail remains on the distant horizon.

If the SEC had built the system I advocated for in 2012, it could have been operational for a year by now and would have given regulators an ability to surveil and study markets that is years ahead of their current approach.

There is no issue that is more critical to ensuring market integrity than proper access to data for study and surveillance, and there is no reason this cannot be done quickly.

My testimony also called for a mandate requiring SROs to demonstrate the utility of order types or retire them. While the NYSE

recently acted, the SEC only announced a nascent effort on this issue last week.

I would like to thank the Committee for inviting me to testify and hold this hearing, and I applaud the SEC for initiating a comprehensive review of market structure and for the scope and ambition of Chair White's speeches last month. I urge regulators to undertake a review that addresses not just the rules that govern trading but also the staffing requirements and mind-set necessary to do so properly. And I urge Congress to fund regulators appropriately to ensure they can succeed.

Thank you. I am happy to answer questions.

Senator REED. Well, thank you very much, Mr. Lauer, and let me begin with you. I recall that hearing—Senator Crapo and I presided over it—and we asked you specifically to go back and review. And what you said then is even more relevant today with subsequent events that have taken place.

Looking at your testimony, one point among many leaped out: "It should be concerning to anyone reading this that there is no algorithmic, cross asset-class surveillance being performed right now. This leaves little doubt that there is market manipulation taking place. Bad actors know that nobody is watching. There is no issue that is more critical to ensuring market integrity than proper access to data for study and surveillance, and no issue that is more readily and easily solved. It is time to stop making excuses."

Would you like to elaborate on that?

Mr. LAUER. So last month I was invited to testify before the CFTC Technology Advisory Committee by Commissioner O'Malia on how to do surveillance in the 21st century, and I included my testimony there in my submission for the Committee here. In it, I have outlined a system that can be built relatively quickly. Certainly in the private sector, it is something that most firms have a form of. And it can combine futures data, options and equities data into a cloud-based platform in which you could have algorithmic analytics running.

I am very concerned—and I have yet to talk to somebody in the industry who does not concur—that there is, of course, something going on in cross asset class trading because nobody is watching, and why anybody would expect otherwise, you know, I cannot understand. I think that when you look at the primary issue there, I believe it is regulatory agencies working together, and I think that that is the main concern. So the SEC and CFTC should be collaborating on a surveillance platform. There is no participant in the markets, especially in HFT, who sees things in only an equity silo. You are looking at equities in futures and options and all sorts of other data. The regulators should be, too.

Senator REED. Thank you very much.

Let me ask both Mr. Wittman and Mr. Ratterman a question. You both in your positions have the very difficult challenge of balancing technology, which you all indicated provides significant advantages in terms of prices and liquidity, with the possibility of error. And as Mr. Lauer said, complicated things break, and so we have to assume that.

Given Chair White's speech, what other message might you sort of identify and emphasize with respect to the structural integrity

of your markets? And let me start with Mr. Wittman, then ask Mr. Ratterman to comment.

Mr. WITTMAN. Thank you, Senator. My background is technology. I spent my first 10 or 12 years writing software in our equity environment under the Philadelphia Stock Exchange, so I understand technology and the process.

As the previous panel explained, you know, with fragmentation, I think with technology you can do just about anything. But with the more fragmented markets as they are getting now, it has become more of a challenge. I think with Regulation SCI that the SEC has talked about, I think that is a good step forward for exchanges, and, quite frankly, any platform that executes an order should come under those same Regulation SCI restrictions when those are implemented. I think that is a great first step.

Senator REED. Thank you.

Mr. Ratterman, please.

Mr. RATTERMAN. So as an exchange operator, we do take technology very seriously. We try to do everything we can within our own systems to provide redundancy at each step of the way, whether it be an order handler, a matching engine, the routing infrastructure, even within data centers having technology in two different places, and all that goes a long way to making sure that within our market center we stay stable. But that is not good enough, and I think that what we have today in today's equity market structure is a competitive landscape where, when my systems might fail, then NASDAQ's systems would pick up. And that is something that was instituted with Regulation NMS that has worked extremely well.

In my testimony I talked about the number of times that an exchange declares self-help on another exchange having gone down. So it has worked over the years to allow the market to route their orders around the failing node in this connected network, and the number of instances of those failures has come down and is continuing to come down.

So I support the current competitive landscape because no matter how much we think about redundancy and build disparate data centers across the country, if something in our technology fails in real time, NASDAQ or NYSE can pick up the load, and customers rarely really notice the impact of that.

Senator REED. Thank you, Mr. Ratterman. My time has just about expired. I will entertain a second round. Let me now recognize Senator Crapo. Senator?

Senator CRAPO. Thank you, Senator Reed.

Mr. Wittman, according to reports, the JOBS Act has been very helpful in aiding companies enter our capital and equity markets. But there is still a lot of concern that smaller companies are unable to tap into our equity markets.

Given your role as a listing exchange, could you give us some of your thoughts on what can be done to help smaller companies IPO? And what can be done to help small-cap companies succeed in today's secondary markets?

Mr. WITTMAN. Sure. There are probably two parts to the answer to that, and one is the recent move by the SEC with the tick size pilot to try to liquefy those less liquid small-cap names. So we look

forward to that program and measuring the effectiveness of that program to see how that works.

Also, NASDAQ has initiated an alternative way to bring companies to the listed market through our private markets program. So with those two efforts, I think that we will watch the growth of those newly small-cap companies come to market.

Senator CRAPO. Thank you very much.

This second question is addressed to all three Members of the panel. I would like you, if you would, please, to discuss with me what the proper role, if any, there is for dark pools in today's markets, especially for institutional investors. Is there a role for dark pools? Or should we look at eliminating them?

Mr. LAUER. I would say that the proper role for dark pools is probably how they were originally envisioned, which is as crossing networks for block trades, a way for institutional investors to put interest out there without tipping their hand to the market, not as a place that is extremely fragmented with order sizes that are the same as or smaller than the lit markets.

Senator CRAPO. Mr. Ratterman.

Mr. RATTERMAN. I believe that there is a definition place in our market infrastructure for dark pools. As Mr. Cronin commented on the previous panel, as a representative of the institutional investors, you cannot do large size in a displayed market at all times, and we would like to encourage more trading on exchange. But the fact is that a large order will impact the price adversely, and so having choices to place your orders in pools that do not display bids and offers and move the price before you are able to get your trade done is an important facility in today's marketplace.

I believe that transparency, as referenced on the first panel, is something that could go a long way to helping improve the cohesiveness between displayed and non-displayed markets that transparency around the rules within the engine, transparency around the pricing, and fairness amongst participants, and those dark pools would go a long way to taking away some of the mystique about a dark pool. But the fact is that dark pools are a necessary, important part of the institutional trading tool set.

Senator CRAPO. Thank you.

Mr. Wittman?

Mr. WITTMAN. Yes, so in short, you know, we agree with the use of dark pools for institutional block size trading. But over the years, we have seen those facilities being used for more than just the facilitating of large block trading. The average trade size is now down in the 200 shares range.

So, you know, we believe there should be more transparency there. We think that the addition of all these dark pools helps fragment liquidity, which in the end hurts our listed companies and listed companies on exchanges. So block size is fine, but the proliferation of the use beyond that is beginning to be worrisome.

Senator CRAPO. So am I hearing that it would be appropriate or encouraged to prohibit smaller than the large block size transaction? And is part of the answer as simple as figuring out what that size is and prohibiting dark pools from engaging in that sector of business?

Mr. RATTERMAN. I will go first and say that I am not sure that I would support that. I think large institutions have a long history now of breaking their orders up into small sizes, and so even though the average execution size in a dark pool is a small number of shares typically, some number of those executions are a result of larger sizes that have been broken up and sent to the dark pools, the same way they would have been sent to the exchanges. And so careful regulation here to make sure that we do not inadvertently take away tools from the institution given that so much of their infrastructure has probably already been designed to break up their large orders given the way the markets work.

Mr. LAUER. I think that prohibition in this type of top-down regulation can be dangerous. We can see unintended consequences from it. One thing that we are pushing with the Healthy Markets platform is for a trade-at rule and for pilot tests around the trade-at rule. I agree with Mr. Cronin from the earlier panel that a comprehensive trade-at pilot would help us to see what the effects would be from imposing a burden to execute off-exchange for small orders. And what it says is if you are going to damage the price discovery process on the lit markets by displaying your interest off-exchange and executing off-exchange, there has to be significant price improvement, with an exclusion for block trades. And I think that when you see the change in behavior that that will encourage and the change in the dynamics of the types of orders that reach lit markets, it would be healthier for both the dark venues trying to facilitate block trades and the lit markets trying to improve liquidity.

Senator CRAPO. Thank you.

Senator REED. Thank you, Senator Crapo.

Senator Warren, please.

Senator WARREN. Thank you, Mr. Chairman.

So we have been talking about investor confidence, the importance of investor confidence. But there is obviously a real problem here.

According to a survey conducted last December by the University of Chicago's Booth School of Business and Northwestern University's Kellogg School of Management, only about 15 percent of Americans trust the stock market. That is one in seven. And just to give some comparison, about 35 percent of the public said they trusted banks and about 17 percent said they trusted large corporations. Fifteen percent is not a good number. And this matters because people are not going to invest in the stock market if they do not trust it. And, in fact, that is exactly what the data seem to show.

Historically, when stocks are going up, net flows into the stock market are going up. People want to get into the market when they see that it is rising. When interest rates are low, that effect should be even stronger. But that is not what happened in 2012 and part of 2013. Interest rates were low. The market was shooting up. And net flows were actually down. And according to survey data from Gallup, the percentage of the public with money invested in the stock market is steadily declining over time.

So trust in the stock market is not the only thing that explains this trend. There are certainly other things going on. But it is also

certainly a contributing factor. Lack of trust in the stock market means less capital for growing companies, slower growth in the economy, slower job growth, and it means that fewer Americans have an opportunity to share in the wealth that is created by a rising stock market, and that further increases the disconnect between Wall Street and everybody else.

Now, we have talked some about it. Michael Lewis made headlines when he said that the stock market was rigged. And there was a lot of debate over whether he was technically correct. But when a company can claim to be trading on stocks and come out ahead 1,237 days out of 1,238 days, you can see why some people think the game is rigged for the big buys to make money and everybody else to lose.

So I would like to get your views on this. Mr. Wittman, let us start with you. What steps do you think are needed to improve public trust in the stock market?

Mr. WITTMAN. Well, I think hearings like these where people can listen in and hear the comments from the experts I think is helpful. I think, you know, with some of the failures that have been alluded to and have been talked about on the panel, the previous panel, I think are some of the issues that investors worry and care about. But I believe the exchanges are working toward improving those situations, as Joe alluded to in his remarks about self-help and stability and resilience.

Senator WARREN. Mr. Wittman, I presume, though, that you have been doing this over some period of time, and what we see is confidence in the market seems to be going down, and people's willingness to invest their money in the market seems to be going down.

Mr. WITTMAN. I am not 100 percent sure that the confidence in the market and the decline in investments are tied completely together, though, myself. So I am not sure if that is a true correlation.

Senator WARREN. All right, although people are certainly reporting that they do not have confidence in the market and that they are over time investing less and less money. And that is certainly what the flows seem to show. So I do not know what evidence you have to the contrary, but it seems to me something needs to be done here.

Maybe you have an idea, Mr. Ratterman. What are your views on how we can increase investor confidence?

Mr. RATTERMAN. Two primary points. One is, luckily, the one that is underway right now, and that is, SEC Chair White's plan for a holistic review of the equity markets. By my understanding, that is completely comprehensive and covers every tenet of market structure that we have today. And while it may take some time to go through methodically, and as we have talked about before, you know, a data-driven approach, what I see is the ability for the regulator, along with industry, to touch every single point of our market structure and determine whether it could be improved or maybe it is fine the way it is. But one way or another, at the end of this holistic review, it will have touched every single element of our market structure from a fresh pair of eyes. So I am encouraged that we have not done that in many, many years, and that will be

a nice point in time to mark that we have looked and we have assessed. And communication about that process I think can go a long way.

And then, too, as a subset of, you know, that holistic review and some of our recommendations is just more transparency—transparency around how dark pools operate, transparency around how order execution quality is being achieved by different brokers. I think the increased transparency around these elements will go a long way as well.

Senator WARREN. Mr. Chairman, I am over time, but would it be all right if, instead of a second round, I just asked Mr. Lauer to go ahead.

Mr. LAUER. Thank you, Senator Warren. So I think that I agree that more openness and more transparency is the first step and the most obvious step, and we have proposed many different enhancements to current disclosures and refinements of current disclosures. Rule 605 and 606 were developed in 2000 and 2001, and they no longer pertain to the current market. So we need to see more transparency.

I think we need to see more data-driven analysis. We keep talking about data-driven analysis, but the facilities, the tools to facilitate that data-driven analysis have not kept up with the times. Regulators are still using data sets that just do not pertain to current markets, do not have the right kind of time stamps and clock resolution. And these things might sound too mechanical and wonky for the average person, but they hear lots of things. They hear about feeds that are gamed because of latencies, and they hear about high-frequency trading, trading on these time scales, and there seems to be little public indication that regulators are able to keep up with that and are able to study markets.

So if regulators could take a different approach, an open approach where they facilitate access to people in the industry and academics to study that data and come out with reports that can conclusively demonstrate the health of the markets, I think that would go a long way. On top of that, the markets need to get out of the news. I said in my opening statement that technology should be invisible. If regulators and SROs can embrace the complexity theory and understand that technology is going to fail and design around that, have the systems degrade gracefully, they could stay out of the news. And I think that would go a long way toward improving confidence.

Senator WARREN. Well, I want to thank you all. I do not think we can overstate the importance of investor confidence, and that means investors have got to believe that these markets work. And they are not going to believe it so long as you continue to stay in the news, and continue to stay in the news with this kind of evidence that the market works for the big guys but not for anybody else. So I appreciate your work on this. Thank you.

Senator REED. Senator Shelby.

Senator SHELBY. Thank you.

What percentage of the market trades are so-called e-retail as opposed to institutional trading, roughly? Mr. Wittman?

Mr. WITTMAN. I believe the stats have retail at around 40 to 42 percent, but I can get back to you with the exact—

Senator SHELBY. Would you furnish that for the record?

Senator SHELBY. But it is a high percentage of institutional trades versus say if I was trading retail trades.

Mr. WITTMAN. Well, an institutional carveout besides the other trading that takes place between professionals and market makers. So you have retail, you have institutional, and you have got the professional that trade with each other. So I am not sure if the institutional makes up the balance or if others on the panel have an answer on that.

Senator SHELBY. But do you basically agree that confidence or integrity in the market is key to the markets?

Mr. WITTMAN. I do, and I think I said that in my oral statement, yes.

Senator SHELBY. Whether it is retail investors or even if it is institutional investors.

Mr. WITTMAN. I agree.

Senator SHELBY. They have got to believe there is integrity in the market.

Mr. WITTMAN. I agree, yes.

Senator SHELBY. Do you agree with that, Mr. Ratterman?

Mr. RATTERMAN. I do.

Mr. LAUER. Yes.

Senator SHELBY. What has been driving the so-called dark pools' or private pools' growth in the market from 16 percent of all trades in 2008 to over 40 percent as of last month? Is it because of money? Because they can make more money doing it privately as opposed to going through the exchange with transparency?

Mr. WITTMAN. I will categorize that into two buckets, and I think Mr. Griffin talked about it a bit on the first panel. The two buckets for what I consider dark would be, you know, retail internalization, and then another set was institutional, and I would call it almost cost avoidance, avoiding probably the take fees from exchanges. So those two buckets. So profitability and probably cost avoidance would be the two top points in there which create this fragmented market structure, lack of transparency.

Senator SHELBY. Of course, we all know that technology has changed just about everything, not just the capital markets, but it has changed it tremendously. But when you have the high-frequency trades—and this is a result of technology and growth, we know that—it does give these people a certain edge. I mean, they might hold a stock for 2 seconds or a split second and they make money out of it, and people are looking for the best investment in the market. But how do retail people—say if I wanted to buy some stock in the market, how do I compete with that? Or do I?

Mr. LAUER. You do not.

Senator SHELBY. You do not. That answers that. You agree with that.

Mr. LAUER. I agree. It is—

Senator SHELBY. You cannot compete with it, can you?

Mr. LAUER. No. There is no sense in it. Your holding period is months or years.

Senator SHELBY. Does that go back to the issue of confidence, people say, well, gosh, I cannot compete with these people in the

marketplace? Does that erode the capital markets? Or does it just keep the retailers out?

Mr. LAUER. I am not sure from that angle that that erodes confidence, but I do think that an amount of uncertainty or misunderstanding about the nature of high-frequency trading and the confidentiality with which those firms treat everything that they do. I mean, obviously their code is confidential, but there has been very little publicity or in-depth understanding until very recently about what high-frequency trading even is and how varied the trading activity is that occurs under this umbrella term. So I think that from a retail perspective, if you do not quite understand it and you hear about dark pools and—you know, it used to be that the market was easy to understand. Your order made it to a guy down on a floor.

Senator SHELBY. Do you agree that dark pools, the term “dark pools” has a negative connotation with the average person?

Mr. LAUER. I think that the connotation has become negative, and when you look at what the Attorney General discovered recently, there is not—that is not unfounded. And I think that when you look at the tremendous conflicts of interest with brokers operating their own dark pools and the conflicts of interest in the payment for order flow model, the retail internalization, and the way that retail brokers make routing decisions, and the fact that there is no enough transparency and accurate transparency into those broker routing practices, all of that contributes to increasing concern and increasing tension on the retail trader side.

Senator SHELBY. Mr. Wittman, let me ask you this question. I do not know how you regulate or overregulate, or whatever you do to block trades. I mean, we have had block trades. We have great institutional trading of pension funds, of endowments from universities, everything else, and they have always had block trades. How do we not fool with that, not mess with that, yet try to bring some confidence into the market?

Mr. WITTMAN. Well, the whole institutional side of the business has changed a lot in the last 5 years. I think they have learned to try to adapt to the current marketplace, as Joe pointed out. They take these larger orders now, and they are trying to put them on exchanges, in dark pools, to try to get their executions and try not to impact the market. So I think the days of seeing, you know, a million share block go up on a TRF are not coming back anytime soon, unless there is regulation in place which allows them to find the counterparty more easily and print that. But I do not see that anytime soon.

Senator SHELBY. Mr. Ratterman?

Mr. RATTERMAN. So in today's matrix of trading venues, there are two locations where large block trades can happen and do typically, and Liquidnet and ITG POSIT are two examples of large block trading venues. And the average trade size, as I understand it, can be as high as 30,000 or 40,000 shares on Liquidnet.

So there are opportunities, and this goes back to, I think, the competition and the choice that is offered institutional investors, if they want to try and find a large counterparty to their trade, they can try to advertise, if you will, in a place like Liquidnet or ITG. If they do not feel confident that they can find that large

counterparty, they can break their order up into small pieces and put them on exchanges or dark pools.

It is a very challenging task, especially in small- and mid-size stocks, to find a counterparty, and in reality, given that everybody has adopted to today's market structure, the other large size has already been broken up before it can find a counterparty, and so people have simply adopted to the way that the markets have brought some of the benefits of competition, but the challenge of fragmentation is that these orders are not coming to the market in their original large size very often.

Senator SHELBY. Mr. Lauer?

Mr. LAUER. Yes, I completely agree. I think the main issue with that is fragmentation, and when you have broker-operated dark pools and brokers incentivized to rest these large orders in their dark pools, you have all of these shallow pools sitting around and nobody able to find each other. "Ships passing in the night" it has been called.

Senator SHELBY. One last question. My time has gone, but how do you discern and differentiate between people looking for the edge in the marketplace, which they all are, as manipulation of the market itself? They are probably two different things. Sometimes maybe it is murky. Mr. Wittman?

Mr. WITTMAN. Yes, you know, your question takes me toward the HFT angle a bit and Senator Warren's comments earlier. You know, with HFT, I would look at it more as high-frequency market making. You have got to take a look at not that they are latency sensitive if they are HFT labeled, but what are they actually doing with their algorithms? Are they doing something nefarious? Are they doing something across markets? Are they trying to push a market or do something else in the equity market? We have the opportunity to run and equity and options markets, so what are the relationships between what they do in equities and options?

So it is not the fact that they are latency sensitive or they have got a tag of HFT. They are putting capital at risk. They are making markets for others to trade at on exchange, which is different than a dark pool. They are not accessible. So I think that is what the difference is. We have got to take a look at from a surveillance perspective, what are their algorithms doing, how are they behaving, and look at that behavior.

Mr. LAUER. I think surveillance is just a critical issue, and it is something that has been very underinvested in, and even with the amount of investment, there has not been innovation. So one of the ideas that I put forward in 2012 was to have an open platform where people could design manipulation detection algorithms for prizes, and you would have participants competing over better and better algorithms to find that type of behavior, and either there could be a stake put up or they could have a percentage of fines collected. I think creative solutions like that—and I am sure there are better ones out there—are the way—that is the way forward in trying to understand the activity in the market. It is not going to come from individual regulators or even individual people. It has got to come from the marketplace and from the expertise that you have from practitioners. You know, if you had—you cannot tell me that regulators, for example, can understand nuanced mathe-

mational manipulation across the treasury yield curve, for example, but there are certainly practitioners out there who could. The same could be said for cross asset class manipulation as well.

Senator SHELBY. But all markets would work better with integrity and a perception of integrity in the market, would they not?

Mr. RATTERMAN. I absolutely agree. Perception is vital to people's confidence. Whether it is actually as solid as people think or if they think it is not, the perception is what drives the investment decision.

If you do not mind, I would just like to throw out three additional points here. One is that I do believe that we have a competition amongst regulators with regards to surveillance, and maybe that is not talked about enough. But each of NASDAQ and NYSE and BATS and Chicago in the equity markets—those are the four equity market operators—have their own separate surveillance technologies, each of which has been developed independently and looking for not only on-market but across-market surveillance problems.

In addition—and I would like to give more credit to the SEC's MIDAS system and Gregg Berman and their efforts there. You know, that system has actually taken every single direct feed from every single electronic book as well as the SIPs, the consolidated tape, and has done comparative analysis of the numbers and the flow and been able to produce what I think are some very insightful discoveries about the functioning of our equity markets.

Then, finally, while it is taking probably longer than it should, there is an effort by the industry the SEC led with the SROs to create the consolidated audit trail. That will get done. It will have all the data so that multiple regulators can peek inside for true cross-market surveillance with a competitive angle to it. So I see a lot of light down the road.

Senator SHELBY. Thank you, Mr. Chairman.

Senator REED. Thank you very much.

Mr. LAUER, in your 2012 testimony and again today, you talked about the central role that has to be developed for comprehensive surveillance. Do you believe that we need an legislative initiative to give the SEC the authority to do that? Or is that something within their authority today?

Mr. LAUER. I cannot say I know the regulatory authority rules well enough, but it does seem like something needs to be done to get different agencies working together. Whether that is legislative or through FSOC and OFR or just sitting them around the table, I think it is a critical issue.

Senator REED. And Mr. Ratterman has made comments about MIDAS, and I think you in your testimony also commented on MIDAS. Can I have your view?

Mr. LAUER. Yes, and I do not mean to denigrate the work that the SEC is doing, but there is no arguing with the fact that MIDAS is missing over half of the activity just in equities markets. They do not receive the resting orders on dark pools, hidden orders on lit exchanges, immediate or cancel orders that do not interact with liquidity on lit exchanges, certain characteristics of exotic order types. There are no participant IDs. It is a system that any private firm would build in order to study markets, and that is exactly

what happened, is that it was built by a private firm, an HFT firm that also builds out infrastructure. And I do not, you know, say that in any way other than to say they probably understood the technology best, but in my mind regulators should have better technology than participants. And I think that when you are talking about feeling confident and comfortable that regulators are on the beat and are on top of things, that is one of those areas in which you would have expected them to do more than just build what any other private firm has.

Senator REED. And I will make the obvious point that the regulators have a much more limited IT budget than any one of the participants. We tried to fix that a little bit, but we have not gone as far as we think we must.

An interesting point, and it goes to this discussion of Senator Shelby and Senator Warren, about confidence in the market. The market has changed. I mean, the old-fashioned, nostalgic view of the stock market is capital formation. That is where you form capital, which ultimately created jobs. And now it is about trading.

John Bogle, who will know more about this stuff than I will ever, made a speech a few months ago, in April, and he said, you know, the numbers tell the story: \$56 trillion per year in trading volume as investors buy from and sell to one another, minute after minute, day after day, year after year. That \$56 trillion of trading volume dwarfs the capital formation total of \$270 billion. Result: Short-term trading on the Wall Street casino represents 99.5 percent of the market's activity, and long-term capital formation, which is the small investor putting money in hoping that someday it will pay for college for the kids is just a sideshow, really. And that I think is becoming a reality that people appreciate. They are looking at this—and high-frequency traders are the ones that have got the most sort of attention at the moment because of the book and because of other things, but the market itself is—you know, as he says, it is a casino. And I think people are getting that impression.

Then, of course, you have got two recent suits by FINRA and by the Attorney General of New York questioning the operations in dark pools.

So all this is coming together for the perception that—as I say, this skepticism about the market working for long-term capital formation, which is—so I will just get your comments, Mr. Lauer, and then—

Mr. LAUER. Yeah, I agree. I think it is unfortunate—

Senator REED. And I must say the FINRA—the FINRA was a settlement without acknowledging any malfunction. The suit by Schneiderman is an allegation now. It has not been concluded.

Mr. LAUER. Yes, I agree with you, Senator Reed. I think it is unfortunate, the perception of the industry. I know a lot of people in it. They work really hard, and, you know, a lot of people are trying their best to help fix things or to make it a little simpler, reduce complexity. But there is an ongoing debate over market structure, and you have several different parties, but there are people in the industry, very well regarded, who understand markets and do not think that things are right. They think that there are problems that need to be fixed. Even people who think that markets are bet-

ter than they have ever been agree that there are serious problems that need to be addressed.

And so when that is the message that comes out, it is no wonder that perception is where it is, and I think that if we had more data, if there were much clearer answers, the issues that we were debating would not be as severe. We would be able to have clearer answers, and that is the frustration, because I know the answers are out there. It just seems like the data is not being analyzed.

Senator REED. Mr. Ratterman, please.

Mr. RATTERMAN. Senator Reed, I think you are right to point out the difference not only in function but in the notional side of capital formation versus price formation. And, you know, from my perspective, as both an operator of an exchange as well as an individual investor, I look at those as very different activities, and I try not to conflate them.

You know, when I think about capital formation, I think about small companies trying to raise money to, you know, grow their operations or, you know, whatever they are going to do down the road. And they need that money from investors, and investors typically would be institutional investors that are providing the funds for these growth companies, I think, as opposed to individual investors. I myself am just too risk averse to want to invest in an IPO. I would rather see a track record before I invest.

So I think that market structure is probably maybe one element of maybe a friction for capital formation and the fact that maybe small-cap and medium-cap stocks are not as well handled in today's one-size-fits-all market structure. Things like the tick size could potentially, you know, help institutional investors feel a bit more confident to enter and exit a position in a small-cap stock, which would then encourage small-cap companies to come to market.

I think there might be other things to look at as well. You know, it could be that the weight of being a public company, given other regulation, completely outside the equity markets, Sarbanes-Oxley compliance, *et cetera*, you know, may be a factor in determining whether a company goes public or not. I am not saying you should do away with Sarbanes-Oxley. I am just saying that there is a balance between the security of a company who has gone through those rigors and the weight that it carries in the decision to go public or not to go public.

So when I look at price formation as the larger of the two notional values, you know, I look at it as an individual investor. When I go to trade a stock that I can see a track record, there is somebody standing there day in and day out willing to take the other side of my trade, and that is the trading, I think, that happens in the secondary markets that is beneficial to the investor who is not risk averse—who is risk averse, who does not want to invest in IPOs, but wants to invest in companies with a track record. That is where you can go and find the standing market day in and day out.

Senator REED. Mr. Wittman, please.

Mr. WITTMAN. The amount of trading that is taking place in the top 50 or 100 issues, it is all consolidated up in those names. So the more, I think, that we see trading take place off-exchange, the

less liquidity we are going to have in these lower small-cap names. The exchanges are providing indicative prices to the public. They are on-screen. But for the most part, when it comes to customer flow, that flow is executing off of an exchange. It is using indicative pricing from the U.S. exchanges and executing off-exchange and reporting through a trade reporting facility, which in the end I think is going to hurt the capital formation and price discovery.

Senator REED. Thank you.

Senator Crapo, any questions?

Senator CRAPO. No.

Senator REED. There are no further questions. Gentlemen, thank you for your excellent testimony, and this hearing is adjourned. Thank you.

[Whereupon, at 12:11 p.m., the hearing was adjourned.]

[Prepared statements and responses to written questions supplied for the record follow:]

PREPARED STATEMENT OF SENATOR JACK REED

Thank you, Mr. Chairman. In 2012, Senator Crapo and I, as the then Ranking Member and Chair of the Securities Subcommittee, held two hearings on Computerized Trading, taking a critical look at what the rules of the road should be. And in one sense, not much appears to have changed because we're still asking the questions we asked back then. Are our markets still fair? Is everyone playing by the same set of rules? And are our markets focused on long-term capital formation and the creation of jobs?

Given the complexity of our markets and the pace at which technology is advancing, these are questions we will ask with regularity in order to ensure that we continue to harness the advantages of technology and minimize, to the best of our ability, the errors that technology can magnify in our markets. Our capital markets are a public good, much like our interstate highway system. While no analogy is perfect, I do believe that we need clearer rules of the road here in our markets, and as the markets continue to evolve, the regulators and we must keep pace to ensure that our markets are fair, accessible, and effective.

Before I conclude, I would like to apologize ahead of time for missing the first panel of witnesses due to a closed hearing on the situation in Iraq and Afghanistan in the Armed Services Committee, on which I also serve. I will, however, return for the second panel of witnesses before the Banking Committee today. Thank you, Mr. Chairman.

PREPARED STATEMENT OF JEFFREY SPRECHER

CHAIRMAN AND CEO, INTERCONTINENTAL EXCHANGE, INC.

JULY 8, 2014

Chairman Johnson, Ranking Member Crapo and Members of the Committee, my name is Jeff Sprecher and I am the founder, Chairman and Chief Executive Officer of Intercontinental Exchange, or ICE. We very much appreciate the opportunity to appear before you today to share with you our views on the U.S. equity markets.

As background, ICE was established in 2000 as an over-the-counter (OTC) marketplace with the goal of providing transparency and a level playing field for the previously opaque, fragmented energy market. In the past 14 years, we have grown our business substantially from a startup company in Atlanta to a global company with 11 exchanges and five central clearing houses in the United States, Europe and Asia.

Much of our growth can be attributed to solving complicated problems by investing in existing businesses and making them more efficient and transparent to the benefit of our clients and the broader marketplace. We have inevitably faced headwinds as a result of challenging the status quo but believe strongly that our vision, together with our ability to work with regulators and customers, is what has allowed us to be here today.

In November of last year, ICE completed its acquisition of NYSE Euronext. I quickly learned that operating an equities exchange comes with a much higher profile given the public price discovery function it performs. Combined with the New York Stock Exchange's role in the global capital markets, we understand the strong public interest and economic importance of well-functioning markets. Meeting with participants from every corner of the securities market, it is clear that the business has changed in less than 10 years. While some of this change has been beneficial, the equities market has become far more complex and fragmented than participants want it to be, and that we believe it needs to be. We believe competition among trading venues is important to markets, but also that there are other equally important factors, such as the ability of buyers and sellers in a marketplace to meet and compete with each other.

Although we may not all agree on the details of an equities market structure, I think there are a few points of agreement among the panelists today worth highlighting. First, the capital markets are a critical tool that businesses need to permit investment in new companies and to expand existing ones. Second, one of the most important factors in maintaining a strong capital market is the trust and confidence of issuers and investors that the market will be fair. And third, in our current markets, investors—particularly individual retail investors—enjoy greatly improved, cost-efficient access to the stock market.

ICE, however, believes that because markets are not stagnant, there are improvements that can be made in response to the market's evolution that will benefit investors and market intermediaries if we simplify the structure and realign incentives to improve the fairness of markets to investors.

There are several issues we have raised and continue to question. For example, we do not believe it is fair that some investors are permitted to trade in dark markets without either first interacting with lit markets or providing some tangible benefit to the investor such as meaningful price improvement or size improvement. We question whether the maker-taker pricing model used by trading venues to compensate liquidity providers adds to the complexity problem and increases the appearance of conflicts of interest that brokers face in executing trades on behalf of clients. We also have concerns about the rising level of fragmentation and believe that the increased technology cost and risks that are born from maintaining connections to as many as 60 trading centers is unnecessary and ultimately increases costs to investors.

While Regulation NMS sought to increase competition among markets and consequently increased fragmentation, the costs associated with maintaining access to each venue, retaining technologists and regulatory staff, and developing increasingly sophisticated risk controls are passed on to investors and result in unnecessary systemic risk. The fragmentation also decreases competition among orders. Orders routed to and executed in dark trading centers do not interact or compete with other orders, which detracts from the price discovery function that participants in lit markets provide. The lack of order competition in a fragmented market negatively impacts markets in the form of less liquidity, information leakage and wider spreads.¹

Excessive complexity also hurts market confidence and I believe deters some investors and entrepreneurs from accessing the public markets. Although there has been an uptick in IPOs recently, entrepreneurs don't seem as positive about taking their company public as they used to be, which limits job creation and economic growth. And investing in the market is the best available option that millions of Americans have to grow their savings. We need a resilient, long-term investor base that believes the markets are fair, operate on a sufficiently robust infrastructure and have minimal intraday volatility. And maintaining minimal intraday volatility is often a result of sufficient order competition.

As we highlight below, there are several items that we believe, if addressed, would help fix many of the cracks that have been brought to our attention since entering the equities business. However, the goal of our recommendations is largely grounded in the same goals as Regulation NMS: To increase competition among individual markets and competition among individual orders; and to minimize the transaction costs of long-term investors and thereby reduce the cost of capital for listed companies.² While NMS achieved its goal of increasing competition among markets,³ the pendulum has swung too far at the cost of less competition among orders.

To correct these trends and rebalance the tradeoffs of yesterday, we believe now is the time to take action to build the confidence of individual investors and companies seeking to access the public markets and to bring back the balance set out in the Securities Exchange Act of 1934.

While we should move forward expeditiously with pilot programs, where data gathering and analysis is necessary, my firm has outlined the following recommendations for the industry that we believe should be quickly adopted:

1. We should enhance order competition by giving deference to regulated, transparent trading centers where orders compete and contribute to public price discovery information. Limited exceptions could apply for those with unique circumstances.
2. We should eliminate and ban maker-taker pricing schemes at trading venues. Rebates that were used to encourage participants to quote on regulated, transparent markets add to complexity and the appearance of conflicts of interest.
3. We should lower the statutory maximum cap on exchange fees. Regulation NMS set a cap of what regulated transparent markets can charge to access a quote. In combination with giving deference to regulated, transparent markets

¹ Securities Exchange Act Release No. 51808, 70 FR 37,533, 37,608 n.990 (June 29, 2005) (Reg. NMS Adopting Release); Request for Comments on Measures to Improve Disclosure of Mutual Fund Transaction Costs, Investment Company Act Release No. 26,313, 68 FR 74,820, 74,822 (Dec. 24, 2003); Daniel G. Weaver Study available at: <http://www.sec.gov/comments/s7-02-10/s70210-127.pdf>. John McCrank, "Dark Markets May Be More Harmful than High-Frequency Trading", *Reuters*, April 6, 2014 (<http://www.reuters.com/article/2014/04/06/us-dark-markets-analysis-idUSBREA3508V20140406>).

² Securities Exchange Act Release No. 51808 (June 9, 2005), 70 FR 37,498, 37,501 (June 29, 2005) (Reg. NMS Adopting Release).

³ There are currently 13 equities exchanges, none of which maintains more than 20 percent of consolidated average daily volume.

and eliminating maker-taker rebates, we believe that the SEC should require lowered exchange access fees.

4. We should revamp the current market data delivery system. We support the SEC taking a closer look at the current Securities Information Processors and proprietary data feeds to adopt policies that promote fairness.
5. We should require increased transparency in the way that markets operate. The SEC should demand that all trading centers report trade executions in real time, and all routing practices should be disclosed by those trading centers and brokers who touch customer orders.

In summary, we believe that adopting these proposals will help to inspire confidence in the investing public in the U.S. capital markets. Thank you again for inviting me to testify today and I look forward to your questions.

PREPARED STATEMENT OF KENNETH C. GRIFFIN

FOUNDER AND CHIEF EXECUTIVE OFFICER, CITADEL LLC

JULY 8, 2014

Chairman Johnson, Ranking Member Crapo, Members of the Committee, I am Kenneth Griffin, Founder and CEO of Citadel LLC. I appreciate the opportunity to testify here today and share our views regarding the state of the U.S. equity markets.

Established in 1990, Citadel is a leading global financial institution that provides asset management and capital markets services.

Citadel manages in excess of \$20 billion in investment capital on behalf of institutional investors and high net worth families. As a significant investor in the U.S. equity markets, Citadel has a strong interest in the integrity, transparency, efficiency, and stability of our markets. Our equity research teams follow over 1,800 public companies, seeking to identify appropriate investment opportunities. Our equity research process, combined with our ability to execute upon our investment ideas in a cost-effective manner, enables us to deliver returns to the pensions, endowments, sovereign wealth funds and other institutions that entrust us with their investment dollars.

Citadel Securities is one of the leading market makers in the United States, and is a market leader in the execution of orders on behalf of retail investors. Citadel Securities makes markets in more than 7,000 U.S.-listed securities and 18,000 OTC securities worldwide. Since 2005, we have used our automated trading systems to deliver greater reliability, innovation and service to retail investors. In short, we empower retail investors by deploying sophisticated technology with respect to market data, order routing, and execution strategies in providing best execution.

Our capabilities allow us to deliver faster, more reliable and lower-cost trades for millions of retail investors. This has made us a trusted and valued resource to most of America's major retail brokerage firms. Our continued investment in people, compliance, process and technology earns us business on the merits, and I am proud to say that our continued growth is evidence of the enormous commitment we have made to support the interests of retail investors.

Citadel's experience as both an institutional investor and an active liquidity provider in the U.S. equity markets gives us deep insight into the strength, structure and resilience of our equity markets. From that vantage point, I can state without hesitation that the U.S. equity markets are the fairest, most transparent, resilient and competitive markets anywhere in the world.

* * * * *

The U.S. equity markets play a fundamental role in our economy. They facilitate capital formation by channeling savings into productive enterprises, creating a win-win for American investors and businesses, both small and large. The more efficiently our markets operate, the greater the benefit to the investing public and to the enterprises that rely on them to fund the growth of their businesses.

In recent months, some have questioned the fairness of U.S. equity markets. They have raised serious questions about the changes that have taken place in our markets. They have called into question the motives, and in some cases even the integrity, of market participants, exchanges, regulators and virtually everyone else who has introduced the changes that have unleashed competition and revolutionized the way our securities markets work.

It is my intent today to respond to this criticism, and to separate fact from fiction.

Over the past two decades, a wave of innovation has swept through the markets in response to new technologies and thoughtful regulation. This has disrupted the “old boys’ network” to the benefit of *all* investors. While the basic function of the stock market—matching buyers and sellers—remains the same, the mechanisms through which buyers and sellers come together has been revolutionized. In the supposed “good old days,” much of the trading in a given stock happened on the trading floor of a single stock exchange in a single specialist post under the control of a single specialist.

In recent years, regulatory changes combined with technological innovation have disrupted the old order. Today’s markets are incredibly competitive, wherein a variety of competing trading venues have emerged alongside the exchanges. Orders are now matched and executed by computers and a new generation of analytically driven and technologically sophisticated market participants has emerged as the dominant liquidity providers, displacing the manual intermediaries that once controlled the markets.

The unleashing of competition and surge in innovation has markedly improved conditions for all investors, who benefit from dramatically lower trading costs, improved market transparency and liquidity, and increased competition by liquidity providers. As a result, bid-ask spreads are substantially narrower, currently averaging less than 0.03 percent for S&P 500 stocks, while displayed market depth for the average stock, measured as the value of the shares displayed on the bid and offer, is nearly triple what it was a decade ago.

Fees and commissions are also much lower—retail investors can now trade for under \$10 (down from \$25+) and institutional brokerage commissions often are less than 2¢ per share (down from 6¢), and can be as low as a fraction of a penny per share. Retail investors in particular have benefited—not only do they frequently get better prices than those publicly quoted, but they often get their orders filled at such prices for more size than is publicly displayed.

The disruptive innovation that has taken place within the equities market has created winners and losers. While investors have clearly benefited, most legacy market participants have lost out. They simply cannot compete in today’s hyper-competitive and incredibly efficient marketplace. And so we should not be surprised that they publicly yearn for the old days when they extracted disproportionate rents from investors on the basis of anti-competitive business practices.

I applaud the regulatory efforts to ensure that U.S. equity markets continue to best serve the interests of all investors. In this regard, Citadel supports a data driven and comprehensive review of U.S. equity market structure, and we believe the SEC is taking constructive steps to gather and analyze relevant data and information, ensure the market’s operational stability, and protect market quality and fairness.

The SEC has implemented several measures to obtain the data it needs to evaluate market operations, quality, and performance. For example, the SEC has adopted the Large Trader Rule and the Consolidated Audit Trail framework, and has implemented the MIDAS system through its new Office of Market Analytics so that it may efficiently gather key data and analyze significant market events and trading activities. The financial crisis and the May 2010 “Flash Crash” illustrated the need for the SEC to be able to swiftly reconstruct and analyze market events. Moreover, as the SEC considers various reform ideas and assertions about problems with the current equity market structure, it needs a rich set of data to analyze methodically. That will ensure that the SEC has the best information available when making these critical decisions.

With the balance of my testimony, I want to focus on a handful of ideas and concepts that I believe will further strengthen investor protections, further improve price transparency and market liquidity, and promote market resiliency in times of crisis.

* * * * *

Enhancing Market Quality

Today’s markets are more competitive and liquid, with lower overall transaction costs, than ever before. To further improve market quality, we must continue to take steps that encourage competition. Encouraging competition leads to greater price discovery and market liquidity and reduces both the cost of trading for investors and the cost of capital for American businesses. As we foster greater competition, we must continue to take steps to protect the interests of retail investors in our equity markets.

I recommend the following proposals to enhance our market quality.

Take a Rational Approach to Tick Sizes

The SEC recently ordered the exchanges and FINRA to jointly develop a pilot plan that would require certain stocks to trade in minimum price increments larger than the current one penny trading increment (the so-called minimum “tick size”). We applaud the SEC for its efforts to gather hard data on this topic before embarking on any broader or longer term policy changes. We nonetheless remain concerned that widening tick sizes will artificially widen spreads and thus drive up trading costs for all investors without any tangible offsetting benefit to market quality.

We believe that the SEC should instead focus on tick increment reforms that will both promote liquidity on displayed markets and reduce the cost of trading. Specifically, the SEC should establish a half-penny tick increment for the highest trading volume stocks trading under a specified dollar value. In many cases, the half penny shaved off the one-cent increment will go directly into the pockets of investors. And rather than having to go to dark pools to find mid-point liquidity in such stocks, smaller tick sizes would allow this liquidity to be displayed and readily accessed in the lit markets. This modification would thus bring substantially more of the orders and trades in these stocks to lit markets, and move them away from the dark markets.

Reduce Access Fees to Reflect Declining Transaction Costs; Broaden Caps on Access Fees

Under Regulation NMS, the charge to liquidity takers in today’s maker-taker system is called an “access fee.” The current NMS maximum access fee of 30 cents per 100 shares is now significantly greater than the cost of providing matching services by the exchanges and should be reduced to reflect the current competitive reality. Exchanges are permitted to share the access fees they charge with liquidity providers in the form of exchange rebates. A meaningful reduction in the maximum access fee would materially reduce exchange rebates.

In general, exchange rebates encourage exchanges and liquidity providers to be more competitive. Exchange rebates also reward and encourage displayed liquidity, which greatly benefits the price discovery process. Banning exchange rebates would dampen competition between exchanges and would result in less posted liquidity and could result in wider quoted spreads. The SEC has wisely focused on disclosure and other mechanisms to manage any potential conflicts of interest that may arise as a result of these fee structures. We believe a reduction in the minimum tick size for the most liquid low priced securities combined with a reduction in the maximum permitted access fee would serve the best interests of all market participants.

More importantly, we urge the SEC to close gaps by adopting an access fee cap in important segments of the market that have no access fee cap. First, we urge the SEC to expand the access fee cap to include quotes that are not protected by Regulation NMS. Second, we urge the SEC to implement a parallel (and proportionate) access fee cap for sub-dollar stocks. Third, the SEC should move forward with its proposed rulemaking to cap access fees in the options markets.

Reduce Regulatory Arbitrage Between ATSs and Exchanges

In recent years, increasing amounts of trading has occurred on Alternative Trading Systems (“ATSs”). While public quotes on exchanges are available to all investors, this is not necessarily the case for liquidity present on ATSs. In fact, ATSs may refuse access to certain market participants, make available order types that will not interact with certain types of participants, give execution priority to certain market participants, and/or charge different fees to different types of participants.

ATSs (which include dark pools) should be subject to anti-discrimination rules comparable to those that apply to securities exchanges, and should be required to offer fair and impartial access to market participants. In particular, ATSs should only be allowed to determine execution priority based on the characteristics of an order (e.g., price, size, time of arrival), and should not be allowed to allocate executions based on the identity of the sender. For example, broker preferencing is a practice that has the potential to return our markets to the “old boys’ network” of prior decades when who you were and who you knew mattered more than the merits of your order.

Reducing the regulatory arbitrage between ATSs and exchanges will foster greater competition between the venues, and reduce the incentives to conduct business on the often discriminatory ATSs at the expense of our public markets.

Preserve the Transparent and Regulated Practice of Payment for Order Flow

We support the SEC’s well-established policy of permitting payment for order flow for a number of reasons. First, payment for order flow is a transparent and regulated practice, whereby exchanges and market makers pay a fee to broker-dealers

that route orders to them. If a broker-dealer receives payment for order flow, it must disclose this arrangement under SEC regulation, so that its customers may decide whether they want to continue to send their orders to the broker-dealer in light of the payment for order flow arrangements. Second, payment for order flow does not affect a broker-dealer's obligation to obtain best execution for its retail customers. Third, and perhaps most importantly, payment for order flow that is subject to a robust disclosure framework is far better and creates more accountability than opaque reciprocal business practices that would otherwise proliferate and could not realistically be prohibited.

Enhance Retail Investors' Transparency into Brokers' Execution Quality

In an effort to ensure that investors are receiving the best execution possible, we believe the SEC should require brokers to publicly report consistent, standardized execution quality metrics in a way that allows investors to easily measure performance. We can empower retail investors with information about brokers' execution quality and position them to make better decisions, while also enforcing an important check on the brokerage community. Today, retail investors don't have access to all the information they could or should have, and can only see which destinations are utilized by their brokers, along with very basic information about payment for order flow arrangements. While retail investors may request more specific information regarding their orders, they have no way to compare the quality of the executions received by competing retail brokers.

We recommend that the SEC require all execution quality reports to be comprehensive, understandable, accessible in a downloadable format, and published for at least 3 years. Investors can then track the quality of executions over time, and hold their brokers accountable. Moreover, the disclosure of payment for order flow could be enhanced by requiring that precise amounts of remuneration (hundredths of a cent) be disclosed as opposed to the current practice of providing rounded numbers in the reports (typically preceded by the phrase, "less than").

Increase Protections for Retail Investors Trading Odd Lots

We recommend that the SEC amend applicable order protection rules to reclassify an odd lot to be an order for value of less than \$500. Currently, any order for less than 100 shares is considered an odd lot and does not receive the same protections as the best round lot quote in the same stock. Because many stocks are trading at a high dollar value, many investors are being unnecessarily deprived of the benefits of protections received by round lot orders. For example, Google, ticker symbol "GOOG," ended the month of May trading at over \$550 per share. An investor placing a 50 share GOOG order is investing over \$27,500—yet that investor's limit order is not protected from being traded through because it is considered an odd lot. As a result, quoted spreads are wider than they should otherwise be since this liquidity is not reflected in the protected quote. Given that odd lots accounted for nearly 5 percent of trading volume in 2013, odd lot status needs to be redefined and based on total order value, not share quantity.

* * * * *

Improving Market Resilience

Operational soundness and stability are fundamental to the confidence that participants have in any market. Automation and computerized trading have dramatically improved these conditions. Previously, markets were notoriously opaque and errors and control breakdowns were the norm. Participants in manual markets, including Citadel, would routinely encounter workflow control issues, trade breaks, and delays in receiving fills and trade confirmations. Although some have chosen to reminisce fondly about the past, the reality was much different.

In recent years, the SEC has taken important steps to further strengthen the stability and operational functioning of our markets. The Regulation SCI proposal, the adoption of Rule 15c3-5 on market access, and the post-"Flash Crash" reforms addressing liquidity gaps through limit up/limit down and circuit breaker rules, along with more predictable clearly erroneous rules and the abolition of stub quotes, represent important progress.

Those reforms, among others, have served to enhance confidence in our markets by minimizing the incidence of disruptive trading and managing and mitigating the consequences of any systemic trading malfunctions that do occur. Nonetheless, we recommend a number of additional measures to fully achieve the goal of greater market resilience.

Mandate and Harmonize Exchange-Level Kill Switches

The SEC should require mandatory exchange-level kill switches, and ensure that exchanges have clear authority and responsibility to immediately block and stop activity that appears erroneous and so severe that it is likely to materially impact other members and the market. The activity of a large number of market participants intersects on exchanges and they are thus best positioned to efficiently and consistently monitor activity across a very large number of market participants.

To cite one example, while NYSE detected erroneous trading activity by Knight Capital on August 1, 2012 within a few minutes, the erroneous activity continued for 30 more minutes. If NYSE had a kill switch in place, it could have halted Knight Capital's erroneous trading much sooner, and prevented disastrous results.

While a number of exchanges have responded by implementing some kill switches, the kill switches that have been implemented to date suffer from certain weaknesses that have limited their effectiveness.

First, they only provide market participants with the optional ability to set certain thresholds that may then trigger notifications, disable order entry, or cancel open orders. We should not rely on market participants alone to protect the market from their mistakes. Exchanges should still be required to implement and administer their own mandatory kill switches.

Second, kill switches add latency to the processing of orders. As a result, firms that voluntarily use kill switches are disadvantaged because their orders reach the exchange more slowly than other market participants' orders. Kill switches offered by exchanges should be implemented in a manner that introduces no additional latency and promotes a level playing field.

Third, kill switches are designed differently at each exchange. This lack of uniformity significantly reduces utility and efficacy because it requires significant resources to properly configure and maintain overlapping and inconsistent kill switch parameters at each exchange.

Remove Exchange SRO Powers and Immunity

The special status of exchanges as SROs that have regulatory authority over their broker-dealer members, combined with a history of limited liability, has created a conflicted and weaker market structure than is optimal for fair and efficient markets.

Exchanges face an irreconcilable conflict of interest in the performance of their duties as SROs. This conflict of interest in the dual role of regulator and competitor has led to inconsistencies in the manner in which the exchanges regulate their members. On the one hand, public exchanges are bound by their fiduciary duty to maximize shareholder profits, while on the other hand, they are required to be fair and impartial regulators of the broker-dealers with whom they compete. Exchanges and broker-dealers have become direct competitors in many aspects of their businesses. For example, acute competition exists for order flow, order routing services, and the provision of algorithmic trading services. Yet, to a significant extent, exchanges are able to control the landscape on which they and broker-dealers compete for business.

Further, as SROs, exchanges claim to be insulated from private liability for damages they might cause, based upon both a judicially created doctrine of "absolute immunity" and limitations on liability codified by their own rules. Limiting this immunity would increase the stakes for exchanges in connection with general culpability for operational failures. Facing liability for operational failures would give exchanges very strong financial incentives to invest heavily in steps to prevent or minimize the impact of operational failures.

Apply Regulation SCI to All Alternative Trading Systems

All ATSS, most of which are dark, should be subject to proposed Regulation SCI. Regulation SCI, as currently proposed, would impose substantial requirements on how exchanges and the largest ATSS design, develop, test, maintain, and monitor systems that are integral to operational integrity. ATSS, which perform the same exact market function as exchanges, should be subject to the same standards as exchanges with respect to the issues covered by Regulation SCI. Proposed Regulation SCI would only apply to the largest ATSS, and we see no reason for this size limitation.

Balance Benefits and Costs of New Entrants to Check Fragmentation

Regulation NMS and the foundational regulations that preceded it, along with technological advances, have helped unleash an enormous degree of competition among market centers. In recent years, however, the costs that each new market center imposes on the market in terms of additional complexity and operational risk

have started to outweigh the marginal benefits of a new competing market center. The steps described above will help restrike this balance by requiring that market centers have sufficient resources and make sufficient investments in operational excellence. We expect that over time, this will reduce fragmentation by eliminating marginal market centers that rely on low cost of market entry and operation, externalization of the costs of catastrophic failure, and internalization of the profits of any success.

* * * * *

To conclude, these are important steps that we should take to further enhance market quality, improve market resilience and strengthen investor protection. However, we must pursue this agenda without sacrificing the extraordinary achievements we have made in terms of market efficiency, lower costs, and increased fairness and competitiveness. We must not jeopardize the preeminent global standing of the U.S. equity markets.

Thank you for the opportunity to testify before this Committee today.
I would be happy to answer your questions.

PREPARED STATEMENT OF KEVIN CRONIN

GLOBAL HEAD OF TRADING, INVESCO LTD.

JULY 8, 2014

Thank you, Chairman Johnson, Ranking Member Crapo and Members of the Senate Committee on Banking, Housing and Urban Affairs for the opportunity to speak here today. I am pleased to participate on behalf of Invesco at this hearing examining U.S. equity market structure. Invesco is a leading independent global asset management firm with operations in over 20 countries and assets under management of approximately \$790 billion. Many of the investors served by Invesco are individuals who are saving for their retirement and other personal financial needs, including U.S. investors in defined benefit and defined contribution plans, such as 401(k) plans, IRAs and similar savings vehicles.

Through its investment advisor affiliates, Invesco manages money for investors worldwide who seek professional participation in the markets, both directly and through vehicles such as mutual funds and ETFs. These are long-term investors who are saving for their retirements, to purchase a home or send their kids to college. These long-term investors are the cornerstone of our Nation's capital formation process, and retaining their confidence is fundamental to well-functioning U.S. securities markets, which are the envy of the world. To ensure long-term investor confidence, it is incumbent upon regulators and market participants to address issues raised by developments in the structure and operation of the U.S. equity markets, and we are grateful to this Committee for its attention to these important issues today.

All who seek to maintain our U.S. equity markets as the most respected in the world should have a strong interest in ensuring that those markets are highly liquid, transparent, fair, stable and efficient. Those qualities create a level playing field for all investors, including ordinary American savers served by Invesco. In order to foster investor confidence and preserve robust liquidity, the regulatory structure governing our financial markets should promote, and not impede, those qualities.

Today, due in large part to regulatory changes and developments in technology in recent years, there is robust competition among exchanges and alternative execution venues. These changes have spurred trading innovation and enhanced investor access to markets. Market participants, including Invesco, now have much greater choice and a higher degree of control in how and where to execute our trades. These changes have materially benefited investors in the form of lower commissions, spreads and implicit transaction costs, which in turn have enhanced the all-important liquidity of the equity markets.

Unfortunately, some of these regulatory, competitive and technological changes have also brought unintended consequences, which have included un-leveling the playing field to a degree where certain sophisticated market participants can reap benefits at the expense of ordinary savers. We also are concerned that the one-size-fits-all approach of the current market structure fails to recognize the very real differences between trading large-cap stocks versus trading mid-cap and small-cap stocks. These developments challenge investor confidence in the liquidity, transparency, fairness, stability and efficiency of the markets. These unintended consequences include the following:

Market Complexity and Fragmentation Have Negatively Impacted Investor Confidence

Many investors, including Invesco, believe markets have become too complex and fragmented, not because they need to be but rather because we have allowed them to become so. This complexity has contributed to a number of the technological mishaps over the past several years. These mishaps shake investor confidence in markets. While we commend the Securities and Exchange Commission ("SEC") for the actions it has taken to address many of the structural issues relating to these events, it is important to recognize that today there are underlying structural issues that can give sophisticated participants an unfair advantage over ordinary investors.

For example, exchanges sell co-location services to market participants that allow those participants to locate their servers in the same facility as the exchange's order matching engines and offer these participants direct data feeds from the exchange. These direct data feeds are faster than the indirect data feeds that other participants get from the Securities Information Processor. Because of this speed differential, co-located participants with direct data feeds can gain an unfair advantage over those participants that are not co-located and do not receive direct data feeds, allowing the former to react more quickly to trading information. In our opinion, there is nothing more corrosive to investor confidence than allowing some market participants to have an unfair advantage over others.

Today in the United States, there are 11 exchanges and over 40 alternative trading systems in which investors can trade equities. The rules governing the exchanges are very different from those governing the alternative trading systems (e.g., "dark pools"), a difference that can be very confusing to market participants. These different rules also have facilitated an un-level playing field that unfairly favors sophisticated participants over ordinary investors. Many of these execution venues offer economic inducements to broker-dealers and high-frequency traders to route their orders to them. A number of these destinations offer high-frequency trading participants complex order types (e.g., "conditional orders") that may enable them to detect the trading interests of other participants and then use that information to their advantage. In such a complex and fragmented environment, determining which execution venue will lead to the best trading outcome can be very difficult even for a firm like Invesco.

Conflicts of Interest Have Impacted Market Transparency and Fairness

The robust price discovery that historically has defined our markets has been weakened as a result of the amount of trading activity occurring away from exchanges. It is believed that as much as 35–40 percent of all trading activity in U.S. equities now takes place away from the exchanges. Much of the movement away from the exchange markets is a result of broker-dealer order routing practices including "internalization" and the proliferation of specialized alternative trading venues, including "dark pools."

The order routing practices of some broker-dealers raise a number of concerns for investors. For example, investors are not provided the information from broker-dealers needed to determine if they are receiving best execution within these dark pools. They are also given only limited insight into how and where broker-dealers route their orders. As a consequence, it is very difficult for investors to make informed decisions about the quality of executions they have received.

Much of the problem can be traced to two inherent conflicts of interest. The first is a broker-dealer's interest in maximizing economic inducements by capturing liquidity rebates associated with the so-called "maker-taker" pricing model and by receiving payment for order flow from off-exchange market makers. The second is a broker-dealer's interest in avoiding paying access fees to take liquidity from other trading venues. Under the current regulatory structure, a broker is incented to keep as many trades as possible within its own internalized systems, including within its own dark pools. These problems are not well-disclosed to clients, and yet they can drive brokers' order routing decisions that may be at odds with their clients' interest in obtaining best execution.

High-Frequency Trading and Market Liquidity

There has been much discussion about high-frequency trading and its impact on trading markets. Today, there are a number of different types of participants within the marketplace who could be referred to as high-frequency traders. It is our view that high-frequency trading is not bad in and of itself, but there are certain trading strategies performed in connection with high-frequency trading that have the effect of being manipulative or disruptive. These can include using an information and speed advantage to trade ahead of other market participants. These strategies have

arisen as a result of enabling technology, the fragmented structure of the markets and a lack of uniform regulation and market practices among trading venues.

Changes to market structure have had a pronounced impact on the role of traditional market-makers and the evolution of electronic market-making. While there are today a number of market-makers and high-frequency market-making strategies that make markets in a number of securities, much of this appears to be focused on large-cap securities. While it is true that these high-frequency market-making strategies have increased trading volumes in many of these stocks, it is less clear that they are creating real liquidity. Moreover, the area of the market where market-makers have historically provided the most valuable liquidity—mid-cap and small-cap stocks—have not benefited from the evolution of market structure and the move to electronic market-making.

To restore a level playing field in the markets—and, thereby, restore investors' confidence in the fairness and transparency of the markets—we believe it is time for regulators and market participants to address these issues. Invesco recommends the following improvements:

1. Require broker-dealers to provide much greater disclosure about their order routing activities, their dark pool operations, order types used and all other data required for investors to make accurate determinations of execution quality. If there is greater disclosure about how and where clients' orders are routed and other necessary data for investors to make accurate best execution determinations, investors will be able to make much better informed decisions about how their brokers are performing and, consequently, which brokers they should choose to use.
2. Ensure that the dissemination of market data is fair to all market participants. This could be achieved in a number of different ways, including by eliminating direct data feeds, slowing down the direct data feeds or through greatly enhancing the Securities Information Processor's infrastructure to allow it to transmit market data to participants at substantially the same speed as the direct data feeds. It is in the nature of competition that some participants will be able to process information much faster than others, but these participants should not be given unequal access to allow them to front-run other investors' orders.
3. Eliminate the maker-taker pricing model and substantially reduce access fee caps. We believe eliminating the maker-taker pricing model—and, more specifically, the liquidity rebates provided therein—and substantially reducing market access fee caps, would remove certain inherent conflicts faced by broker-dealers. This would make it more likely that broker-dealer activities will be performed in a manner and with an outcome more consistent with their clients' best execution objectives rather than their own pecuniary interests.
4. Harmonize the regulation of exchanges, alternative trading systems and other trading venues. This will level the playing field between ordinary investors and other participants and ensure fairness, consistency and integrity to the trading markets.
5. Require registration for all high-frequency trading participants and the establishment of a uniform regulatory regime. The activities and strategies employed by high-frequency traders are sufficiently disparate, nontransparent and complex that a reasonable first step in regulation would be to ensure that all entities that engage in high-frequency trading be required to register under a uniform regulatory regime that has the resources and capabilities to detect and, where appropriate, take action against any trading strategies that are deemed manipulative or predatory.
6. Institute a comprehensive "trade-at" rule pilot program. The trade-at rule would require any orders internalized by broker-dealers to provide meaningful price improvement. If material price improvement cannot be provided, then those orders would be routed to more transparent markets. Such a rule would reduce broker-dealer conflicts and may result in much more robust price discovery for investors. We recommend that the SEC work with exchanges, investors and other market participants to structure this pilot program.
7. Market-making participants, exchanges, issuers and investors should work with regulators to facilitate market-making activities by creating sensible, transparent incentives and obligations for making markets generally, but for mid-cap and small-cap stocks in particular.

Invesco believes that these recommendations, if acted upon, will result in less complicated and more robust, highly liquid, transparent, fair, stable and efficient

markets. They would address concerns of ordinary savers that otherwise threaten confidence in the integrity of the U.S. equity markets. We are highly encouraged by Chair White's recent speech outlining a number of initiatives that the SEC is considering to improve U.S. equity market structure. These initiatives will address many of the issues we have raised historically and are raising again here today. We also would like to commend the SEC for its recent action to establish a thoughtful pilot program to assess tick sizes for small company stocks.

Thank you again for your attention to these important issues here today. I look forward to answering any questions you may have.

PREPARED STATEMENT OF JAMES J. ANGEL, Ph.D., CFA

ASSOCIATE PROFESSOR, GEORGETOWN UNIVERSITY McDONOUGH SCHOOL OF BUSINESS

JULY 8, 2014

My name is James J. Angel and I am an associate professor of finance at the McDonough School of Business of Georgetown University.¹ I wish to thank the Committee for looking at these important issues and for asking me to appear before you. I have been asked to focus on the regulation, practices, and structure of the United States stock markets. I will begin with regulation.

Regulation

If Congress gets regulation right, then the regulators will make the right decisions on the details. Congress can then devote its scarce time to other important matters. If our regulatory system worked properly, Congress would not have to spend its time addressing minutiae (albeit important minutiae) such as the tick size in our financial markets.

Money attracts thieves just like garbage attracts flies, and that is one of the reasons why we need good cops to keep the bad guys out of our financial markets. We all benefit from fair and orderly markets that protect investors, supply capital to support economic growth, provide useful risk management tools, and promote economic efficiency.

Unfortunately, the United States has an extremely fragmented financial regulatory structure. There are literally hundreds of different financial regulatory agencies at the State and Federal level. As we learned in the financial crisis, many items can fall through the cracks and the different regulatory agencies do not always play nicely with each other, to say the least.

Congress attempted to address many regulatory issues in the Dodd-Frank and JOBS Acts. However, these Acts did not really address the structure of our regulatory system, which is badly in need of reform. Here are just a few of the symptoms of dysfunction in our regulatory system:

1. The JOBS Act could and should have been done by the SEC with its pre-existing authority.

In 2012, Congress passed the JOBS Act with a broad bipartisan consensus in order to make capital more freely available to growing enterprises and thus create more jobs. Among other things, the JOBS Act temporarily reduces regulatory burdens for newly public "emerging growth companies," reduces restrictions on private share offerings, and provides a framework for crowdfunding.

All of these provisions could and should have been done by the SEC using its pre-existing legislative authority. In particular, Section 36 of the Securities Exchange Act gives the SEC broad powers to exempt particular entities or groups of entities from various rules. The SEC should have recognized the problems in capital formation that led Congress to adopt the JOBS Act and used its existing powers to do what the JOBS Act mandated. Yet it did not. As an institution, it was unable to recognize the problems facing our capital markets and craft appropriate solutions. Worse yet, the SEC has missed, perhaps intentionally, many of the mandated deadlines in the JOBS Act.

¹My comments are strictly my own and do not necessarily represent those of Georgetown University or anyone else. From 2000 through 2010 I served as an independent director on the board of directors of the Direct Edge stock exchanges (EDGX and EDGA). I was a Visiting Academic Fellow from 1999 to 2000 in residence at the NASD (now FINRA), and have served as Chair of the Nasdaq Economic Advisory Board. As an investor I practice what I preach in terms of portfolio diversification and hold a well-diversified stock portfolio that includes small investments in a large number of public companies, including most financial services firms. I also provide expert consulting services to Government agencies, law firms, exchanges, financial services firms, and others.

2. The implementation of the Volker Rule demonstrates the fragmentation of our financial regulatory system.

As part of the 2010 Dodd-Frank legislation, the Congress passed the so-called “Volker Rule” to prohibit “proprietary trading” by banks. Alas, our regulatory system is so fragmented that no less than four (!) agencies have had to engage in rulemaking to implement this provision.² The rulemaking sausage factory has come up with an extremely complex and expensive rule. Similar evidence of fragmentation arises in the various swap rules in which the CFTC has the bulk of the responsibility and yet the SEC has to do rulemaking for the tiny slice in its jurisdiction.

3. Glacially slow responses by the SEC to apparent violations of Federal securities laws hurt investor confidence.

The old saying “Justice delayed is justice denied” is just as true now as it has always been. When investors perceive that little is done to enforce our securities laws, they lose confidence in our financial system. The lack of high-level prosecutions from the recent financial crisis is but one example.

Even if our regulatory system is vigorously attempting to enforce the laws, the long delays between the observation of the alleged offense and any visible regulatory action create the impression that the SEC is incapable of properly enforcing our securities laws. Here is one example of which I have some personal knowledge:

In April of 2013, W2007 Grace Acquisition I, (“Grace”) a Goldman Sachs controlled entity, filed an application with the SEC seeking an exemption from its registration requirements under the Securities Act of 1934.³ To make a very long story short, Grace was the successor company to Equity Inns, a publicly traded firm. Goldman led a leveraged buyout in 2008 that bought up the common shares of Equity Inns, but not the NYSE-listed preferred shares. Most of these preferred shares were held by retail investors, many of them senior citizens. Grace claimed that it had less than 300 shareholders of record, which permitted it to deregister its shares from the SEC and stop providing public financial information.⁴ One of the shareholders, a Mr. Joseph Sullivan, created a series of trusts in order to increase the measured number of shareholders “of record” over the 300 threshold, which would require Grace to once again file public financial statements with the SEC.⁵ Grace filed for an exemption, claiming that the Sullivan trusts should be counted as only one shareholder of record.

It has been more than a year since this petition was filed, and the SEC has not announced any decision in the matter. It is my understanding that the SEC has not even bothered to contact Mr. Sullivan to examine the nature of his trusts. For the SEC to take over a year on this matter without even contacting the creator of the trusts to learn more about their nature shows a shocking slowness or sloppiness in its handling of the matter. However, my examination of the shareholder of record list indicates that there are and have been many more than the required 300 shareholders of record needed to require a resumption of its registration requirements even without the Sullivan trusts.⁶ Grace appears to be openly and flagrantly delinquent in its SEC reporting obligations, to the detriment of its preferred public shareholders. That the SEC has allowed this delinquency to fester leads to the suspicion that Goldman is getting the Bernie Madoff or John Mack treatment in this case. Even if the SEC in its infinite wisdom rules otherwise, this proceeding should

² See <http://www.sec.gov/rules/proposed/2011/34-65545.pdf>.

³ Disclosure: I own less than 100 shares of Goldman Sachs common stock as well as less than 100 shares of the preferred stock of W2007 Grace Acquisition I. There are many more plot twists in this soap opera. See the SEC comment file 81-939 at <http://www.sec.gov/rules/other/2013/34-69477-application.pdf>. Even if the SEC and FINRA are investigating allegations of various infractions, this should not stop the SEC from ordering the firm to resume its filing of public financial statements.

⁴ Title VI of the JOBS Act reiterated the 300 shareholder of record threshold below which issuers could deregister from the SEC, which suspends their filing requirements. Under SEC Rule 12(h)(3)(e), if the number of shareholders “of record” of a deregistered issuer increases above the 300 threshold as of the end of its fiscal year, then the issuer has 120 days to resume filing.

⁵ For the purposes of counting the number of shareholders “of record” to determine whether a company is required to file financial statements with the SEC, current interpretations of SEC rules do not count beneficial shareholders who hold shares in street name in brokerage accounts. Grace has well over 1,000 beneficial shareholders. It is quite odd that the SEC does not count retail shareholders who hold shares in street name in brokerage accounts when it determines whether a company has enough shareholders to merit required registration with the SEC.

⁶ For more details, see one of my comment letters at <http://www.sec.gov/comments/81-939/81939-41.pdf>.

not have been dragging on for over a year with no end in sight. This does not bode well for public confidence.

I would like to emphasize that the problems with our regulatory structure are not the fault of the people who work there. Most of the people who work in these agencies are hard working and intelligent people who are honestly trying to do their jobs as best as they can. The problem is the structure of the regulatory system, and this is something that only Congress can fix. I will get to my suggested solutions at the end.

Practices

Trading technology has changed dramatically in recent years, and there has been much controversy over various practices used in the financial markets. This section describes some of the controversial practices in financial markets.

Not all users of high-speed computers are the same.

There has been much discussion lately of modern trading practices. Often all uses of high-speed computers are lumped into one catch-all phrase of “high-frequency trading.” “High-frequency trading” is a misleading catchall term. Some “HFT” practices help the market, and some hurt. This is why we need a regulatory system that is smart enough to tell the difference between the good and bad uses of high speed computers and that has the capacity to keep out the bad while not harming the good.

Market making and ETF arbitrage benefit low-frequency retail investors.

Here is one example of a “high frequency” technique that is beneficial to low frequency retail investors like me. Many retail investors invest through exchange traded funds (“ETFs”), convenient basket products that allow an investor to buy part of a large basket of securities with a single trade. For example, an investor can buy a basket of all 30 stocks in the Dow Jones Industrial Average by buying the Dow Diamonds ETF. Retail investors can trade the ETF with the confidence that its price will closely track the price of the stocks in the index because arbitrageurs monitor the price of the ETF and the price of the stocks that go into the ETF. When the price of the ETF gets out of line with the price of the stocks in the basket, arbitrageurs swoop in to buy the cheap side and sell the expensive side in order to capture the difference. This pushes the cheap side up and the expensive side down, and thus pushes prices back into the proper alignment. Because this is such a simple strategy, it is easy to duplicate and there are many competitors. When an arbitrage opportunity arises, there is a race to take advantage of it. The first trader to trade wins, and the rest lose, even if they lose by only a thousandth of a second. Therefore, the traders invest in technology to speed up their trading by buying the fastest computers they can and then putting them as close to the stock exchange computers as they can get so that their orders will get to the exchange even faster.

Traders use high speed computers to engage in a variety of other trading strategies as well. These include market making, a strategy similar to that of a car dealer who provides the service of convenience by buying at a trade-in price and selling at the retail price. The car dealer does not want to be a long-term owner of the car, but to sell it as quickly as possible. Likewise, market makers do not want to be long-term investors, but they provide the service of immediacy to investors who want to buy or sell a stock quickly. By being willing to buy and sell at all times, they make sure there is a buyer when long-term investors want to sell and vice versa. Competition between market makers helps to keep transactions costs low for the long-term investors.

Other strategies are more controversial.

Traders have been looking for trends in stock prices since the beginning of financial markets. Generations ago, “tape watchers” would gather in brokerage firms to watch the ticker tape and guess where prices were going. Later, chartists and day traders would do the same. These investors attempt to discern where prices are going by learning from the information that large investors leak when they break up large orders into many smaller trades. As the price and quantity of every stock trade in the highly transparent U.S. market become public knowledge immediately, every time one of these small pieces of a larger order trade, they are leaving clues about their future trading.

Now, instead of standing in brokerage firms and reading a paper ticker tape, some traders use computer programs to guess which way prices are going. Some would call these predictive traders “predatory” traders as they seek to gain from the stock price movements caused by larger traders. It is a myth, however, that such traders “see” institutional orders before they hit the market. Such traders merely

guess at the direction of future stock price movements based on the data that are available to anyone who wants to pay for it.

Here is an example known as “latency arbitrage.” Suppose that there are two stock exchanges that are 25 miles apart. It takes about one hundred microseconds (millionths of a second) for light, and thus information, to travel from one exchange to the other by the fastest route. Both exchanges are offering to sell 5,000 shares at \$20.00 per share. Suddenly someone buys all 5,000 shares available on the first exchange, and now the only shares available for sale on the first exchange are priced at \$20.01. At this point it stands to reason that if a sophisticated large trader has bought up all of the shares on the first exchange, then prices are going up. Those 5,000 shares that are offered on the second exchange might still be available, and whoever buys them will make money as the price goes up. Indeed, the large trader who bought up all the shares on the first exchange may well be on his or her way to try to buy up the shares on the second exchange. Now the race is on. Traders use the fastest computers and communication links they can to rush to the other exchange and buy up the cheap shares there before anyone else does. If the large trader is using a slow communication line, the fast trader may well arrive at the second exchange in time to scoop up the available shares at \$20.00, leaving none behind for the large trader whose order initiated the transaction.

These high speed traders use a variety of techniques to trade as fast as possible. Not only do they buy the fastest computers they can, they try to locate them as close as possible to the computers used by the stock exchanges to process trades, a process known as co-location. They subscribe to the fastest data feeds possible, the direct data feeds offered by the exchanges, and transmit their orders using the fastest data lines they can.⁷ There has been a considerable hue and cry over the fact that some investors pay for faster data feeds than other investors receive. The important fairness consideration is to make sure that such high speed data feeds are available on nondiscriminatory terms to all market participants.

As a low-speed low-frequency investor, I am not concerned that some, if not most, market participants have faster computers and faster data feeds than I do. My trading strategies, like those of most retail investors, are not based on reacting instantaneously to news or other information, but instead on longer-term buy and hold strategies. As I am not racing to react faster than other participants, I do not care that other high-speed investors are racing with each other.

Some uses of high speed technology are just plain bad.

I will not argue that all uses of high-speed computers are necessarily good. Manipulators can use fast computers as well. One manipulative strategy is known as order ignition. Here is an example. A computer program (known as an algorithm, or “algo”) searches for a stock where the amount of buy orders seems unusually small and the stock seems vulnerable as a result. Then the algo puts in a large short sale order with the intent of pushing down the price in order to trigger “stop” orders, orders to sell after a stock has dropped below a specified price. The triggered selling of the stop orders causes the stock to drop further, at which time the algo kicks in and buys the stock back to cover the short at a profit. Such manipulative trading is antithetical to a fair and orderly market.

Maker-taker pricing

The current pricing system used by most stock exchanges is usually called “maker-taker” pricing. The exchanges charge a fee to market orders because they “take” liquidity and pay a rebate to a limit order that gets filled because it made liquidity. For example, suppose a customer puts in a limit order to buy 100 shares of BAC at a price not to exceed \$15.00 per share. Later, another customer market order comes in and is matched with that resting limit order. Under typical exchange pricing schedules, the market order would pay the exchange 30 cents and 28 cents of that (93 percent!) is rebated to the resting limit order.

I have long criticized maker taker pricing.⁸ It has created a number of distortions in the market, and I have called for its elimination or restriction. However, as I believe in evidence-based rulemaking, it would be appropriate to conduct a scientifically designed pilot experiment to examine the impact of reducing and eliminating

⁷The direct feeds are faster than the consolidated data feed that contains the data from all of the exchanges. The consolidated data feed will always be slower because it takes time for the information to travel from the exchange that created it to the point of consolidation and to be consolidated into the data feed.

⁸See my comment letters to the SEC at <http://www.sec.gov/rules/proposed/s71004/jjangel012505.pdf> and <http://www.sec.gov/rules/proposed/s71004/jjangel051904.pdf>, as well as my joint articles with Larry Harris and Chester Spatt, *Equity Pricing in the 21st Century and Equity Pricing in the 21st Century: An Update*.

exchange access fees. I believe that eliminating or reducing maker-taker pricing would greatly reduce the incentive for investors to send orders to some so-called “dark pools”, as one of the advantages of such trading platforms is to avoid exchange fees.

Broker order handling practices

The practices by which brokerage firms route customer orders are also controversial. Brokerage firms have a duty of “best execution” in handling their customers’ equity orders.⁹ The SEC currently requires market centers to disclose execution quality statistics in Rule 605 and for brokerage firms to disclose how they route orders in Rule 606. However, these disclosures currently do little to inform retail customers how well their orders are being filled. A better solution would be for the brokerage firms themselves to disclose execution quality directly to their customers.

Exchange order types

The proliferation of special order types at the stock exchanges has also been controversial. Critics charge that these order types create an unfair advantage as well as add complexity to the marketplace. However, they are available to all investors.¹⁰ The real question is whether they can cause the market to react in an unstable or otherwise undesirable manner. So far I have seen no evidence that they do.

Tick size: Issuers should be allowed to choose their own tick size.

The tick represents the smallest allowable price differences in stocks. Currently, the United States has a “one tick fits all” model with a tick size of one penny for all stocks over \$1.00. Thus, brokers are allowed to accept orders at \$10.00 and \$10.01, but not \$10.0001. The tick represents the smallest amount of money an investor has to pay to jump to the next level in the queue. A wider tick benefits patient traders who place limit orders, as investors would have to pay more to jump in front of them. However, a wider tick harms impatient traders who cross the bid-ask spread and trade with market orders and thus pay a higher transaction price. The optimal tick represents a tradeoff that results in a balanced ecosystem of liquidity takers and demanders. The optimal tick is not zero and not infinity, but somewhere in between. And it is not the same for all stocks.

The SEC is currently planning a pilot study to examine the impact of different tick sizes on smaller stocks. This is good as far as it goes, as it will provide useful information with which to inform rulemaking. However, the big issue is “Who decides what the tick size will be for various companies?” I believe that each issuer should be able to select their own tick size, as they have the proper incentive to select a tick that provides optimal liquidity for their company. Neither the exchanges nor the SEC have the similarly powerful incentive to get it right.

The risks of technology: We are still vulnerable to major disruptions like the Flash Crash.

Most of the time our markets work well. Except when they don’t. The Flash Crash of May 2010 is a case in point. I had warned the SEC in writing five times in the year before the Flash Crash that our market was vulnerable to such disruptions.¹¹ Our market is still vulnerable. Our market is a complex nonlinear network. It is in the nature of financial markets that from time to time they are overwhelmed with tsunamis of trading activity that can overwhelm the capacity of the market network to produce fair and orderly prices. Complex networks that are pushed beyond their capacities fail in weird and strange ways that are difficult if not impossible to predict.

Subsequent to the Flash Crash, the U.S. equity markets instituted several types of circuit breakers:

⁹I concur with SEC Chair White’s comments that brokers should have a similar best execution requirement for retail fixed income orders. <http://www.sec.gov/News/Speech/Detail/Speech/1370542122012#.U7o0AldWSs>.

¹⁰However, many retail trading Web sites are simplified to the point that they do not offer complex order types. Investors wanting to use complicated order types would have to go to brokerage firms that offer them.

¹¹These are listed in my December 8, 2010 testimony to the Senate Committee on Senate Subcommittee on Securities, Insurance, and Investment and the Senate Permanent Subcommittee on Investigations. This testimony also contains a summary of the events of the Flash Crash. http://www.banking.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=a4f49d29-fe78-4ed9-839-3a6c09917298.

- 1) The “Limit Up-Limit Down” system causes a short trading halt in individual stocks if the market price moves outside of a predetermined price band.¹²
- 2) The short sale circuit breaker restricts short selling at the bid price for the rest of the day and the subsequent day if a stock drops 10 percent below the previous day’s price.¹³
- 3) Market-wide circuit breakers halt the entire market for various periods of time under various conditions.¹⁴

These are mostly improvements as far as they go, but there is still more work to be done.¹⁵ In particular, there is no evidence of any coordination in these efforts across the equity, options, and futures markets, despite the fact that the Flash Crash demonstrated the close interrelationships between these markets and the ease with which a disruption in one market can be transmitted to other markets. This is another example of the dangers caused by the fragmentation of our regulatory system.

The current system deals appropriately with disruptions to the trading of individual stocks, although more refinement is needed for handling small stocks with wide bid-ask spreads. However, the system is totally untested in dealing with large market wide disruptions across multiple asset classes. The rigidity of the rules could also hamper the restart or lack thereof when the next tsunami hits the markets. And there will always be another one coming. We just don’t know when.

Structure

The United States has a competitive, “open-architecture” equity market structure.

Many commenters use the pejorative term “fragmented” to describe the current U.S. market structure. This word has a negative connotation. Its synonyms include broken, shattered, splintered, and disorganized. It is anything but these. Our markets are better than they have ever been by traditional measures of transactions costs, speed of execution, intraday volatility, transparency, and certainty of settlement.

However, the high quality of the U.S. markets does not imply that they can’t get better. The fundamental trading problem has not been solved. Our market structure allows new market entrants to ideas for better trading systems to plug into our National Market System. This competition improves the breed.

It should be noted that we have the market structure that Congress rightly decreed in 1975. In 1975, Congress passed the so-called National Market System amendments to our securities laws. In particular, Congress added Section 11A (a)(1)(c) to the Securities Exchange Act which called for a competitive market structure with competition among exchanges, broker-dealers, and other than exchange markets. And that is what we have today.

Some complain that we have “too many” exchanges or other places to trade. Do we have too many supermarkets or gas stations to choose from? Normally we depend upon competition to provide incentives for efficiency and good customer service. The cost of trading is much lower in the hyper competitive equity space than in the highly concentrated futures industry.

A competitive market structure makes good economic sense.

The logic behind a competitive market structure is simple and compelling. A monopoly exchange structure suffers from all of the normal problems of a monopoly. Even a not-for-profit monopolist will lack incentive to improve the product or to run the operation efficiently. A for-profit monopolist will charge high prices to the detriment of social welfare. In the olden days, the technology was such that the NYSE was an almost natural monopoly. As the saying goes, liquidity attracts liquidity, and the old NYSE had a huge network advantage over everyone else because it had the liquidity that investors sought.

¹² See <http://www.sec.gov/rules/sro/nms.shtml#4-631> for details.

¹³ See <http://www.sec.gov/rules/final/2010/34-61595.pdf> for details.

¹⁴ See <http://www.sec.gov/rules/sro/bats/2012/34-67090.pdf>. Indeed, note that the market-wide circuit breakers were done as rule filings by 16 separate SROs. See SR-BATS-2011-038; SR-BYX-2011-025; SR-BX-2011-068; SR-CBOE-2011-087; SR-C2-2011-024; SR-CHX-2011-30; SR-EDGA-2011-31; SR-EDGX-2011-30; SR-FINRA-2011-054; SR-ISE-2011-61; SR-NASDAQ-2011-131; SR-NSX-2011-11; SR-NYSE-2011-48; SR-NYSEAmex-2011-73; SR-NYSEArca-2011-68; SR-Phlx-2011-129. This is another example of the absurd fragmentation of our regulation among SROs.

¹⁵ For more technical comments on circuit breakers, see my comment letter at <http://www.sec.gov/comments/sr-bats-2011-038/bats2011038-2.pdf>.

In order to prevent monopoly there is a need for competition. And the profit motive is a great motivator for competition. That gives us a world of competing for-profit exchanges.

Fortunately, the computer revolution has changed the economics of the equity exchange business. An equity exchange is no longer a natural monopoly, but a hotly competitive enterprise. Low cost and high speed communications have neutralized most of the network advantage of the dominant exchanges, making it possible for entrants to enter the business.

The United States is not alone in adopting this structure. Most developed countries are moving toward market structures in which for-profit entities compete with each other. The European approach expressed in MIFID (Markets in Financial Instruments Directive) is an example.

Some observers claim that the current market structure is a result of Regulation NMS, which was passed by the SEC in 2005. However, NMS merely codified and updated a number of rules. What was significant, was that it extended trade-through protection to NASDAQ-listed stocks, which did not have it before, and it provided trade-through protection only to orders that were electronically accessible, which forced the NYSE to more fully automate its systems.¹⁶

For the record, here is an oversimplified summary of NMS (CFR §§ 242.600 through 242.612):

Rule 601: All trades in NMS stocks must be reported to the consolidated tape.

Rule 602: Each exchanges best bids and offers must be reported so that the consolidated National Best Bid and Offer (NBBO) can be calculated.

Rule 603: Brokers must display consolidated trade and quote information to clients. They can't just give out the data from only one exchange.

Rule 604: Dealers must display customer limit orders to the market.

Rule 605: Market centers must report execution quality statistics.

Rule 606: Brokerage firms must report each quarter how they route customer orders and what kind of payment for order flow they receive.

Rule 607: Brokers must disclose payment for order flow to customers.

Rule 608: Exchanges work together to form NMS plans.

Rule 609: Securities Information Processors (SIPs) must register on Form SIP.

Rule 610: The access fee (take part of maker-taker) is limited to \$.003 per share. Locked and crossed markets are prohibited.

Rule 611: Exchanges must have policies to prevent trade throughs.

Rule 612: The tick size for all stocks over \$1.00 is \$.01.

Recommendations to Congress

1. Start the debate to fix regulation.

This will be a long and sometimes painful process that will take many years. Even though pessimists will say that nothing will be passed due to partisan gridlock, or that an SEC-CFTC merger is impossible because the various committees do not want to give up their oversight powers, we need to start the process now. Reform will not occur unless the debate begins.

Congress should direct all of the Federal regulatory agencies and self-regulatory organizations such as FINRA to conduct thorough studies of the structure and effectiveness of regulation and make suggestions for reforms that 1) simplify the currently complex and overlapping regulatory system, 2) reduce unnecessary compliance costs, 3) provide usable rights of appeal for high-handed regulatory action or inaction, 4) enhance consumer protection, and 5) enhance economic efficiency and capital formation. Although these goals sometimes appear to conflict, we need to start the process now.

Congress should also fund a study similar to the U.K. Foresight project in which experts from around the world are invited to submit studies on the relevant topics.

Of course, there should be lots of hearings as part of this debate.

¹⁶ A trade-through occurs when one exchange trades at a price even though another exchange was quoting a better price. I commented at the time, and still believe, that a trade-through rule that prevents trade throughs is unnecessary. The economic incentives pushing brokerage firms to get the best price for their customer are so overwhelming that they can and do go to the market with the best price. A trade-through rule just adds significant complexity to the market network with little improvement in market quality.

However, this process should also closely examine experience around the world. We did not invent financial regulation. We copied much of the U.S. system from the U.K. many years ago. Congress should explicitly study the experience of other countries around the world to see what we should do here. In particular, there has been a lot of fresh thinking in Europe as the Europeans struggle to harmonize their regulation, and we can learn from their debates as well.

2. Consider functional-based regulation.

Currently, our regulatory system is a hodgepodge of institutional-based regulators. However, financial services spill across these institutional boundaries, leading to many overlaps and gaps. We should seriously consider a functional-based system with regulatory bodies based on function rather than institution. We would thus have a markets regulator, a consumer protection regulator, a solvency regulator, a guarantee fund, and so forth.

3. The role of SROs needs to be rethought.

This debate should include a thorough examination of the SRO model. The current SRO model came about as part of a political compromise during the creation of the SEC. The industry would regulate itself through exchange-based SROs, and the SEC would regulate the SROs. This moved part of the cost of regulation off the Federal budget, and provided some industry input into the result. Since the NYSE was the dominant exchange, it regulated exchange member firms and the NASD regulated the rest. This worked well for many years. However, in a world with competing trading platforms, there needs to be a market-wide regulator. Although FINRA has become the *de facto* market wide regulator, its role should be examined carefully.

4. Put the SEC and CFTC in the same buildings.

The SEC and CFTC in particular should integrate their operations. Even if a full merger is not yet politically feasible, placing the agencies in the same buildings with shared common facilities will enhance cooperation between the agencies.

5. Move the locus of SEC/CFTC operations from DC to NY and Chicago.

Our regulatory agencies have problems attracting enough good people with industry experience. These people are usually found in New York and Chicago, and are often unwilling to uproot their families for the kind of salaries the Government offers. By moving most operations to our financial centers, the SEC will be able to hire people who know where the bones are buried, and more closely and personally monitor the industry.

6. Fully fund the SEC budget with close oversight of how the money is spent.

We have been pennywise and pound foolish in how we fund the SEC. We have gotten what we have paid for. The sum total of every dollar spent on the SEC since its founding in 1934, even grossed up for inflation, is less than investor losses from one Bernie Madoff. A properly functioning agency will more than pay for itself with lower compliance costs for law abiding citizens, faster and more efficient capital raising, and fewer investor losses due to fraud. However, the SEC has a history of misallocating resources in the past. Congress should specify carefully where the money should be spent and follow up on the results.

7. Monitor the qualifications of the people in the regulatory agencies.

One longstanding problem with the SEC is that it has plenty of lawyers but an insufficient number of people with other necessary qualifications. Congress should demand regular updates from regulatory agencies on the nature and qualifications of the staff. In particular, every time a regulator testifies before you, I suggest asking the following questions:

- a) How many people are working on this issue?
- b) How many of them have two or more years of industry experience?
- c) How many of them have passed a FINRA exam such as Series 7?
- d) How many of them have degrees in:
 - a) Economics or business?
 - b) Engineering or computer science?
- e) How many of them have professional certifications such as CFA or CPA?

8. Monitor the speed of execution, but watch out for games.

One of the major problems with the SEC is the slow speed with which it operates. The slowness of its operations is a major impediment to investor confidence. While accuracy is more important than speed, speed is nonetheless important. The SEC's

lawyer-dominated culture feels that the glacial progress of judicial and legislative processes is appropriate for regulation, when in fact it is wholly inadequate in the modern world. The SEC needs to have a cultural change so that it recognizes that delay is costly to the country.

Congress has repeatedly attempted to address this issue by providing deadlines for the SEC to respond. The SEC repeatedly misses these deadlines with seeming impunity, while misallocating resources to other nonmandated areas. However, Congress needs to be very careful that the SEC does not play VA-style games with the numbers.

Congress needs to demand statistics from regulatory agencies on the length of time that an agency is taking on various areas. For example, Congress should expect and pay attention to statistics on the status of mandated rulemakings, length of investigations in process, SRO rule filings, and no-action letter requests.

9. Create a Serious Fraud Office to prosecute criminal financial offenses.

It was a great disappointment to me and others how few criminal prosecutions occurred subsequent to the financial crisis.¹⁷ Currently, the SEC only has civil jurisdiction and must turn over criminal cases to the Department of Justice. However, DOJ has many other responsibilities, and it is understandable that terrorists and gangsters will be their top priority. A separate agency focused only with prosecuting financial fraud will be able to develop expertise in complex financial fraud will leaving financial fraud FBI *et al.* get distracted by going after terrorists and truly bad guys.

10. Encourage agencies to provide more status information to tipsters.

The agencies should be encouraged to be more open with tipsters and complainants about the status of investigations. I can attest from personal experience that it is extremely frustrating to receive no follow up after submitting a tip. A simple follow up message to the effect of “The case is still open” or “We plan no further action at this time” would help to increase investor confidence in the integrity of the system by letting them know that something is being done with their complaints.

11. Open an investor advocate offices in or attached to every State and Congressional district.

As Members of Congress, you are well aware of the numerous complaints that you get from frustrated citizens with regard to financial matters. Often citizens are so confused by the overwhelming alphabet soup of Federal and State agencies that they don’t know where to turn for help. A properly funded financial ombudsmen type office attached to every Senator or Representatives office would provide appropriate guidance to help citizens navigate the regulatory maze. The office would also follow up on cases to make sure that they do not get the Bernie Madoff and John Mack treatments. This will increase investor confidence because investors will feel heard and have a sense that their tips are getting a proper investigation.

12. Continue to build a culture of evidence-based rulemaking at Federal regulatory agencies.

The forthcoming pilot experiment with regard to tick size is a great step forward. It is sad that once again it took Congressional action to prod the SEC to do something it could and should have done on its own volition. The Congress should encourage a culture of evidence-based rulemaking through carefully designed pilot experiments. I have heard that there is some concern at the SEC that the agency may not have legislative authority to conduct properly randomized scientific pilot studies. Congress should clarify the relevant statutes to indicate that the SEC does indeed have such authority.

13. Amend the APA to require agencies to look at how other countries and other entities address similar issues.

Many agencies have an insular culture that does not naturally explore how other entities deal with similar problems. This is a mistake. We do not have to keep reinventing the wheel. The Administrative Procedures Act should be amended to require each rulemaking to explicitly address how other countries and other entities have addressed similar issues. This is particular important given the global nature of financial services, and the need to work with other regulators. Explicitly examining how other regulatory entities address a problem makes it more likely that we will adopt a similar approach, leading to a more uniform global regulatory environment and thus reducing compliance costs.

¹⁷ See <http://www.justice.gov/oig/reports/2014/a1412.pdf>.

PREPARED STATEMENT OF TOM WITTMAN
EXECUTIVE VICE PRESIDENT AND GLOBAL HEAD OF EQUITIES
NASDAQ OMX GROUP, INC.

JULY 8, 2014

Thank you Chairman Johnson and Ranking Member Crapo for the opportunity to testify today on “The Role of Regulation in Shaping Equity Market Structure and Electronic Trading.”

Thanks to the efforts of SEC Chairman Mary Jo White, the debate as to *whether* we change our equity market structure is over. The SEC has launched an evaluation of what changes are needed and has taken a first step by releasing the guidelines for the creation of special market structures for a range of smaller stocks known as the Tick Size Pilot. We support Chair White’s efforts which also include the launch of a series of efforts to evaluate more holistically the broader market structure and to take action to ensure robust regulation of all participants in the markets. These are all positive developments that NASDAQ OMX absolutely endorses.

Now it is time for us to talk about solutions.

We agree with Chair White that our markets are not rigged, but, are indeed the strongest capital markets in the world. And we at NASDAQ OMX have been dedicated to ensuring fair access to all investors in our marketplace and view fair access as a hallmark of our organization. Let me be clear, NASDAQ OMX endeavors to ensure everyone has a fair and equitable experience with us, and we fully support any effort to ensure that there is fairness and transparency in the market. While we are firm in our belief that the U.S.-licensed exchanges provide a fair and highly efficient market platform, we agree with many others that the markets are complex today. And, while that complexity can bring benefits to participants, we agree that it also brings a need for regular examination. When appropriate, we should move quickly to update the market rules consistent with the Exchange Act principles of fairness and transparency. *As an exchange, we believe that the bedrock principle for well-functioning and fair markets is the need for robust price discovery*—and transparent price discovery is at the center of what exchanges do for our economy.

Special Role of Exchanges:

Companies like Comcast, Cisco, GoPro, Intel, AmGen, Celgene and Mylan use capital they raise from listing on The NASDAQ Stock Market (NASDAQ) to finance their missions of making cutting-edge products that transform lives and industries. The public trading of these companies allows Americans to invest in and participate in the American Dream, and allows companies to understand the value of their company and raise additional capital by issuing new shares. With financing provided by the public markets, these companies create millions of jobs and bolster the American and global economies. We see tangible evidence of this, from Silicon Valley to the Northern Virginia high tech corridor and in my home State of Pennsylvania.

An exchange listing is a valuable asset to a company’s livelihood. The iconic public companies that your constituents recognize, such as, Apple, Microsoft, Google, eBay and Amazon, must provide broad and deep transparency regarding their operations; they must satisfy exchanges’ listing standards; and they remain continuously subject to exchange rules protecting investors against corporate fraud and abuse. Exchange listed companies have an ongoing responsibility to maintain high financial, operating, and governance standards, which are rigorously enforced by the exchanges, to ensure investor confidence.

Equity exchanges in the United States are uniquely entrusted with the important responsibility of being a catalyst for growth and wealth creation. After the IPO, exchanges have a continuing role in fostering price discovery and transparency. By allowing investors to come together in an efficient and open manner, we enable them to discover the price at which these public companies can be bought and sold throughout each trading day. Exchanges, like NASDAQ, then disseminate those prices for your constituents to see on television, online and in newspapers. Exchange equity quotes create the reliable reference price for all trading. Exchange quotes are a byproduct of the SEC-approved rules and robust regulatory systems that equities exchanges must develop and enforce to protect investors and to provide lit and orderly markets. We fully disclose and seek SEC approval of all of the policies and practices that we use to operate our markets.

Market Structure:

Now we turn to the details regarding the processes and mechanisms within the U.S. market system used to create a transparent market. First, with regard to order types, NASDAQ OMX supports the Chair’s call for a thorough review of existing order types, which highlights the difference between exchanges and lighter regu-

lated ATSS. Each venue (exchange or broker owned) has its own systems and procedures and each competes for orders from brokers and ultimately investors. Each venue has its own order types and each is continually talking to market participants to develop new order types that satisfy the needs of the marketplace.”

Unlike less-regulated ATS trading venues, including dark pools, when seeking to launch a new order type, NASDAQ was subject to a rigorous process to define, design, evaluate, explain and obtain SEC approval of order types. As an exchange we are required to expose innovative ideas to the market through the notice and comment process. We were subject to public scrutiny and examination of our ideas by our competitors. This process often undermines the benefits of our innovation, allowing our competitors, particularly those who are less regulated, time to potentially mimic our ideas before we even had our ideas approved. This is one of the costs of maintaining an SRO license. For the sake of transparency and to help members understand our order types, we have posted on our Web site a list and a plain-language description of all of NASDAQ’s order types.

Turning to the issue of dark pools, many of our concerns with today’s fragmented market structure are the direct result of layers of iterative market structure decisions that have built up through the years when SEC approval was based upon the technological and market needs at the time these rules were proposed and approved. Many current problems with our markets stem from well-intentioned regulations like Regulation ATS and Regulation NMS, which sought to promote competition and to resolve tensions between electronic and floor-based trading. But, regulations cannot be adopted and forgotten; they must evolve as conditions change. Regretfully, over time Regulation ATS and Regulation NMS have led to a significant increase in dark trading, which denies market participants a clear view of trading interest in a given stock—preventing the full strength of supply and demand to determine price. The latest dark trading data available to us from Rosenblatt for June indicates that almost 40 percent of all trading in our markets was done away from the lit exchanges.

While alternative trading venues certainly have an appropriate role within a well-functioning market, we strongly believe that the current trend toward dark trading as the market’s default setting is an unhealthy phenomenon. The United States is not alone in its challenges with dark trading. Other countries are adapting their rules to address the concern that dark trading reduces the fairness and transparency of the markets. Specifically, Canada modified its market structure to limit dark trading and to maximize price discovery and the EU has included a regime for capping the level of dark trading in its recent MIFID policy changes. It’s time for the United States to update Regulation NMS, and we can benefit from examining other countries’ efforts to determine a structure that could work within our own markets.

On the topic of high frequency trading, NASDAQ supports Chair White’s call to have all high frequency trading firms register. While we have not seen the details, we believe there are benefits in the SEC assuming a broader role and to lay the groundwork for greater transparency into all trading activity. Many in the public arena have attacked high frequency trading as a business model. We encourage and support a thorough analysis of the subject in order to reach a rational conclusion. In our view, high-frequency firms that are registered broker-dealers—whose primary function is as a regulated market-maker—offer the valuable service of providing liquidity throughout the trading day, which stabilizes pricing in the market and aids in price discovery. However, what we know from experience is that our industry, no matter the business model, will always attract individual players who cross the line. They forget the true purpose of the markets, and they find opportunities to exploit them. The role of NASDAQ, the other licensed, regulated exchanges, FINRA (the Financial Industry Regulatory Authority), and the SEC is to surveil the market and identify those individual ‘bad actors.’ We will continue to be vigilant in serving that critical industry function.

Systems Resiliency:

Another area of focus in recent years has been the resiliency of the systems that underpin the U.S. markets. At NASDAQ OMX we are focused every day on how to improve our markets and make them more resilient and robust. We recognize that past events across the markets, including our own, may have harmed investors’ confidence in the U.S. markets. We are extremely focused on identifying and mitigating risks in our systems and infrastructure, as well as in the interconnectivity across the markets. Providing resilient and robust markets is critical for efficient capital formation, investor confidence, and job creation. We are confident we can provide that resiliency. In this area we are engaged in many efforts to be a catalyst for positive change. For example, we recently implemented so called “Kill Switch” to pro-

vide another backstop against a computer incident going from a localized issue to a market-wide problem.

The role of exchanges is more important than ever in today's challenging environment. And yet, market complexity continues to create new risks that we are constantly working with other market participants and the SEC to address. Investor demand and the nature of regulatory complexity have made U.S. markets lightning fast, fragmented and deeply inter-connected. This complexity has added many more friction points where mistakes can occur.

That's why NASDAQ OMX favors the adoption of Regulation SCI, which the Chair highlighted in her recent public remarks. The U.S. market is only as strong as its weakest link. To protect investors, all market participants and trading venues—not just exchanges—must be subject to rigorous standards of technology design, testing, and implementation. While NASDAQ OMX favors the expansion of protections that Regulation SCI will bring to some ATSs and brokers, in our view the obligation should be expanded further to include all ATSs because every ATS poses a systemic risk to a tightly linked market.

The SEC deserves credit for its leadership through recent, challenging times. In the aftermath of the May 6th, Flash Crash, the SEC and the exchanges worked quickly and cooperatively to devise new protections to keep trading errors from spreading too rapidly or inflicting unacceptable harm on the overall market. The exchanges reformed their rules for breaking trades, instituted single stock circuit breakers, updated market-wide circuit breakers, and implemented the Limit Up/Limit Down mechanism. NASDAQ OMX has also, on its own, developed tools to help broker-dealers manage their obligations under the Market Access Rule.

At NASDAQ OMX we are passionate about and steadfast in the role we play in capital formation and improving the performance of the economies we serve. We think that the SRO model and U.S. market structure have been effective in protecting investors over many decades. But as technology and the inter-relation among all traded asset classes evolve, so too must the regulatory environment in which the markets operate. If it does, we will continue to protect investors, transparently set prices for the stocks of our listed companies, and support our economy through highly efficient capital formation and job creation. All of our employees, including our CEO work hard to deliver a dependable, fair and safe environment for investors and to fuel the U.S. economy. We look forward to working with this Committee. Thank you for your invitation to testify. I look forward to your questions.

PREPARED STATEMENT OF JOE RATTERMAN

CHIEF EXECUTIVE OFFICER, BATS GLOBAL MARKETS, INC.

JULY 8, 2014

Thank you and good morning. My name is Joe Ratterman, Chief Executive Officer of BATS Global Markets, Inc. ("BATS"), and one of the founding employees. I am pleased to be here and want to thank Chairman Johnson, Ranking Member Crapo, and the entire Banking Committee for inviting me to testify on matters related to the U.S. equity market structure. This Committee has played a leading role in the development of the securities laws over the past 80 years, and I appreciate the attention to these timely and important issues related to our capital markets.

BATS was a startup less than a decade ago, formed in 2005 in response to a competitive void that emerged in the U.S. equity markets. The NYSE and NASDAQ had acquired the first generation of efficient, technology-oriented exchange competitors, namely Archipelago, Inet (which reflected the merger of Instinet and Island), and Brut. In the face of this exchange duopoly, BATS stepped into the competitive void, launching as a small alternative trading system ("ATS") from a north Kansas City storefront in January 2006. In January of this year, we merged with Direct Edge, an innovative exchange operator that was similarly formed in 2005 to enhance competition among markets.

BATS remains headquartered in the Kansas City area, and maintains offices in New York, New Jersey, and London. With approximately 300 employees globally, we compete vigorously every day in the United States and Europe to earn our customers' business and trust. We have leveraged technology to significantly reduce execution costs for all investors and deliver innovative products and services to market participants.

I agree with the sentiments recently expressed by SEC Chair Mary Jo White, who said that our markets are “not broken, let alone rigged.”¹ Academic and empirical evidence overwhelmingly demonstrates that the automation of the market over the last decade or more has resulted in significant enhancements in market quality for long-term investors, whether retail or institutional. But like Chair White and her fellow commissioners, I recognize that our markets are not perfect; indeed, the search for perfection is a never-ending quest. As exchanges, we are not only competing market centers, but also regulators and, therefore, approach these issues with utmost seriousness. Because of this, I am particularly grateful to be here today and have the opportunity to share my views.

I. Background

In 1975, Congress amended the Exchange Act of 1934 (“Act”) to adopt Section 11A, which was designed to facilitate the establishment of a national market system to link together the multiple individual markets that trade securities. Congress intended for the SEC to take advantage of opportunities created by advancements in technology to preserve and strengthen the securities markets. By leveraging technology, our national market system is designed to achieve the objectives of efficient, competitive, fair, and orderly markets that are in the public interest and protect investors.

In response to this Congressional mandate, the SEC has adopted various rules since 1975 to further the objectives of the national market system, including the order handling rules in 1997, Regulation ATS in 1998, decimalization in 2000, and Regulation NMS in 2005. Many of the innovative structural characteristics of our market owe their existence to Congress’ 1975 amendments to the Act, and subsequent SEC rulemaking in furtherance of those amendments.

Our national market system is premised on promoting fair competition among individual markets, while at the same time assuring that all of these markets are linked together in a unified system that promotes interaction among the orders of buyers and sellers. The national market system thereby incorporates two distinct types of competition—competition among individual markets and competition among individual orders—that together contribute to efficient markets. Vigorous competition among markets promotes more efficient and innovative trading services, while integrated competition among orders promotes more efficient pricing of individual stocks for all types of orders, large and small. Together, they produce markets that offer the greatest benefits for investors and listed companies.

In adopting Regulation NMS, the SEC stated that its primary challenge in facilitating the establishment of the national market system has been to maintain the appropriate balance between fostering competition between markets and fostering competition between orders; mandates that at times come into conflict. The SEC further stated that it attempted to avoid the extremes of: (1) isolated markets that trade securities without regard to trading in other markets, and (2) a totally centralized system that loses the benefits of vigorous competition and innovation among individual markets. The SEC navigated these extremes by allowing market competition, while at the same time fostering order competition through the adoption of the order protection rule, which prohibits markets from trading without regard to the prices posted on other markets.

As a result, today we have an equity marketplace that is widely considered to be the most liquid, transparent, efficient and competitive financial market in the world. Costs for long-term investors, both institutional and retail, in the U.S. equity marketplace are among the lowest globally and these gains in market quality have been noted by academics, institutional buy-side investors, and agency brokers:

- In April 2010, *Vanguard* noted that estimates of declining trading costs over the previous 10 to 15 years ranged from a reduction of 35 percent to more than 60 percent and stated that Vanguard’s own experience was in line with that range. Reduced trading costs, as Vanguard noted, flow directly as a “substantial benefit to investors in the form of higher returns.”²
- In June 2013, three economists, including former SEC Chief Economist Larry Harris, found a dramatic change in the spread for NYSE-listed and Nasdaq-listed stocks over the preceding 12 years. In particular, between 2001 and 2013,

¹ Mary Jo White, Chair, SEC, Enhancing our *Equity Market Structure* (speech given at Sandler O’Neill & Partners, L.P. Global Exchange and Brokerage Conference, New York, NY, June 5, 2014).

² See Letter from George Sauter, Managing Director and Chief Investment Officer, Vanguard Group, Inc., to Elizabeth M. Murphy, Secretary, Securities and Exchange Commission, dated April 21, 2010.

*the spread paid by investors had decreased from more than 6 cents to below 2 cents for NYSE-listed stocks and from above 5 cents to below 3 cents for Nasdaq-listed stocks.*³

- In April 2014, *Blackrock* noted the same positive trends in their assessment of market structure performance since 1998, stating that *bid-ask spreads have narrowed significantly and that institutional trading costs have declined and are among the lowest in the world.*⁴
- In June 2014, *ITG's Global Cost Review Report* further confirmed the decline in institutional trading costs, noting that from Q3 2009 to Q4 2013, *implementation shortfall*⁵ costs decreased from roughly 45 basis points to 40 basis points. (This decline followed a drop from 63 basis points in Q3 2003).⁶

Further, our market is able to handle volume and message traffic considered astronomical only a few decades ago, and the efficient operation of this market throughout the recent financial crisis and resulting volatility should serve as a reminder of the systemic risks that have been reduced as a result.

Despite the overall high quality of our equity capital markets today, we must remain focused on identifying areas in which market quality and stability can be improved and regulators should consider responsible, data-driven regulatory action where appropriate. In this regard, we are encouraged by the SEC's plan for a continuous and comprehensive review of the state of our market structure, and we appreciate the Banking Committee's oversight. Such a review is timely because the aforementioned changes, particularly those following from the implementation of Regulation NMS in 2007, reflect a relatively recent and dramatic evolution in the manner in which securities trade.

We should always strive to improve market quality, but should act only when we can be sure to avoid disrupting or reversing the substantial improvements in market quality we have experienced. While it has been widely recognized that retail investors have benefited the most from improvements in market quality over the last decade, I also believe institutional investors have experienced measurable benefits in the form of the above-referenced reductions in implementation shortfall costs. That said, I recognize that institutional investors continue to face challenges in executing large orders with a minimum of market impact. To be sure, finding a "natural" investor or liquidity provider willing to take the opposite side of a well-informed institutional investor's order is a complex problem to solve regardless of market structure.

Policymakers looking to reform our equity market structure must be cognizant of the concern that enacting rules that tip the scales for or against particular market constituents runs the very real risk of negating benefits currently delivered by our equity markets. Therefore, we advocate for responsible and carefully crafted changes supported by reliable data and perhaps even tested through pilot programs of sufficient duration to obtain data that adequately demonstrates the impact of the change.

II. Speed of Today's Markets

There has been much commentary of late regarding the speed at which our equity market operates, and the benefits and risks associated with that speed. It is certainly true that today's fully automated equity market is capable of processing order messages in timeframes that were unthinkable a decade ago. These gains in speed (or reductions in latency) have been made possible by advances in the computer hardware and software that underpin the equity market structure, as well as innovations by industry participants.

The increasing speed at which equity trading occurs is but another dimension of how technology has improved the efficiency of our markets. Whether trading as an investor or acting as a market maker, time equals risk, and execution speed reduces that risk and the costs associated with it. This risk mitigation benefits all investors in the form of a lower risk premium, expressed as tighter spreads and lower overall transaction costs. Importantly, these benefits are quantifiable; as noted above, the

³See Angel, James J., Lawrence E. Harris and Chester S. Spatt, "Equity Trading in the 21st Century: An Update" (June 21, 2013), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1584026.

⁴See BlackRock, "U.S. Equity Market Structure: An Investor Perspective" (April 2014).

⁵ITS defines Implementation Shortfall cost as the difference, or slippage, between the arrival price and the execution price for a trade.

⁶See ITG, "Global Cost Review Q4/2013" (June 6, 2014), available at http://itg.com/marketing/ITG_GlobalCostReview_Q42013_20140509.pdf; see also Speech by Chair Mary Jo White: Enhancing Our Equity Market Structure. (June 5, 2014)

evidence shows a market that has experienced declining spreads for retail investors and declining implementation shortfall costs for institutional investors.

Long-term investors are the primary beneficiaries of this risk mitigation through the narrowing of spreads. Both institutional and retail investors have access to tools that leverage the benefits of these improvements in speed. For example, institutional investors can and regularly do utilize trading algorithms programmed on brokers' servers co-located within market centers. And, retail investors accessing real-time market data can act on trading decisions from their brokers' Web sites and receive an execution report within a matter of seconds or even less, at a price at or better than the national best bid and offer ("NBBO") prevailing at the moment the trade was placed, and with a commission rate of less than \$10. This result is widely taken for granted today, but it was not that long ago when retail orders were processed much slower, with much less certainty of outcome, and at commission rates considerably higher than those today.

It is not readily apparent why regulators should be particularly concerned about the extent to which firms are willing to pay for tools that help them achieve increased speed. It stands to reason that if the marginal cost of gaining additional speed exceeds the marginal benefit, firms will decide not to spend the money seeking that gain. As a practical matter, it is worth noting that we are probably reaching that point now.

That said, there are risks and concerns associated with the speed of trading that warrant managing and addressing. Differentials in speed associated with the dissemination of market data may create perceptions of unfairness. Because of the flexibility of our national market system for market data, it is in many ways the fairest in the world. With side-by-side competition between a nationally consolidated feed and direct feeds from multiple exchanges, market participants pay only for the content and related infrastructure they actually need. Given that quote and trade information serve multiple needs ranging from real-time trading data to back-office reference information to news and information, providing multiple products through multiple sources meets the needs of market participants in a diverse, constructive, and efficient fashion.

Nonetheless, there remain perceptions that differences in content and speed of dissemination confer unwarranted advantages on select market participants. And perceptions affect investor confidence about the integrity of the markets, so I take them very seriously. While Rule 603 of Regulation NMS dictates that exchanges do not release market data to private recipients before disseminating that data to the public securities information processor ("SIP"), differences in content and downstream technologies can still create a perception of unfairness.

To address this perception issue most effectively, exchanges should continue to strive to make the dissemination of consolidated data through the SIPs as fast as possible, and should consider including aggregated depth-of-book data per exchange based on industry demands.

Perceptions of unfairness are also present with respect to the market data exchanges use in their matching engines and routing infrastructure to calculate the NBBO. Some have suggested that exchanges using the SIP data to calculate the NBBO provide unfair opportunities to sophisticated traders engaging in risk-free latency arbitrage. Exchanges historically have used SIP data to determine the NBBO with the changeover to direct feeds being a relatively recent phenomenon. While that change yields an optimization in the speed with which quotes can update, there are reasons why that optimization is not as significant at an exchange as the difference in the speed between the SIPs and direct feeds. Specifically, this is because exchanges accept intermarket sweep orders ("ISOs"), which can display on an exchange at a price from the SIP data that appears to lock another exchange's quote. The ISO designation on an order tells the exchange that the sender has either sent an order to execute against the locking quote or that the sender has a faster view of the market and knows that the locking quote no longer exists. Therefore, when SIP data is augmented by ISOs, exchanges are able to update the quote in their matching engines nearly as fast as direct feeds update.

III. Conflicts of Interest

Certain practices surrounding broker agency relationships, such as payment for order flow and soft dollar arrangements, as well as exchange fee structures create the potential for conflicts of interest; however, I believe these potential conflicts of interest can be and generally are managed by vigorous oversight within broker-dealers, and can be supplemented through additional transparency as well as oversight and enforcement by FINRA and the SEC. For example, I believe institutional investors could benefit from additional transparency about the ATSS to which their brokers route orders. I support the voluntary initiatives of some ATSS to make public

their Form ATS, and additional steps could be considered to require ATSs to provide customers with their rules of operation, which would include order types, eligible participant and participant tiers, all forms of data feed products, and order-routing logic and eligible routing venues. With this information, institutional investors would be better positioned to determine which trading venues best meet their trading needs, and compare disparate broker product and service offerings.

Moreover, I support reviewing current SEC rules designed to provide transparency into execution quality and broker order routing practices. In particular, Rules 605 and 606 of Regulation NMS require execution venues to periodically publish certain aggregate data about execution quality and require brokers to publish periodic reports of the top 10 trading venues to which customer orders were routed for execution over the period, including a discussion of any material relationships the broker has with each venue. Publication of this data has helped better inform investors about how their orders are handled.

Nonetheless, these rules were adopted nearly 15 years ago⁷ and the market has evolved significantly enough to warrant re-examining whether additional transparency could be provided that would benefit investors. For example, advances in technology now permit significant market events to occur in millisecond timeframes, and audit trails are granular enough to capture that activity. However, the current requirements of Rule 605 effectively allow a trading venue to measure the quality of a particular execution by reference to *any* national best bid or offer in effect within the 1-second period that such order was executed. Given the frequency of quote updates in actively traded securities within any single second, compliance with this requirement may not in all cases provide adequate transparency into a particular venue's true execution quality. In addition, the scope of Rule 605 could be extended to cover broker-dealers, and not just market centers. Transparency could further be improved by amending Rule 606 to require disclosure about the routing of institutional orders, as well as a separate disclosure regarding the routing of marketable and nonmarketable orders.

Some have suggested that exchange fee structures may be the source of unmanageable conflicts of interest associated with order routing decisions. The dominant exchange pricing mechanism over the last decade has been the so-called maker-taker model, which generally encourages liquidity makers to take the risk of exposing an order in the marketplace by paying them a small rebate, if and only when their order is executed. Under Regulation NMS, exchange fees to access—or “take”—liquidity are capped at 30 cents per 100 shares, which effectively serves as a cap on the rebate that can be paid to liquidity makers.

These rebates provide an effective incentive to encourage liquidity makers to post tight bid-offer spreads, which benefit all investors. I believe restricting incentives to provide liquidity could be counter-productive. Whether it is banning the current maker-taker fee structure, limiting payment for order flow generally, or other attempts to alter the fundamental economics of trading, price controls are a blunt instrument likely to cause disruptions and consequences that are unforeseeable and potentially detrimental to all types of investors. I am concerned that additional pricing restrictions could drive significantly more volume to dark venues or order types, make the compensation brokers receive for their liquidity far less transparent, and widen the displayed bid-ask spread in a manner that effectively taxes all investors. Efforts to avoid these potential consequences could lead to a set of regulations so complex that the root cause of future behaviors could never fully be known.

IV. Venue Complexity—How Many Is Too Many?

Competition and automation have combined to dramatically improve the market's trading infrastructure. The low commissions, diversity of products and ability to handle large order and trading volumes are a direct result of these forces. Regulation ATS and Regulation NMS provided a framework for this competition to thrive, and maintaining a system whereby new entrants can prove their value to the market is essential. At the same time, we need to reconsider where regulation may artificially subsidize competition or encourage complexity that does not address a market need.

In particular, all exchanges are given a significant competitive advantage regardless of their size by virtue of the order protection rule under Regulation NMS. While this was necessary in an era where legacy exchanges routinely ignored their competitors, current practices have reduced the need for regulatory protections of smaller venues. Recent events provide evidence that market forces ultimately can correct for venues that add only marginal value; the existing concentration of exchanges

⁷ Exchange Act Release No. 43590 (Nov. 17, 2000) (Rules 605 and 606 were originally adopted as Rules 11Ac1-5 and 11Ac1-6, respectively, under the Exchange Act).

among scale providers—including BATS—means that in some cases the marginal operating cost for a “new” exchange is near zero. The cost and complexity of connectivity to a small venue for market participants, however, can be substantial.

Accordingly, Regulation NMS should be revised so that, until an exchange achieves greater than a *de minimis* level of market share, perhaps 1 percent, in any rolling 3-month period:

- They should no longer be protected under the order protection rule; and
- They should not share in/receive any NMS plan market data revenue.

The combination of these two provisions would: (a) potentially reduce client costs in connecting to small exchanges, giving them the flexibility to route around them should they so choose, while still protecting displayed limit orders on all venues of meaningful size; and (b) take away market data revenue that may be the basis for the continued operation of marginal venues.

V. Order Type Complexity—Drivers and Solutions

While I am sensitive to concerns about the complexity of our markets, the vast majority of market functionality exists because it meets the needs of a diverse group of market participants.⁸ Functionality becomes counter-productive when it exists solely to address arcane or trivial requirements, rather than addressing important economic, operational or regulatory needs of market participants. This is especially true when the level of complexity is high in relation to the supposed benefits.

One such driver of excessive exchange complexity is rooted in an often-overlooked provision of Regulation NMS—the ban on locked markets. Price-sliding logic and other order types such as ISOs often stem directly from this discrete prohibition. Given that existing regulatory guidance already effectively prohibits locking a market for the sole purpose of avoiding or reducing fees, revisiting regulatory obligations in this regard could be a simple yet powerful way to materially reduce the complexity of exchange operations.

VI. Systemic Complexity—Strengthening Critical Infrastructure

Technology has undoubtedly transformed our market for the better, but it has also created new challenges and risks. Even in a market with fewer exchanges and fewer order types, the risk of IT or operational malfunctions will remain. Since 2010, the SEC and the industry have worked constructively to improve coordination and systemic risk management, from the implementation of Limit Up/Limit Down execution price bands to the enactment of the Market Access Rule to the harmonization of the standards for clearly erroneous trades. Taken together, these initiatives represent significant progress with respect to enhancing market stability.

This progress is measurable. According to the Financial Information Forum, exchange system issues as measured by self-help declarations have dropped more than 80 percent since 2007 and 2008, the first years after Regulation NMS. In addition, the number of clearly erroneous executions across the industry has dropped dramatically over the last few years. For example, clearly erroneous events reported on the BATS BZX Exchange in 2014 is on pace to be approximately 66 percent lower than 2013 and 85 percent lower than the previous 5-year average.

Further mitigating operational risk requires continuous vigilance and a flexible framework. More can and needs to be done with respect to critical market infrastructure as a whole, and by the individual institutions that actively participate in the markets. In particular, a well vetted and properly scaled Regulation SCI should be finalized and adopted with respect to exchanges, SIPs and clearance and settlement facilities. While the SEC should work with these future Regulation SCI entities to refine its requirements in a manner that will achieve the best outcomes, completing this regulation should be prioritized. I am encouraged by Chair White’s recent comments on her desire to finalize the proposal. This would strengthen market infrastructure truly deemed to be “critical” around industry best practices and help better manage the complexity that competition brings where it is needed.

VII. Conclusion

While our current equity market structure is certainly not perfect, I believe that it is by far the fairest, most efficient and most liquid market in the world. And because it is a complex ecosystem, policymakers need to be mindful of the potential unintended consequences of sudden, significant changes. I fully support the SEC conducting a deliberate, data-driven study of the quality of our market structure

⁸See e.g., Gregg E. Berman, Associate Director, Division of Trading and Markets, SEC, *What Drives Complexity and Speed of our Markets* (speech given at the North American Trading Architecture Summit, New York, NY, April 15, 2014).

and advocate for reforms where that analysis supports the likelihood for market quality improvement.

Thank you for the opportunity to appear before you today. I would be happy to answer any of your questions.

David Lauer

President and Managing Partner, KOR Group LLC

Testimony on "The Role of Regulation in Shaping Equity Market Structure and Electronic Trading"

The Committee on Banking, Housing, and Urban Affairs

July 8, 2014

Good morning Chairman Johnson, Ranking Member Crapo and members of the committee. Thank you for inviting KOR Group to testify this morning.

I'm here today on behalf of KOR Group and the Healthy Markets Initiative. KOR Group is a market structure research and consulting firm focused on data-driven analysis. We help firms in the industry understand market structure through research, web-based analytics and monthly reports. We also help buy-side firms navigate this complex market and reduce transaction costs. Healthy Markets is a non-profit initiative seeking to build consensus on substantive market structure reforms and to lead a coalition of firms to advocate for these reforms. Our platform is centered on five key concepts: Transparency, Metrics, Data Freedom and Technology, Displayed Liquidity and Competition. The coalition we are building consists of firms from across the industry, including exchanges and ATS's, buy-side firms, broker/dealers, investment banks and HFT market makers.

My name is David Lauer and I am the President and Managing Partner of KOR Group. My background is in technology, high-performance computing and the application of both to market structure. I have experience designing high-performance, low-latency trading platforms, engaging in quantitative analysis and high-frequency trading, and in public advocacy for market structure reform. This includes tenures with Allston Trading, Citadel Investment Group and Tervela and consultation for IEX Group. I have a Master's Degree in International Economics and Finance from Brandeis University. I grew up in Southern New Jersey.

Introduction

In our industry, we're used to hearing that "past performance is not indicative of future returns." Certainly, the same could be said about past technology and structural failures. As much as we like to think we're learning from our mistakes, these failures may tell us very little about the next crisis on the horizon.

"If a regulator cannot regulate a complex system, then what can it do? Will a regulator always be caught behind the curves of self-organization and emergence; holding a bag of obsolete rules that came from less evolved systems? Rather than a regulator, complex systems should have a co-evolver/counter-evolver. This must be an organization that has the requisite variety not only to have an idea of the complexity of the operational organization (and thus has to co-evolve with how that organization evolves), it should also have requisite variety to counter-evolve."

Sidney Dekker, Drift Into Failure

Today's markets bear little resemblance to those that existed and flourished in the United States in the latter part of the 20th Century. We operate under the terms of the Securities Acts, including the Securities Act of 1933, the Securities Exchange Act of 1934 and the Amendments of 1975 that established the National Market System. Few things about our markets function as they did then, or even as they did fifteen years ago.

While it is positive and fortunate that we have enjoyed such a rapid advance of technology, our regulatory framework has been left behind. The rules have been changed many times over the last fifteen years, most importantly with limit order display, decimalization, Reg ATS and Reg NMS, in an attempt to maintain pace or force changes in behavior. Our capacity for understanding the results of these rule changes and technology advances remains woefully dated. Out-of-date regulatory tools and inconsistent data availability and access for academics have prevented us from attaining a clear understanding of the impact of rule changes and technology.

Our markets are increasingly complex and the technology driving them increasingly sophisticated. By contrast, regulators have failed to embrace the language of Complexity or Systems Theory and the thoughts and principles behind it. Regulators are too focused on events, on short-term fixes and on a narrow view of the industry. Regulators and exchanges treat issues in isolation, whether the issue is order type complexity or SIP infrastructure failures, but all of these things are inextricably linked. This is well illustrated by William Young's (MIT) diagram on Systems Thinking¹:

¹ <http://psas.scripts.mit.edu/home/wp-content/uploads/2013/04/Leveson-tutorial-intro.pdf>



The issues that I will address in the written portion of my testimony aim to broaden the way that we collectively perceive the challenges of reforming market structure. The ideas expressed here are informed by the Complexity and Systems Theory, which recognize the interconnected nature of systemic failure and which consequently calls for a reconsideration of our current top-down approach to regulation. This calls for a strategy of addressing system-wide flaws, misaligned incentives and improper transparency/disclosure, rather than reacting to each technology failure with an endless sequence of fixes. Complex systems are not susceptible to ordinary cause-and-effect analysis, and each attempt to impose this type of analysis will mislead regulators into a false sense of security over having solved the most recent problem.

Regulators need to better define how they can use available tools to cope with this complexity. So do other market participants. Included here are two broad recommendations, the details of which I will discuss in my remarks. First, we need to revamp the SRO structure to make it more efficient, less conflicted and more data-driven. Second, we need to make data about what is taking place in the markets widely available and subject to scrutiny from a variety of sources. In combination, these changes will bring about better markets.

As such, this testimony recommends, and identifies as critical, the following priorities:

- Improved academic and regulatory understanding of market quality and improved access to data for study;

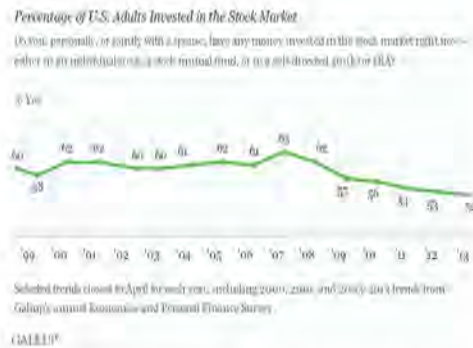
- Confrontation of massive market fragmentation;
- Regulatory oversight of dark pools;
- Stronger Best Execution requirements;
- Implementation of a trade-at rule; and
- Strengthening and improving surveillance capabilities at the regulatory level.

This is not to say that broker-dealers and other market participants bear no responsibility. All market participants need to self-police, need to commit themselves to fairness and transparency, and need to abide by the rules. Participants also need to be constructive in the process of upgrading and regulating our markets.

This testimony also includes follow-up commentary on the recommendations provided during my 2012 Testimony before the Subcommittee on Securities, Insurance and Investment. Briefly, this includes reiteration of my call for:

- Effective marketwide surveillance;
- Retrospective review of order type approvals; and
- Strong, clear market technology standards.

My 2012 testimony also called into question investor confidence in markets. While I will not claim that market structure, the Flash Crash or repeated technology failures are the primary causes of the waning of investor confidence, neither do these issues instill confidence nor push the public back into the market. While it is irrefutable that more funds are flowing into the stock market, those funds are coming from a smaller segment of the American population. Investor confidence is better measured by the public's participation in markets, not in the amount of capital flowing into stocks versus bonds. That measure is at a fourteen year low according to Gallup:



Investor confidence continues to be a concern. This is a direct threat to the US economy. Many of the ways to address investor confidence are outside of the scope of this testimony, but we can be sure that a stable financial market that is no longer in the news for unexplained technology failures would help. Regulators' goals should be to increase transparency, reduce conflicts-of-interest and demonstrate that they are capable of regulating and policing this new electronic marketplace.

The key issues and recommendations contained here within are informed by the same principles that guide KOR Group, the Healthy Markets Initiative and the pursuit of markets that operate transparently, fairly and efficiently.

Complex Systems Fail

Recent events have produced a tremendous and unprecedented amount of visibility for the previously obscure concept of market structure. Unfortunately visibility does not always mean clarity. In fact, if market structure was well-designed, incentives properly aligned and systems therefore built to prioritize stability, **technology and structure would remain invisible.**

While Congress, regulators and the public are now focused on the rules that govern our industry for various reasons – whether because of the financial crisis, the Flash Crash, various technology failures or portrayals in popular media – they are discovering that there are generally no easy answers for the issues that we face. While many find it easier in each of these cases to search for a “root cause” to a problem—and upon finding it fixing it—such an approach is limited in scope at best and downright dangerous at worst.

The “fallacy of the broken part” is one of the more important ideas contained within Systems Theory. Likewise, its implications for regulating and understanding the evolution of markets are profound. For example, there is broad agreement among academics and practitioners that the Flash Crash and related mini-flash crashes are symptomatic of the current market structure as a *system*, and not the result of a “broken part.” In its request for testimony, the Committee prompts, “describe your view on lessons learned from past market events and what can be done to strengthen the stability and operation of the markets.”

This is the imperative that I’ve been most compelled by as I’ve witnessed and taken part in the rapid changes to our market. I’m pleased to share my thoughts with you today.

The technology and structural failures of the past several years are well known, and include:

1. The Flash Crash in May, 2010.
2. Numerous instances of extreme volatility, including August 2011 and the continuing occurrence of so-called “mini flash crashes.”
3. IPO glitches resulting from technology failures at Nasdaq and BATS.
4. The Knight Capital incident on August 2, 2012.
5. Goldman’s options market making incident in August 2013.
6. Nasdaq’s SIP failure in August 2013.

If we include the many minor incidents that have failed to capture media attention, this list would be much longer.

What can we learn from these incidents? Can we learn anything? Representatives of these firms will assure the public and the industry that they have learned the lessons, that they have improved their technology, and that such incidents will never happen again. In doing so, they are falling victim to the “fallacy of the broken part.” This is best illustrated by reference to Dr. Richard I. Cook of the Cognitive Technologies Laboratory at the University of Chicago. In his essay, “How Complex Systems Fail,” Dr. Cook states³:

³ Cook (2000). How Complex Systems Fail, page 2.
<http://www.ctlab.org/documents/How%20Complex%20Systems%20Fail.pdf>

7) Post-accident attribution to a 'root cause' is fundamentally wrong. Because overt failure requires multiple faults, there is no isolated 'cause' of an accident. There are multiple contributors to accidents. Each of these is necessarily insufficient in itself to create an accident. Only jointly are these causes sufficient to create an accident. Indeed, it is the linking of these causes together that creates the circumstances required for the accident. Thus, no isolation of the 'root cause' of an accident is possible. The evaluations based on such reasoning as 'root cause' do not reflect a technical understanding of the nature of failure but rather the social, cultural need to blame specific, localized forces or events for outcomes.

8) Hindsight biases post-accident assessments of human performance. Knowledge of the outcome makes it seem that events leading to the outcome should have appeared more salient to practitioners at the time than was actually the case. This means that ex post facto accident analysis of human performance is inaccurate. The outcome knowledge poisons the ability of after-accident observers to recreate the view of practitioners before the accident of those same factors. It seems that practitioners 'should have known' that the factors would 'inevitably' lead to an accident. Hindsight bias remains the primary obstacle to accident investigation, especially when expert human performance is involved.

15) Views of 'cause' limit the effectiveness of defenses against future events. Post-accident remedies for 'human error' are usually predicated on obstructing activities that can 'cause' accidents. These end-of-the-chain measures do little to reduce the likelihood of further accidents. In fact that likelihood of an identical accident is already extraordinarily low because the pattern of latent failures changes constantly. Instead of increasing safety, post-accident remedies usually increase the coupling and complexity of the system. This increases the potential number of latent failures and so makes the detection and blocking of accident trajectories more difficult.

We can presume to learn the lessons of our repeated technology failures, and we can take pains to "fix" parts of the systems that were so obviously broken. Doing so does not help us prevent future

failures. In the past, I have called this strategy “Technological Whack-A-Mole.”³ New problems will continue to spring up no matter how many we hammer into the ground.

The lesson that regulators should be learning is that advances in technology and massive market fragmentation have created a market unlike anything that we’ve seen in the past. Instead, regulators focus on repairing the “broken part.” Consequently, we convene committees and roundtables, undertake investigations to determine what went wrong, meticulously reconstruct the events under investigation, draft a plan that will take months or years to implement at an extremely high cost to taxpayers or industry, and proclaim victory.

Alternatively, investigators may arrive at an overly simplistic cause-and-effect explanation that neglects to consider the environment in which faults occur and the non-linear phenomena that underlie these faults. One example is the Flash Crash – the perfect demonstration of a failure in which nothing actually broke. The Flash Crash resulted from a complex and non-linear interplay between participants, regulations and technology. The study of the Flash Crash was substantially flawed, plagued by poor data and poor understanding of high-frequency market dynamics. The regulatory response is similarly flawed; a Level-Up/Level-Down regime that presumes remedying the most obvious symptoms will address the cause.

“Mini flash crashes” offer us another example. The SEC has contended that these events are actually the result of human error or “fat fingers” and not related to high-frequency trading. This is another illustration of assigning linear cause-and-effect relationships to non-linear events. While there may be a “precipitating event” such as a “fat finger” that causes these incidents, it defies logic to ignore the complexity of the market, the fragmentation of liquidity, the rapid speed at which resting orders can be withdrawn and the non-linear feedback loops / illiquidity contagions that market making strategies fall into as large orders plow through an order book. There was a time when markets were simpler and easier to understand. That time has long passed but regulators are still struggling to accept and embrace this.

Today’s markets are characterized by interconnectedness and speed, and contending with this combination has proven very difficult for regulators. This environment generates a massive amount of data, though this amount of data still pales in comparison to other examples of “big data” in different

³ Lauer (2013), “Fixing Technology Complexity on Wall Street: No More Whack-a-Mole.”
http://www.huffingtonpost.com/dave-lauer/high-frequency-trading-technology_b_3830734.html

industries. Regulators have fallen significantly behind in their ability to collect and analyze data, and this should be a huge concern to practitioners, legislators and the public. This is an issue that I will address later, as I examine the recommendations I made in my 2012 testimony before the Subcommittee on Securities, Insurance and Investment.

As we confront the issue of market complexity and fragmentation, you often hear proponents of the current market structure ask “What is the right number of market centers?” They claim that if you are going to allow more than one, you must let the market figure out the appropriate number. Having adopted this mentality, having passed the trade-through rule as part of Regulation NMS, and lacking a trade-at rule in conjunction with Regulation ATS, we are left with the current highly fragmented market. There are fewer incentives to display liquidity, and as such dark volume is increasing every year. Trading volume on non-lit venues has just recently passed the 40% mark.

Going Dark



Regulation NMS gave us protected endpoints regardless of market share, and forced an incredible amount of complexity on to the markets in an attempt to end the NYSE monopoly and push them into the electronic trading era. While that goal has been met, and the value has been tremendous, it is completely reasonable to now question whether the cost of meeting that goal through Regulation NMS is a reasonable one to bear. We've managed to create a network of dark pools that rarely route to one another, and instead of providing a safe haven for large institutional orders, there has been a proliferation of shallow pools with average trade sizes at or below the displayed market. This has not only driven complexity in technology, connectivity and order routing but has also created intractable conflicts-of-interest when you combine this landscape with the maker-taker pricing model, the absence

of a trade-at rule and government-imposed price controls of 30 cents per share. Regulation has created this monstrosity of a market, and it is only by peeling back some regulations and refining others that we can hope to simplify market structure and increase market efficiency.

While KOR and Healthy Markets advocate for the removal of some regulations, modifications of others and the passage of new rules, we are driven by a belief that we cannot regulate without unintended consequences. To minimize these unintended consequences, we must attempt to regulate in a bottom-up manner, rather than top-down. This is an approach that focuses on creating the right environment and incentives, removing conflicts-of-interest and disclosing these conflicts when they cannot be removed. This approach allows competition to proceed in a productive manner, hopefully finding the equilibrium that we all seek. Removing conflicts where possible and shining light on them when not allows participants to make more informed decisions and forces firms to compete. There can be no doubt that the days of the floor broker, 1/8's, and the NYSE monopoly are long gone. But the pendulum has swung too far in the other direction. **Complexity is not necessarily bad, but unnecessary complexity certainly is.**

If we embrace the language of complexity we "realize that control is little more than an illusion, at least in some areas and some parts of how the system works. ... In complex systems order arises because of (or emerges from) the interaction of lower order components and their interaction with the environment."⁴ The design of the environment and the incentives for those lower order components is everything.

Conflicts and Incentives: Self-Regulation

So how can we understand where our structure has gone wrong and how can we begin to reform it? Let's start with the Self-Regulatory Organization. As KOR covered in our October 1st 2012 comment letter to the SEC: "Today, SROs file rules under Section 19(b) of Exchange Act of 1934 and more specifically under rule 19(b)(7)(c) which has changed little since adopted over 78 years ago⁵. When those rules were adopted, Exchanges were mutually owned by 'not-for-profit' organizations whose goal was to serve the public and their associated members."⁶ Regardless of how "altruistic" the Exchanges

⁴ Dekker, Sidney (2011). *Drift Into Failure*. Page 172.

⁵ Because Section 19(b)(7)(C) of the Act states that filings abrogated pursuant to this Section should be re-filed pursuant to paragraph (b)(1) of Section 19 of the Act, SROs are required to file electronically such proposed rule changes in accordance with form 19b-4. See about form 19b-4: <http://www.sec.gov/about/forms/form19b-4.pdf>

⁶ KOR Trading Comment Letter by Chris Nagy, October 2, 2012: <http://www.sec.gov/comments/4-652/4652-27.pdf>

were, there can be little doubt that the rules under which Exchanges are governed today are antiquated, the product of a time when electricity had just reached 70% of households, not an era in which a gigabyte of data can be transmitted around the world in seconds. It is incumbent upon Congress and the SEC to revisit the self-regulatory structure and design a system of incentives and regulation with the requisite variety and industry skills along with the independence to enforce a reasonably designed set of rules.

Before getting started, I'd like to preface this section with a disclaimer. I am not advocating that the self-regulatory structure disappear. I agree with the CFA Institute that "[w]ith its inherent conflicts and governance challenges, the self-regulatory system is far from perfect. Such a system is needed, however, in today's highly complex and technologically changing and evolving markets."⁷ I believe that the framework is dated, and must undergo a transformation so that it does not continue to undermine the integrity of markets.

Is there evidence that the self-regulatory structure is failing us? Certainly it should be apparent that the incentives of a for-profit, publicly traded or broker/dealer-owned, self-regulatory organization are to increase shareholder value, not to build transparent, fair and efficient markets. "In no other industry can a for-profit publicly traded organization create and enforce industry regulations and market standards which, in many instances are immediately effective."⁸

Do we really need evidence that this conflict is intractable? That's easy enough to produce. Let's simply consider the mountain of reforms that SROs could have undertaken on their own, yet have refused to. In some cases, it has taken catastrophic failure and, in others, regulatory fiat. There are yet

⁷ CFA Institute (2013). Self Regulation in the Securities Markets: http://www.academia.edu/5797953/SELF-REGULATION_IN_THE_SECURITIES_MARKETS_Transitions_and_New_Possibilities

⁸ Securities Act of 1934 Section 19(F)(ii) The rules promulgated by the commission under clause (i) are not required to include republication of proposed rule changes or solicitation of public comment. (3)(A) Notwithstanding the provisions of paragraph (2) of this subsection, a proposed rule change shall take effect upon filing with the Commission if designated by the self-regulatory organization as (i) constituting a stated policy, practice, or interpretation with respect to the meaning, administration, or enforcement of an existing rule of the self-regulatory organization, (ii) establishing or changing a due, fee, or other charge imposed by the self-regulatory organization on any person, whether or not the person is a member of the self-regulatory organization, or (iii) concerned solely with the administration of the self-regulatory organization or other matters which the Commission, by rule, consistent with the public interest and the purposes of this subsection, may specify as without the provisions of such paragraph (2). (B) Notwithstanding any other provision of this subsection, a proposed rule change may be put into effect summarily if it appears to the Commission that such action is necessary for the protection of investors, the maintenance of fair and orderly markets, or the safeguarding of securities or funds. Any proposed rule change so put into effect shall be filed promptly thereafter in accordance with the provisions of paragraph.

⁹ QOR Trading Comment Letter by Chris Nagy, October 2, 2012: <http://www.sec.gov/comments/4-652/4652-27.pdf>

other reforms that the SROs still have not undertaken. One is left befuddled as to why catastrophe or regulatory dictate are required in these cases:

1. Server clock synchronization
2. SIP infrastructure resilience
3. SIP infrastructure performance
4. Order type consolidation / preening
5. Market data availability for research and surveillance
6. Industry-wide testing for disaster recovery
7. Enhanced transparency around ATS reports

Let's examine each of these with consideration to the conflicts-of-interest they create and the want they leave for appropriate incentives. Hopefully, this will help us to understand the issue more clearly.

Server Clock Synchronization

To some, the synchronization of server clocks to a common time source would appear a small and simple issue, hardly worth even being mentioned. But to regulators attempting to reconstruct events, study the market and perform proper surveillance in a world of high-frequency trading, there is no substitute for high-resolution server clocks and microsecond-level clock synchronization. Exchanges timestamp all of the messages that they send to participants, yet these timestamps are universally ignored because they are not synchronizing to a common clock source and cannot, therefore, be sequenced with each other across market centers. This technology has been readily available for years, and there is simply no reasonable excuse as to why the SROs have yet to implement it. Why is regulatory intervention needed here? It defies common sense.

There is one simple answer. While synchronizing their clocks would help to facilitate a fairer, more efficient market, and one that is more readily understood by participants and policed by regulators, current SROs are not incentivized to do so over the possible objections of their shareholders (because of cost) or their best customers (for fear of better surveillance). Regardless of their motives, every day that goes by without synchronization of their system clocks brings further damage to the credibility of SROs and the SRO framework.

SIP infrastructure resilience

After the dismal SIP failure in August 2013, Exchanges were called into the Chair's office at the SEC and instructed to develop a plan to prevent it from happening again. Why was that necessary? Why weren't SROs properly incentivized to maintain this infrastructure in a high-performance and resilient manner consistent with their incentives to do just that with their private, proprietary feeds? One need only review the "Report of the Advisory Committee On Market Information: A Blueprint For Responsible Change"¹⁰ to see that as early as 2001 there were substantive concerns about "a 'single point of failure' with capacity at the consolidator level."¹¹ While the Seligman study made many excellent suggestions, including the idea of allowing for multiple consolidators to ensure competitive forces are allowed to find better solutions, its suggestions were disregarded. This includes the suggestion that if there was going to be only one SIP, to at least open the bidding process up and allow competitive bidding. Because of explicit and implicit conflicts-of-interest it took 13 years and a massive infrastructure failure to heed this advice.

Once again we fall victim to conflicts-of-interest. Here we have an explicit conflict in that there is no incentive to improve the SIP infrastructure, particularly not when under-investing in technology means keeping a greater share of funds for the SROs charged with running the SIP.

SIP infrastructure performance

There can be no doubt that market data received from the SIP is far slower than the same data received over proprietary, direct feeds. This does not have to be the case, but once again, SROs refuse to change how they produce and distribute data because of conflicts-of-interest. The Seligman study identified this issue in 2001¹², and recommended a new system of distributed consolidators through whom all market data would be distributed. Healthy Markets is advocating for a modified version of this in which the existing consolidator is used, but would support the Seligman recommendations as well.

The chart below shows latency differences between the SIP and the direct feeds starting from 2010. Before 2010, the problem was much worse, and the average was an order-of-

¹⁰ Seligman (2001): <http://www.sec.gov/divisions/marketreg/marketinfo/finalreport.htm>

¹¹ *Ibid.*

¹² *Ibid.*

magnitude higher (it was approximately 40 milliseconds in 2006). In addition, this chart only shows average numbers, and says nothing about the jitter and outliers, which are such a critical part of high-speed trading.



Here we have an implicit conflict. The fact that the SIP is slower means that faster, direct, proprietary feeds are more valuable. The SROs profit by selling these proprietary feeds and are thus incentivized to avoid equalizing performance between the two systems. There should be no latency differential between direct feeds and the SIP as measured by receipt time in co-location facilities.

Order Type Consolidation / Preening

The proliferation of order types has produced a complicated system of indicating buy/sell interest that few can navigate with total comprehension. This complexity may or may not be necessary, though it is certainly a result of Regulation NMS. There should be no doubt that many order types are under-utilized and could be retired, while still others are of questionable utility. In addition, the order type controversy has been covered in the media and has contributed to the general public frustration with unnecessary complexity and markets that the average person simply does not understand. While this controversy has raged for years since Haim Bodek first burnished his sword in the Wall St Journal¹⁴, there has been no action by the SEC or the SROs until Jeff Sprecher's ICE bought the New York Stock Exchange:

¹⁴ Patterson (2012). For Superfast Stock Traders, a Way to Jump Ahead in Line:
<http://online.wsj.com/news/articles/SB100008713963904439892045775992436995616707mg?reno64-wsj>

"To start, we are self-imposing a six-month moratorium on any new, or novel, order types that further segment the market. We believe that this will give the industry and the SEC time to focus on the complexity that exists. In addition, we have already announced the elimination of more than a dozen unique order types."¹²

Why did it take a futures and commodities exchange to purchase a US Equities SRO before the first substantive action was taken on order types, over 2 years after the issue had been identified? The answer, once again, is couched in a conflict-of-interest for SROs who have no incentive to simplify and consolidate market structure.

Market data availability for research

In my 2012 testimony before the Subcommittee on Securities, Insurance and Investment¹⁵, in subsequent¹⁶ comment¹⁷ letters¹⁸ and most recently in my testimony before the CFTC Technology Advisory Committee¹⁹, I have repeatedly urged regulators to provide a centralized platform for market data so that practitioners and academics can effectively research our markets. **This issue is so important that it is reaching crisis levels.** Data accessibility to academics is nearly non-existent in a complete, unbiased and objective manner. Often, industry firms sponsor research. It should surprise no one that these studies usually arrive at the results that the firms want. If they don't get results they like, the researchers in question won't have access to data for subsequent studies. There is an ongoing debate about market structure and market quality, and there are no clear, objective answers. Research is not reproducible and code is not available. **This is not science. This is a farce. And the future of our economy and markets are at stake.**

If the SROs so desired, they could easily come together and provide the platform that I have called for on repeated occasions. My calls have been directed at the SEC, but they have refused to act:

¹² Testimony of NYSE President Thomas Farley before Senate PSI on June 17, 2014

¹³ http://www.banking.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=56ef1df0-6c9a-4c53-99e8-2a47a514afe2

¹⁴ 10/2/2012: <http://www.sec.gov/comments/4-652/4652-32.pdf>

¹⁵ 4/4/2014: <http://www.sec.gov/comments/s7-02-10/s70210-413.pdf>

¹⁶ 4/16/2014: <http://www.sec.gov/comments/sr-finra-2014-018/finra2014018-1.pdf>

¹⁷ Attachment 1, original available at <http://koiitrading.com/wp-content/uploads/2014/02/CFTC-Testimony-David-Lauer-June-3-TAC-Meeting.pdf>

October 2012, before the SEC's Technology Roundtable: "[T]he SEC should provide an open API-based interface to this system and incentivize independent developers to build novel and advanced pattern recognition algorithms by offering them a percentage of fines collected or using a prize-based mechanism."²⁰

September 2012 before the Subcommittee on Securities, Insurance, and Investment: "The Internet and Open Source efforts have taught us that open systems are nearly always preferable to closed. In that spirit, and under the premise that markets are a public good, market data feeds and tick data history should be opened up. It is critical to understand that many academic papers are skewed because they are either funded directly by the industry, or provided access to expensive and proprietary data by the industry. Opening up access to this data would have a dramatic effect. Access to the historical data of direct market data feeds should be made available freely to the public, and a prize-based incentive created for those who can find innovative ways of designing surveillance systems and algorithms. While the exchanges will surely argue vigorously against this idea as market data is a major profit engine for them, it is in the public's interest for the regulation and enforcement to move out of the 20th century."²¹

2013 Article: "Open up access to MIDAS, the SEC's quantitative analysis platform, to academics and independent researchers! Embrace the principles of the open source movement, and make it cheap and easy to perform studies on market data with the goal of advancing the public discussion and regulatory decisions. The SEC team at the head of the MIDAS project is talented, but small and resource-constrained. ... Open up the data! There's really no good argument against it."²²

2014 response to approval of FINRA fees for ATS volume reports: "Regulators need to fundamentally change how they approach access to data. We have a data crisis in US financial markets; academic and public research is crippled, and yet we are just getting *Business as Usual* from the regulators. We don't need more talk from the SEC and FINRA, more speeches and more hearings; we need action."²³

²⁰ Lauer (2012), Written Statement, SEC Technology Roundtable

²¹ Lauer (2012), Written Testimony before Subcommittee on Securities, Insurance and Investment on

"Computerized Trading: What Should the Rules of the Road Be?"

²² Lauer (2013), HFT – In Search of the Truth: <http://dlauer.com/post/55103434567/hft-in-search-of-the-truth>

²³ Lauer (2014), Regulators & Data: Business as Usual. <http://hrttrading.com/business-as-usual/>

If the SROs so desired, they could solve this problem practically overnight. **It's time to open up historical data to the public and the academic community free of charge. To do anything less is the height of absurdity.**

Industry-wide testing and backup / recovery

Once again, those observing from outside the industry, like those of us within, are left scratching their heads. We collectively watched as a natural disaster such as Hurricane Sandy closed markets for two days. When a localized event can disrupt a global economy, why does the industry refuse to perform coordinated industry-wide testing? The SROs could mandate this tomorrow, schedule the tests and get it done. Yet they need to be forced by Regulation SCI? Why?

If the SROs were incentivized to maintain fair, transparent, efficient markets, such testing would be routine. There is, unfortunately, nothing in the publicly traded shareholder value commitment that says an organization must or even should do this. It is, therefore, not done. It is a relief that Regulation SCI will change that, but it is nonsensical that it has come to that. It is as if SROs are children that can't be left unattended lest they destroy something valuable.

Need for transparency and ATS regulation

The Healthy Markets platform²⁴ starts with a simple, well known quote by Supreme Court Justice Louis Brandeis: "Sunlight is ... the best of disinfectants."²⁵ As such, Transparency is the primary and core principle in our platform. The SEC has long held this to be true, and their Rules 605 and 606 were critical steps to ensure that brokers and market centers were held accountable for their behavior. Yet these rules are completely outdated in the world of fragmented market centers and high-frequency trading. The SROs are perfectly capable of producing updated rule 605 statistics (as outlined in the Healthy Markets platform), yet they continue to produce statistics that are of questionable value and easily gamed. Are they focused on fair and efficient markets? Or are they meeting the lowest possible standards of compliance to avoid fines while passively obstructing the industry's forward progress?

This question applies equally to the state of ATS disclosure. There is nothing preventing ATSs from publishing intimate details of their order matching logic, tiered access, fee structure,

²⁴ Attachment 2, original available at <http://healthymarkets.org>

²⁵ Brandeis, Louis D. (1933). *Other People's Money - And How Bankers Use It*.

order types, etc. Instead we've gotten a trickle of Form ATSs being published, most after being sanitized / scrubbed (as evidenced by the recent revision dates). FINRA was supposed to be investigating Alternative Trading Systems and it has certainly been within their purview for years to mandate enhanced disclosure requirements. So why has it taken a sensationalistic novel published by Michael Lewis to get any action from them? FINRA revealed after an investigation in 2013 that it was concerned by what it found, yet no action was taken other than to mandate volume reports. Consequently, FINRA will be charging an outrageous amount of money for computer-based access to these volume reports. Why must the regulator charge for access to data that should be publicly accessible? Why did the NY Attorney General need to intervene with Barclays? Why didn't the SEC or FINRA discover this activity?

Unfortunately after a close examination of the SRO conflicts and their failures to act in the public interest, we are left with so many more questions than answers.

Conflicts: Speed over Stability and Fragmentation over Simplicity

While this conflict may be part and parcel of the SRO conflict, it is worth highlighting as per the request to testify. The Committee has asked about "the consequences of the focus on speed in today's automated and interconnected markets and whether regulation has adequately addressed this growth." In fact, one is hard pressed to find any example of regulation addressing this growth, let alone adequately. There has been little in the way of regulatory attempts to even understand the speed at which markets trade²⁶, let alone to examine whether it needs regulatory attention. While I am not trying to advocate for slower markets, I do not pretend to know the answers. Further study is warranted, and part of that is making the appropriate data available to academics to attempt to answer the question as to whether market quality has improved since the implementation of Regulation NMS and the acceleration of trading and matching systems. There has most certainly been a cost associated with this acceleration as measured by the technology required to maintain pace with extreme data rates or the resulting fragility of the markets as corners are cut in development and testing.

Further, as a result of Regulation NMS and ATS, and the lack of a trade-at rule, we've seen massive fragmentation in the markets. We are left picking up the pieces of a massively conflicted system in which brokers are not only allowed to own and operate their own dark pools, but in which they are

²⁶ One lone example is the SEC's Quote Lifetime study on their Market Structure website: <http://www.sec.gov/marketstructure/research/highlight-2014-02.html#U7YETfIdUeo>

also able to route 90% of their customers' orders through such venues without drawing any regulatory scrutiny around best execution requirements. **This is the perfect example of an environment in which poor regulation and poor foresight combined to ensure that incentives and conflicts-of-interest would drive the industry in the wrong direction.** It is also an example of something that can be easily remedied by making best execution requirements stronger (an issue addressed later in this testimony) and incentivizing displayed liquidity through a trade-at rule. The effects of this would be profound.

Conflicts: Maker/Taker and Payment-For-Order-Flow

While the topics of Maker/Taker and Payment For Order Flow (PFOF) are not specifically part of the Committee's request, they must be mentioned in the context of system stability and resiliency. The Maker/Taker business model and the SEC-imposed fee cap of 30 mills per share have created a prisoner's dilemma. First, the race to the bottom brought access fees up to, or close to, the price controlled cap. This allowed exchanges to increase their rebates to levels near that cap. This led to increased costs for taking liquidity in the lit market, which drove volume to internalizers and dark pools. The subsequent increase in dark trading has been tremendous and unprecedented. Driving this liquidity off of exchanges has had a significant impact on both market making and execution quality in the lit markets. This has increased adverse selection on lit markets and reduced market maker profitability to such an extent that diversity has been lost. Over half of trading is now done by high-frequency firms, largely because this is now the only profitable timescale on which to trade. The dominance of Maker/Taker and high-frequency trading in exchange volumes, and the associated reduction in diversity of the marketplace has increased market fragility. This worrisome development may help to explain the increase in "mini flash crashes" or illiquidity contagions.

There is a lesson to be learned here, as was covered in the previous section on fragmentation. A trade-at rule, as has been adopted by Australia²⁷ and Canada²⁸ (appropriately named Market Integrity Rules in both countries), would serve to push liquidity and activity back to the lit exchanges, rendering market-making a more profitable activity and encouraging a greater diversity of market making participant. This could help to improve system stability and reduce order book fragility. This is a theory that emphasizes the beneficial effects of reducing adverse selection on lit exchanges. At Healthy Markets we are advocating strongly for this theory to be tested. We were thrilled to see the SEC include

²⁷ <http://www.asic.gov.au/asic/asic.nsf/byheadline/Market+Integrity+rules?openDocument>

²⁸ http://www.ilroc.ca/Documents/2012/77c0af22-004e-417d-9217-a160b3fcb5c5_en.pdf

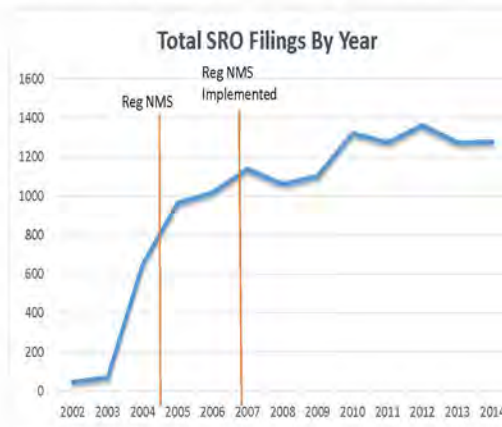
a trade-at group in the decimalization pilot, and we continue to push for another pilot that will reduce or eliminate rebates and include a trade-at rule.

Regulatory Organization and Resources

"Regulators that are serious about improving compliance and protecting investors must embrace technology and adapt their organizations to the realities of 21st century trading. This will require courageous leadership, a tectonic shift in thinking, and a radical reallocation of budget and staff resources."

Director, Market Surveillance Technology for an international regulator

Regulators face a nearly Sisyphean task in trying to make sense of modern electronic markets, let alone regulate them. This task is made all the more difficult by the deluge of data with which they must contend, the complexity and consequences of rule filings, and the lack of appropriate resources and budget. The SEC increasingly finds itself delaying approval of rule filings and reaching out to the industry with detailed questions on the consequences of these filings. The increase in rule filings over time, especially in the wake of the approval of Regulation NMS in 2005, is startling:



Since 2010 the average SRO filings per year have been 1,300, yet the SROs pay no cost for these filings. This is not only a huge amount of work to perform, but the implications of approvals are significant. Substantial technological and market structure expertise is needed to evaluate many of these filings and the unintended consequences may not be clear. As the number of filings increases and staffing levels do not, we are asking more of our regulators than we should.

This provides the perfect introduction to some of the more significant and foundational issues that our regulators are facing: inappropriate resourcing for confronting the challenges of modern electronic markets and a dated, bureaucratic mindset that fosters top-down regulation, rather than bottom-up co-evolution. In my testimony before the CFTC Technology Advisory Committee, I identified five key challenges that regulators face²⁵:

1. Lack of sophisticated technology skills to collect, normalize, process and analyze huge amounts of data.
2. Cultural challenge of re-orienting perspective to foundational integration of technology rather than simply as a tool or supplement to operations.
3. Political frictions that ensure silos remain within and across agencies.
4. Bureaucratic mindset that focuses on job security and individual "fiefdoms" to the detriment of open, transparent analysis and data sharing.
5. Conflicted, for-profit SRO structure that leads to questionable incentives.

"Never has the need for expertise been greater, or the resource gap wider. Regulatory organizations are predominantly staffed by attorneys, yet they wonder why they have trouble keeping pace with private companies staffed by experts in every domain – traders, programmers, quantitative modelers and operational / back-office engineers. **The markets have changed.** Can this be stated more strongly? The markets look **nothing** like they did 100 years ago, or 50 years ago, or even 15 years ago. Yet regulators continue with nearly the same type of staffing, similar allocations of resources and similar approaches to surveillance."²⁶

In that testimony to the CFTC, I focused heavily on what technology-centric regulation means, and there is no need to repeat that here. I would urge anybody interested in ideas on how to regulate in the 21st century to read that document as well as to explore the wealth of research and writing that has been produced in recent years on complex industry regulation and systems thinking. If regulators have any hope of catching up with, and staying ahead of the industry, this mindset is a required shift. It will

²⁵ Lauer (2014). "Written Statement: Market Surveillance in the 21st Century." Included as Attachment 1, original at: <http://kotrading.com/wp-content/uploads/2014/02/CFTC-Testimony-David-Lauer-June-3-TAC-Meeting.pdf>

²⁶ Ibid.

not be easy, but there's little hope otherwise. This represents one of the greatest risks to market integrity that we face – regulators who are unable to understand or keep up with the rapid pace of technological change in markets.

Nowhere is this failure more readily apparent than in the inability of regulators to provide effective oversight, whether in ensuring Best Execution, controlling retail and institutional broker order routing practices or demanding any level of accountability in broker-operated dark pools. If the SEC and FINRA were capable of policing the industry, why did the New York Attorney General find the alleged fraud and deception occurring at Barclays? Does anybody reasonably think that there will not be additional revelations at other broker-operated dark pools? Is this an issue of technological sophistication? Or is FINRA simply too hesitant to police the brokers sufficiently? Once again we are left with more questions than answers, and conflicts-of-interest lurking around every corner.

All of this contributes to a broad public perception of an industry that is operating with reckless abandon and one that is not being policed sufficiently by regulators. The evolution of the SRO structure has saddled FINRA with many of the duties that were once under the domain of the front-line SRO. Upon recognizing the presence of intractable conflicts, some front-line functions were divested to FINRA. This legacy structure may not make sense anymore. It has become unclear why FINRA is not part of the SEC, or at the very least why the agency operates without Congressional oversight. As we re-examine the regulatory structure in the light of market integrity, investor confidence and addressing conflicts-of-interest, I would not recommend abandoning SRO. Front-line regulatory functions are critical in this complex environment and an increase in the variety of regulatory competence is important. Some functions should not be under this structure though, and I would argue that surveillance and enforcement are among these.

2012 Testimony Recommendations

The Committee has requested that I comment on whether any recommendations discussed in my 2012 testimony have been addressed and, if not, whether they are still relevant. I truly appreciate the opportunity to discuss some of these ideas and follow-up on them. There are several recommendations I would like to highlight and address.

Marketwide Surveillance

Shortly before I advocated for a marketwide surveillance system, the SEC announced the MIDAS project. While I was optimistic at first, it has become clear that MIDAS is incapable of surveillance and incapable of accurately studying market structure above what any participant can do. Furthermore, MIDAS is only looking at equity data, and does not take futures market data. I spent 12 pages of testimony before the CFTC TAC explaining how to build a proper cross-asset class marketwide surveillance system and I do not believe there is a need to rehash that material (it has been included at Attachment 1). However, I will once again urge Congress and the SEC to act right away to build this system. Neither I, nor anyone else I have spoken with in the industry, is optimistic with regards to the timeline for delivery of the Consolidated Audit Trail (CAT). In light of this, the SEC and CFTC could work together to build a much simpler surveillance system that can function and provide insight and surveillance while CAT is being built. It should be concerning to anyone reading this that there is no algorithmic, cross asset-class surveillance being performed right now. **This leaves little doubt that there is market manipulation taking place. Bad actors know that nobody is watching.**

I will also take this opportunity to re-iterate the need to get market data with participant IDs into the hands of regulators and academics studying market structure. While I believe the industry would be best off with everyone having secure, API-based access to this data, it is sufficient to begin with a central repository and computational platform where academics and regulators are able to run studies on detailed data-sets. Privacy concerns are valid and reasonable, but they can be addressed. Privacy can be protected and confidentiality maintained, all while creating a platform that would revolutionize the study of markets.

Without such a platform it is impossible to study markets, impossible to get the appropriate data for critical studies and impossible to understand what is taking place in markets today. The MIDAS platform is ideal for such an undertaking, but it is severely lacking. It is missing the following data:

1. Identifiers for each order (either at the firm or supervisory individual level)
2. Hidden orders on lit exchanges
3. All orders on dark pools, including resting limit orders and IOIs
4. Immediate-or-cancel orders on lit exchanges
5. Some exotic order types on lit exchanges

These shortcomings are catastrophic. I can't overstate this. **These gaps render MIDAS incapable of providing the requisite insight that regulators need to achieve the data-driven approach to**

regulation called for by SEC Chair White³¹. There is no issue that is more critical to ensuring market integrity than proper access to data for study and surveillance, and no issue that is more readily and easily solved. It is time to stop making excuses. There is no reason why this can't be done and done quickly. Had action been taken on my original recommendation in 2012, the system could quite possibly have been operational for over a year by now. Our level of insight and understanding of markets would be light-years ahead of where it stands today.

Reducing off-exchange trading and ending PFOF

In my testimony, I advocated for the elimination of PFOF and for rules that will help push more trading to lit markets. I no longer believe that PFOF should be directly addressed, as that is a clear example of top-down regulation. Instead, the Healthy Markets platform advocates for a trade-at rule to ensure that any volume taking place off of lit markets at least provides substantial price improvement to compensate for the damage to the price discovery process. We were very encouraged to see the SEC include a trade-at group in their tick size pilot proposal, and we will continue to push for this enhancement to be included in the final pilot design. We also continue to advocate for a pilot that will reduce or eliminate rebates, and which will also include a trade-at rule. It appears that there is interest at the SEC in such a pilot, and we will continue to take a vocal stance in support of its implementation.

The issue of PFOF is directly related to Best Execution. The current system of relying on brokers for "regular and rigorous" review is not only dated, but lacks the proper level of disclosure, transparency and oversight. Recent concerns have been raised around order routing practices at retail brokers (starting with the study³² by Robert Battalio, Shane Corwin and Robert Jennings and continuing with the admission of fee-based routing practices by TD Ameritrade at the Senate PSI hearing on June 17th) and institutional brokers (Barclays suit by the NY Attorney General).

An important consideration for Best Execution would be the primacy of conflicts, subjecting any conflicted routing decisions to a much higher standard of execution quality. This can help to address the issues that have been found on both the retail and institutional side. However, for any change to Best Execution, enforcement must be a focus. Enforcement has been non-existent. In fact, six years have

³¹ White (2014), Enhancing Our Equity Market Structure:
http://www.sec.gov/News/Speech/Detail/Speech/1370542004312#.U7q7Z_idVuM

³² Battalio, Robert H. and Corwin, Shane A. and Jennings, Robert H., Can Brokers Have It All? On the Relation between Make Take Fees & Limit Order Execution Quality (March 5, 2014). Available at SSRN:<https://ssrn.com/abstract=2367462>

passed since the last enforcement actions were taken. Regulators should mandate enhanced disclosure, more relevant factors and conflict considerations.

Revocation of order type approval

One of the ideas put forth in 2012 was to demand that SROs demonstrate the utility of their order types and that they are being used, or to retire them. There has been no progress on this issue, excepting the recent decision by NYSE to retire over a dozen order types. The SEC has requested that SROs begin an inventory of all order types to ensure that the functionality is correct and properly described in filings. I would prefer that they go a step further and institute a retrospective review of all order type rule filings, and ask the SROs to produce data on how the order types are being used, whether they are being used at all, and where opportunities exist to reduce the number of order types and the resulting complexity. If the SROs have already done this internally, then it should be simple for them to produce the data and convince the SEC as to the utility of the order type.

Establish strong, clear market technology standards

It is clear that this recommendation, along with those made during my subsequent participation on the Technology Roundtable in October 2012, has been acted upon by way of Regulation SCI. I support many of the ideas in Regulation SCI, although, once again, it is an unfortunate example of top-down rather than bottom-up regulation. I look forward to the final rule proposal.

Conclusion

I would like to thank the Committee for inviting me to testify and considering my suggestions. These questions of market complexity, market disruptions and of how best to learn from past events are indeed complicated. I do not believe the answer lies in root-cause analysis of technology failures or in attempting to address the reliability and resiliency problems that are thereby identified. We will be far better off as an industry if regulators can start to re-orient themselves towards regulating with a complex systems mentality. We can't possibly account for every failure scenario and every edge case. As Dr. Nancy Leveson discussed on the SEC Technology Roundtable in October 2012³³,

"The third and final practice I want to talk about is the application of systems thinking and system engineering. These industries realize the problem is not just a

³³ <http://www.sec.gov/news/otherwebcasts/2012/ttr100212-transcript.pdf>

technology problem; that they need to design the larger system so that software errors don't cause mayhem because they know that the software errors are going to occur despite what they do."

"The financial industry needs to learn, too, that computers aren't magic; that our engineering techniques for creating software aren't perfect; and that failsafe and fault tolerant designs, whether these features are automated or they use humans in a monitoring function, are a goal but not yet a reality."

This same thinking is echoed by Sidney Dekker in his book Drift Into Failure:

"System thinking is about relationships, not parts. System thinking is about the complexity of the whole, not the simplicity of carved-out bits. Systems thinking is about non-linearity and dynamics, not about linear cause-effect-cause sequences. Systems thinking is about accidents that are more than the sum of the broken parts. It is about understanding how accidents can happen when no parts are broken, or no parts are seen as broken."

If we are to follow their lead, we must examine the environment and interconnectedness of systems, we must embrace technological failure and design around it. Most importantly, we must identify conflicts-of-interest and skewed incentives and address or mitigate them at every opportunity. Where they cannot be mitigated, we must have disclosure and transparency to ensure that there is sufficient visibility and an understanding of risk.

The answer to market integrity is not to upgrade technology or build a more resilient backup system (though these are obviously important!). The answer is to embrace complexity and equip our regulatory framework to evolve as the industry advances. I applaud the SEC for initiating a comprehensive review of market structure and for the scope and ambition of Chair White's speeches in June 2014. I urge regulators to undertake a review that addresses not just the rules that govern trading, but also the staffing requirements and mindset necessary to do so properly, and I urge Congress to fund regulators appropriately to ensure they can succeed.

Attachment 1: CFTC Technology Advisory Committee Testimony

Dave Lauer

Written Statement: Market Surveillance in the 21st Century

CFTC Technology Advisory Committee, June 2, 2014

"Regulators that are serious about improving compliance and protecting investors must embrace technology and adapt their organizations to the realities of 21st century trading. This will require courageous leadership, a tectonic shift in thinking, and a radical reallocation of budget and staff resources."

Director, Market Surveillance Technology for an international regulator

Introduction

The technology revolution that has swept Wall Street and the Financial Services industry has missed one critical segment – market surveillance. Regulators continue to play catch-up to an industry that is moving forward at light-speed, literally. Are regulators doomed to forever remain behind the industry as they attempt to make sense of mountains of data? Must they resign themselves to a flawed approach under the reasoning that only industry practitioners are capable of making sense in a timely manner of terabytes and petabytes of market data?

Or is there a way for regulators to leapfrog the industry, and institute a technology-centric approach that will ensure they remain ahead of the most sophisticated firms in the industry regardless of how quickly technology evolves? It may sound absurd but it is possible. It may not be politically feasible, but with fundamental shifts in their approach to, and treatment of data, regulators can ensure that they remain at the forefront of data analytics and forensics.

As the SEC touts MIDAS as a revolutionary breakthrough in market analysis, many in the industry are shocked at the pride of just reaching the point that most firms were at in the late 90's and early 2000's. To say that they are 10 years behind would be generous.

As FINRA attempts to use OATS to enforce rules and detect malfeasance, those in the industry who want to see proper surveillance are left speechless at the timestamp resolution and age of the systems and technology storing and analyzing this data.

As so many electronic trading firms operate across asset classes, they do so knowing that there is not a single cross-asset electronic analysis being performed on their order flow. Most of them still operate within the law and rules, but as in anything there are inevitably bad actors.

Regulators face several challenges as they attempt to police today's high-speed, electronic markets:

6. Lack of sophisticated technology skills to collect, normalize, process and analyze huge amounts of data.
"Big Data & the Commission's Biggest Problem." – Commissioner D'Amico
7. Cultural challenge of re-orienting perspective to foundational integration of technology rather than simply as a tool or supplement to operations.
8. Political frictions that ensure silos remain within and across agencies.
9. Bureaucratic mindset that focuses on job security and individual "fiefdoms" to the detriment of open, transparent analysis and data sharing.
10. Conflicted, for-profit SRO structure that leads to questionable incentives for policing and surveillance.

The first challenge is the easiest to solve. As for the rest, I will make several proposals in this testimony for what regulators should be trying to accomplish, and the roadmap for achieving these goals. Politics is not my forte (as should be obvious from the blunt language so far), and I have little insight to offer on how to navigate jurisdictional issues and bureaucratic "fiefdoms".

My experience in designing low-latency trading systems and then in high-frequency trading was informative in one very important way. Since 2005 I have witnessed an incredible technology revolution on Wall Street from the inside, and have had a very small role in it.

I worked in a world in which data is data – and asset classes are secondary. Each market center has a set of rules, some instruments have different rules, fees or margins than others. In this new trading world, there is no reason not to bring in as much data as you can to make the best, most profitable, most effective trading decisions. The firms I spent time with or worked at were almost without fail all looking at futures, equities and options data to get the best valuation on an instrument that they could, to find the most edge and therefore to trade in any asset class, at any time. That's not to say there aren't challenges with this approach – options market data alone represents an order-of-magnitude difficulty above equities, which is an order-of-magnitude difficulty above futures. This isn't meant to characterize all firms – most have individual desks devoted to each asset class and some just focus on a single asset class. But while market centers focus on a sliver of data and regulators focus on a piece of the pie, these firms are able to see the entire picture and profit from that information.

If I were to adopt the perspective of a market manipulator looking for weaknesses in the current system, the lack of cross asset-class surveillance would be a big flashing neon sign welcoming me. I would also have a clear understanding of the inadequacy of current systems, notably the SEC MIDAS and FINRA OATS platforms.

Surveillance is important for detecting nefarious behavior and market manipulation. It is far more important when it acts as a deterrent, ensuring that behavior doesn't happen at all. In order to do that, it must be effective, advanced and intimidating. It must also be visible, frequent, regular and transparent.

"To catch a geek, you have to be a geek. To deter a geek, you have to demonstrate that your technological proficiency matches theirs."
Director, Market Surveillance Technology for an international regulator

Technology-Centric Regulation

In the quotes above, an international regulator who asked not to be named spoke about a "radical reallocation of budget and resources" in order to reach a "technological proficiency that matches" the industry. This is a point that cannot be overstated. In his seminal book [Drift Into Failure](#), Sidney Dekker stresses that regulators cannot keep pace with practitioners in a complex industry without becoming co-/counter-evolvers. This means building a nimble, dynamic organization – a concept anathema to traditional regulatory agencies. Many will question whether that is even possible. Unfortunately, I would contend that without it, we simply shouldn't bother wasting resources, and should cut regulatory budgets dramatically.

Never has the need for expertise been greater, or the resource gap wider.

Regulatory organizations are predominantly staffed by attorneys, yet they wonder why they have trouble keeping pace with private companies staffed by experts in every domain – traders, programmers, quantitative modelers and operational / back-office engineers. **The markets have changed.** Can this be stated more strongly? The markets look **nothing** like they did 100 years ago, or 50 years ago, or even 15 years ago. Yet regulators continue with nearly the same type of staffing, similar allocations of resources and similar approaches to surveillance.

Technology-centric organizations are flat meritocracies that embrace failure and experimentation. They thrive on expertise at every level. They are younger and handsomely reward initiative and competence with both money and career advancement. To these firms, the word “bureaucracy” is a kiss worse than death. They are able to sprint while regulators are struggling to crawl.

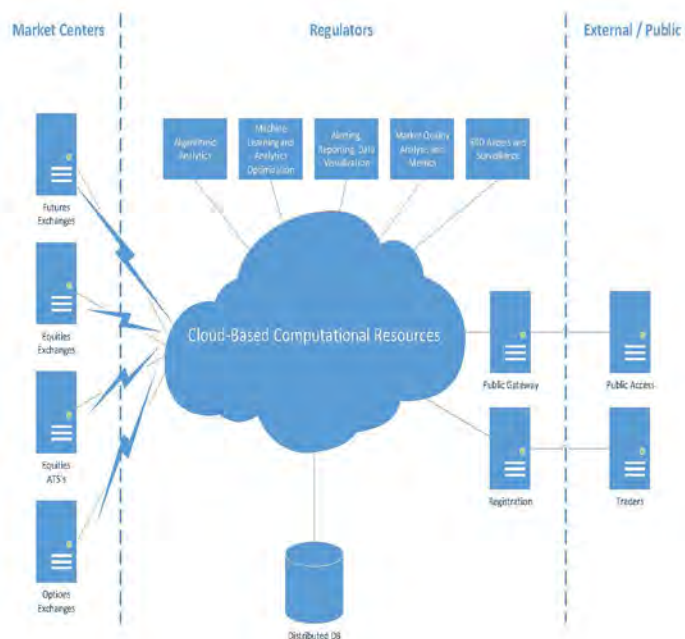
This is not to denigrate the adoption of technology that has happened at government agencies, but it is to point out that regulators see technology as another tool to be wielded within the same infrastructure as the past. Private firms who operate like that have long ago fallen to the wayside, as smaller, nimbler, technology-centric firms have destroyed them in the markets and run away with all of the edge.

Technology-centric organizations do not see technology as a tool built by an IT group in the basement or windowless offices. Instead it permeates nearly every activity, operation and function of the organization. Technology should not only be used to make existing processes faster or more efficient – it should transform those processes and enable new ones that were never thought possible. If regulators truly want to catch up, or even leapfrog the industry, this is the re-orientation that must take place.

Vision

I'd like to present my vision for the ultimate market surveillance system which is presented without regard to current systems, political feasibility or other considerations. It is simply a technologist's and practitioner's view of how markets should be watched by regulators in the modern electronic trading era. It is also not an attempt to reinvent the Consolidated Audit Trail (CAT); CAT will serve certain purposes once it is built but it is years away. The system depicted here can be built quickly with the proper resourcing and priorities. If this plan were proposed to a private firm that started work right away, it could be operational by the end of 2014.

This is a very high-level architecture, and will require a drill-down into every component.



"Our markets are fragmented. Our surveillance is not."

VP Surveillance for an international regulator

Market Centers

In this diagram, the market centers are all on the left and are included regardless of asset class. While this testimony is being prepared for the CFTC, there is no reasonable way to guard against malfeasance then to do so across asset classes. While market manipulation is a concern, cross asset-class front-running should also be front-and-center.

The first step to build this cross asset-class marketwide surveillance system is to develop a FIX specification for all market centers to generate a privileged regulatory feed. In conversations with a

regulator who did just this; they believe this is a 2-3 month development task after the specification is published.

Equally important is for all market centers to start using high-resolution, synchronized clocks for time-stamping messages. The CFTC TAC HFT Subcommittee in its October 2012 report made this same point, calling it "critical to reconstructing and sequencing market events,"³⁴ but lamented that then-current methods of clock synchronization were insufficient for these purposes. Without attempting to argue whether or not that was true at the time, it is certainly no longer the case. Technology is readily accessible for synchronizing to the microsecond, and there is no excuse for not having this in place today. Without it, this surveillance system will suffer the same shortcomings as current systems such as OATS, where aggregation and sequencing is rendered impossible by timestamp resolution and the lack of any clock synchronization. A simple call to a firm such as FSM Labs will quickly and cost effectively solve this issue.

While market centers would be able to continue to operate their surveillance groups in the same manner as they presently do, part of the appeal of this marketwide surveillance system would be that they could leverage centralized resources instead to reduce or eliminate duplication of effort. Market centers will still remain on the front lines for policing their markets and ensuring their rules are followed. They will simply have the option of leveraging a centralized infrastructure, and the possibility of looking at activity on other markets in the context of what's happening on their own. This represents potentially substantial cost savings for the SRO's and could be used to help finance system development.

Regulators

Certainly the most critical departure / disruption in this new surveillance system is the regulator. There are many components pictured here, and it is critical to understand how they all operate.

Cloud-Based Computational Resources

This is the heart of the entire system. High-speed networks and server resources keep data flowing in real-time, leveraging a cloud architecture to dynamically scale up and down as computational demands increase or decrease. While the "Distributed DB" is pictured separately in the architecture above, that is simply to call out the importance of this data store. In actuality, the database is another cloud component, able to scale up as data storage needs increase. As regulators determine the timeframes

³⁴ CFTC TAC Subcommittee on Automated and High Frequency Trading Working Group #2, "Quality Measures and Gap Analysis" http://www.cftc.gov/ucm/groups/public/@newsroom/documents/file/tac103012_wg2.pdf

over which data needs to be readily and speedily accessible, lower-cost data warehouse storage solutions can be used for long-term data storage.

The cloud-based computing resources are split between a virtual private cloud and public cloud. The virtual private cloud is a secure, isolated set of resources that are performing confidential regulatory tasks. The virtual public cloud provides web resources for the public and executes tasks from academics and the public on obfuscated data, as will be described later.

- Private cloud services
 - Data receipt and processing from market centers
 - Module execution (to be expanded upon below)
 - Storage and warehousing of order and trade data
- Public cloud services
 - Web-based systems for viewing derived data and reports
 - Web-based registration system for traders
 - Computational services for the public and academics for market data studies and algorithmic development contests

Surveillance Modules

Along the top of the surveillance architecture are a set of modules. This is a logical illustration of the categories of various surveillance and analytical tasks that can be run within this system. It is not meant to represent an exhaustive list, merely an illustration at a high-level of what can be done with a high-performance computing system dedicated to cross asset-class marketwide surveillance.

Algorithmic Analytics / Pattern Matching

If the cloud computing system is the heart, this module is the brains. The critical consideration with analytics and pattern matching is that it must be built with a “pluggable” pattern in which it is a simple and easy exercise to program and deploy new analytics and pattern recognition algorithms. This will allow for maximum flexibility as the system matures and is developed over time.

This module will initially look very familiar to those currently working on surveillance systems. It will have a familiar set of patterns – layering, spoofing, manipulation of opening/closing, quote stuffing, front-running, etc.

Sourcing these modules will be a difficult task for a regulator without the requisite resources and knowledge. Building this in a “pluggable” pattern ensures that regulators can leverage existing surveillance technology at SRO's, or third-party vendor offerings such as [SMARTS](#), [Surveyor](#) or [Delta Surveillance](#). Regulators can push these vendors to make their platforms and analytics more modular, and could use that architecture to plug in the most effective parts of each.

The pluggable architecture will also allow for more innovative, generic heuristics. Trending of activity, normality modeling, anomaly detection, clustering and dimensionality reduction could all have a role to play in this area. This module goes hand-in-hand with the next one – Analytics Optimization

Machine Learning and Analytics Optimization

While the human brain is smart, it is its neural plasticity that allows us to constantly reshape our thoughts to adapt to new knowledge and skills. While sufficiently sophisticated analytics and patterns are the core of a good surveillance system, a concept well understood by the current set of surveillance vendor offerings, an oft-overlooked technique is the use of machine learning to continually optimize analytics parameters. For example, generally at some point there will need to be manual review of an alert or exception to determine if it is worthy of enforcement. Over time, this creates a “labeled dataset,” which is perfect for supervised machine learning. Machine learning techniques are excellent in discovering the optimal parameters for the analytics and patterns that are searching for manipulation and crimes. This is an example where regulators don’t need **more** technology, just **smarter** technology. There is in fact a high likelihood that this could be done today, with the data that SRO’s and regulators are currently in possession of.

Optimization serves two critical purposes:

- Better parameters provide more true positives, missing fewer items; and
- They also provide fewer false positives, reducing “operator fatigue.”

Optimizing detection algorithms could have a substantial impact on the efficacy of surveillance algorithms. For example, one examination of closing price manipulation estimates that “only about 0.4% of all manipulation is prosecuted. For every prosecuted closing price manipulation approximately 308 to 326 manipulations remain either undetected or not prosecuted.”³⁵

One of the commonly cited reasons to **not** use technology in a more central and automated fashion in surveillance is the high incidence of false positives. Leveraging basic machine learning techniques can help regulators avoid these pitfalls, and advance to the point where systems become more streamlined, accurate and automated.

³⁵ Comerton-Forde, Carole and Putnins, Tālis J., Stock Price Manipulation: Prevalence and Determinants (October 4, 2012). Review of Finance. <http://ssrn.com/abstract=1243042> or <http://dx.doi.org/10.2139/ssrn.1243042>

Alerting, Reporting and Data Visualization

While detection is a critical function for any surveillance system, it must be followed by an alert that allows analysts to examine what the system has found. Even this alerting data should be trended and analyzed, and reporting done on these alerts to ensure that analytics and pattern matching is efficient and effective. In addition, there have been incredible advances in data visualization over the past few years, yet few of these advances have been taken advantage of by US regulators. Taken to its extreme, regulators would be well served to work with a top-tier design agency, and start to “re-design” surveillance for the 21st century. This means taking current systems, workflows and interfaces and asking how appropriate or effective they are in a more technology-centric world.

Market Quality Analysis and Metrics

The dataset collected by the cross asset-class marketwide surveillance system is perfect for running studies and analysis to determine market health, how that is changing over time, and how it is changing in response to new rules or pilot programs. There is no definitive source for market quality metrics, nothing like [Professor Michael Aitken demonstrated](#) in his analysis of the price improvement rule on Australian markets³⁶. US regulators should strive to have a similar system, which is publicly accessible, to act as the definitive source for market quality information. Even the SEC in its most recent research analysis on HFT admits that it must rely on academic studies for market quality information, the results of which are often contradictory³⁷. With an agreed-upon set of metrics and a high-quality, objective source of data, many of these outstanding questions about market quality would disappear.

SRO Access and Surveillance

The final component is SRO access to the same resources. This is simply an idea that SRO's should be able to use the same tools as regulators and the same resources to avoid duplication and wasted time / money. While some SRO's may decide that they would prefer to keep their surveillance systems in-house, the industry could realize significant cost savings and greater knowledge sharing / expertise transfer if these tasks are centralized. As previously stated, this cost savings should allow for partial funding of the effort by the SRO's and a much more efficient system overall.

³⁶ “Review of recent rule changes affecting dark liquidity”, May 2014, Australian Securities and Investment Commission, [http://www.asic.gov.au/asic/pdf/lib.nsf/LookupByFileName/rep394-published-19-May-2014.pdf/\\$file/rep394-published-19-May-2014.pdf](http://www.asic.gov.au/asic/pdf/lib.nsf/LookupByFileName/rep394-published-19-May-2014.pdf/$file/rep394-published-19-May-2014.pdf)

³⁷ “Equity Market Structure Literature Review”, March 18, 2014, Division of Trading and Markets, SEC, http://www.sec.gov/marketstructure/research/hft_lit_review_march_2014.pdf

External / Public

There are two main components to the externally-facing interface to the cross asset-class marketwide surveillance system. The first is the Registration System. The second, and perhaps one of the more innovative aspects of this proposal is the idea that this system can be used as a point of engagement with the public and academic community.

Strategy Registration System

As I proposed in my [October 2012 Written Comment](#) for the SEC's Technology Roundtable, the first step in building out a proper surveillance system is to have appropriate identifiers associated with orders. As the CFTC also considers whether to have high-speed trading firms register, the potential exists to address both issues at once.

This can be accomplished via a Strategy Registration System. While some will argue that monitoring individual strategies is unnecessary, and this system would work sufficiently well at the trader, rather than strategy level, I am going to continue to push for this level of granularity. Strategy-level surveillance will certainly make for more efficient and effective detection of market manipulation.

It will also enable a new breed of kill switch that is able to dynamically adapt to changing market and trading conditions, and monitor individual algorithms in an automated fashion. The kill switch discussion is out-of-context in this testimony, so I have separated the registration system into two phases – what's necessary for surveillance and what's necessary for the kill switch. The kill switch discussion is for another time, and its own paper entirely.

All of that being said, identifiers at the trader level are sufficient, and should be the minimum level of granularity that regulators are willing to accept. Firms should have to first register as automated trading firms, and upon approval they can then register their trading strategies or traders. The Strategy (or Trader) Registration System is a relatively simple web application that would allow firms to register any trading that will be done electronically. This application would treat sell-side algorithm registration differently from market making / proprietary trading algorithms, which will be its primary focus. For market making / proprietary trading firms, algorithms would need to be registered with the following information, separated into two distinct phases:

- Phase 1 registration - Surveillance
 - Strategy name
 - Supervisory individual responsible for strategy's actions
 - Contact information for supervisory individual and emergency contacts

- Asset classes being traded
- Market centers
- Phase 2 registration – Kill Switch
 - Strategy Profile
 - Average/Min/Max cancellation rate
 - Average/Min/Max orders per second
 - Will strategy send ISO orders?
 - Etc.
 - Group sign-off
 - Strategy developer
 - Strategy trader
 - Trading desk manager
 - Operations group manager
 - Head of trading or other executive at the firm

Sell-side execution algorithms will also require this type of registration, although the expectation would be that some of their activity characteristics are not as straightforward to backtest / measure, and minor updates to those algorithms would not require updated registration.

This should be a modern web app, with the ability to save and edit these forms, and use a distributed system for sharing the forms in order to review or sign-off. The form will assign a globally unique ID to the strategy/trader. Exchanges will have to extend their FIX and proprietary electronic order entry protocols to support the receipt of this ID, and participants will have to attach the ID to every quote they submit. Most importantly, the values in the extended Strategy Profile must be empirically measured – not estimated. This will require a minimum level of quality assurance and backtesting so the firm can be assured that these values are reasonable and realistic.

The ability of academics to use publicly available trade and quote data to inform current market structure policy debates is limited at best. To better inform policy, the relevant bodies should periodically make well-documented, market-wide data sets available to the public for analysis.

Prof. Robert Battalia, Professor of Finance at the University of Notre Dame

Public Access

As previously stated, one of the more innovative and disruptive proposals in this testimony is the various ways to give the public access to market data that is being collected. There are two primary reasons that this is a critical function for this system:

1. Research on US markets has reached a crisis point – proper data simply cannot be obtained by academics. Even the SEC acknowledges the “formidable data challenges facing researchers”³⁸ in their March 2014 HFT literature review. The CFTC’s TAC ATS/HFT Working Group 4 realized the same issue in their report, stating “[a]cademic analysis is difficult because ... data remains confidential.”³⁹ The data that is available to researchers either comes from conflicted sponsors (firms in the industry) or exchanges with older or limited datasets. When academics produce research that contradicts their sponsors’ goals, their access to data is cut off. **This is no way to study the engine of the US economy.** Regulators must step in and correct this problem by providing the definitive dataset for academic research. A secondary goal would also be to allow academics to run their studies using resources sponsored by, or at least maintained by regulators. Data access is one part of the problem – the computational resources to properly process that data is another. Regulators can solve both.
2. Regulators are limited. They are limited in their resources, experience in markets and depth of knowledge of manipulation tactics. These limitations are inevitable – they are the nature of being a regulator. The public is limited in other ways. However, there is a vigorous community that has developed around analyzing markets and market structure. Financial services regulators have not yet tapped the potential of this community. Websites such as kaggle.com and other prize-based incentives have demonstrated the incredible scientific brain power that is out there, hungry to apply advanced modeling and machine learning techniques to a new industry or problem. Another approach would be to model this after a whistleblower program and award people a percentage of the fines collected as a result of their algorithms. This would of course present problems of algorithmic overlap (multiple algorithms detecting the same behavior), so other success factors may need to be accounted for: computational efficiency, accuracy / false positives, and heuristic flexibility. It could also open the floodgates for detecting much more complex types of market and price manipulation than previously thought possible. For example, it may be possible for a trader to manipulate the US Treasury yield curve with a more creative and mathematically-based mechanism than just layering or spoofing a single futures contract, but it’s hard to imagine regulators having the capability to detect such activity without help from practitioners.

There is no doubt that there are many valid concerns over providing access to data in this way. Most of those concerns focus on data confidentiality and whether trading strategies can be reverse-engineered. Some others are around data security. These are critically important issues that must be addressed before anything can be opened up in such a revolutionary way. There are answers to these questions though, and some initial ideas to address them include:

- Data security: all data possessed by financial services regulators is critically important to keep safe and confidential. This data would be no different. Modern security practices should be

³⁸ “Equity Market Structure Literature Review”, March 18, 2014, Division of Trading and Markets, SEC, http://www.sec.gov/marketstructure/research/hft_lit_review_march_2014.pdf

³⁹ CFTC TAC Subcommittee on Automated and High Frequency Trading Working Group #4, “Risk Management and Market Structure” http://www.cftc.gov/ucm/groups/public/@newsroom/documents/file/tac103012_wg4.pdf

adopted, as the SEC has recognized in convening a [panel on Cybersecurity](#). This is no matter to be taken lightly, nor is it a problem that cannot be solved.

- Data confidentiality: all identifying information must be obfuscated when the public interfaces with that information in any way, even if they don't have direct access to that data. This includes strategy, trader, firm, broker and order ID's. In addition, all data could be delayed by one or two quarters. There is no hard requirement for immediate academic and public access.
- Reverse engineering: this is perhaps the most important and difficult concern. That is why this proposal does not give the public direct access to market data, but rather to an API (Application Programming Interface) through which they can interact with the data. They can have access to derived data, but not to the raw market data. This can be enforced with stiff fines and policed in a simple way. The amount of data received and frequency with which someone runs studies on the data will quickly betray someone who is trying to access raw data. Those issues can be alerted to an analyst who can examine the program being run, the data being returned, and quickly make a determination as to whether it follows the rules or not.

The benefits to regulators in adopting an open approach such as this would be incredible. The expansion of their resources beyond regulatory staff and the insight of resources from outside the regulatory world would make a tremendous and material difference to the analysis and policing of markets. I don't believe that the benefits of this idea can be overstated – indeed it helps address many of the problems commonly associated with regulation: lack of technological nimbleness, lack of practical experience and insight, and limited resources. Implementing this platform within a newly technology-centric organization could catapult regulators ahead of the industry and ensure that they will remain so, even as technology advances at a furious pace.

Roadmap

The Vision laid out above is what I believe to be the most practical, achievable surveillance system in a reasonable timeframe. It is not meant to be the Consolidated Audit Trail, it is **meant to take readily available technology and leverage it in creative ways to facilitate the maximal amount of functionality in an environment of constrained resources**. Building this system will be challenging for the reasons listed on Page 1. While the technology challenge is formidable, it's also been done by many firms in the industry. This is not a multi-billion dollar project, it's a low single-digit million dollar project. If this was a private firm who kicked off the development effort now, they could have it operational by the end of 2014.

There are several tasks that can begin and run in parallel:

- Foundational tasks / research
 - Write FIX spec

- Deploy clock synchronization technology across all market centers
- Evaluate vendor surveillance products
- Evaluate cloud computing solutions
- Security plan written, integrated into every aspect of development / deployment
- Policies and procedures developed for academic and public access to data
- Development
 - Exchanges build FIX feeds
 - FIX engine deployed to cloud to receive and process feeds
 - Web registration system built for strategy or trader ID's
 - Module development starts in parallel
 - Proper DevOps approach to infrastructure to make cloud computing and storage supportable and scalable
 - API development and workflow creation for academic and public access to data
- Testing
 - Once platform and modules pass unit tests, integration testing begins
 - Data starts flowing through the system, modules get tested
 - Load and volume testing for high-volume situations

"If a regulator cannot regulate a complex system, then what can it do? Will a regulator always be caught behind the curves of self-organization and emergence, holding a bag of obsolete rules that came from less evolved systems? ... Rather than a regulator, complex systems should have a co-evolver/counter-evolver. This must be an organization that has the requisite variety not only to have an idea of the complexity of the operational organization (and thus has to co-evolve with how that organization evolves), it should also have requisite variety to counter-evolve."

Sidney Dekker, [Drift Into Failure](#)

Today

While the vision and roadmap outline one possible destination that market surveillance can reach, it is by no means the only thing that can be done. Regulators can kick off parallel efforts to more effectively monitor markets today.

Regulators can work with existing surveillance groups to understand the data that they have access to today and start to make use of that. Hopefully this Technology Advisory Committee meeting helps that process along. This exercise could reveal a substantial amount of untapped potential in the current set

of data that is available. It would also make an excellent test case for evaluating vendor surveillance products and developing a new set of analytics, as well as leveraging machine learning for optimization of current approaches and algorithms.

Regulators can also get participants to give them the full set of ID's that they are trading under in every market, and use those ID's to connect activity across asset classes. While timestamps will prove a problem for high-frequency trading, lower frequency behavior may be found through simple analysis of existing data.

For any of this to work, **the SEC and CFTC will have to start working together**. Surveillance is the perfect example where all regulatory entities (agencies and SRO's) should be working very closely. In addition, one of the principles of the vision laid out above is a renewed engagement of industry practitioners. This is an example of how regulators can "co-evolve" with a complex industry. They must find creative ways to engage and incentivize traders and practitioners – firms and people who live and breathe markets everyday – if they want to have any hope of understanding and detecting manipulation. While offering prize-based or percentage-of-fines incentives and the technology resources to develop and test detection algorithms should be the ultimate goal, regulators can begin with something simpler:

- Immediate formation of a new committee composed of surveillance personnel and experienced traders to dive deeply into the problems in the current market.
- Development and release of a new dataset for academics to use containing data from futures, equities and options, similar to Nasdaq's HFT dataset.

Attachment 2: Healthy Markets Initiative Platform

The Market Structure debate is a contentious one that has enthralled the entire Financial Services industry. This debate rages from Twitter to the Wall St Journal. Everyone in the industry has a strong opinion on the state of the market and how to reform it. KOR Group LLC principals, [Chris Nagy and Dave Lauer](#), have been at the center of this debate for years and have recognized that, despite many differences of opinion, a broad cross-section of industry professionals can agree on some fundamental reforms for increasing transparency and reducing conflicts-of-interest. While these views are not universally shared, KOR believes that enough key firms can agree on a core set of reforms and principles to effectively lobby for these changes. KOR further believes that these changes would have an enormously beneficial impact on US equity markets.

On the other side of this debate are powerful, entrenched interests with effective lobbying operations and a strong presence in DC. KOR's intention is to build a coalition of like-minded firms that can agree both on general guiding principles and specific remedies. It is only by assembling an equally powerful coalition that the entrenched interests can be challenged.

It is also critical to understand that change is coming. The SEC will be actively examining market structure issues in 2014 and running pilot projects to evaluate significant changes. It is critical that subject-matter experts who are independent of any particular firm or segment of the industry are at the forefront of guiding the SEC to make effective changes. These independent experts would also be critical in preventing the SEC from overreaching its authority or overreacting based on the issue du jour in the media.

HEALTHY MARKETS's principles are simple:

- **Transparency:** "Sunlight is ... the best of disinfectants." – Supreme Court Justice Louis Brandeis
- **Metrics:** In order to evaluate any changes, a new set of metrics must be agreed upon and developed.
- **Data Freedom:** All recommendations and rulemaking must be data-driven; In addition to the Division of Economic & Risk Analysis "DERA", data should be in the provided to academics, researchers and the public.
- **Displayed Liquidity:** Displayed price discovery is one of the critical functions of the market and must be encouraged.
- **Competition** for order flow is healthy for markets.

The HEALTHY MARKETS Group platform naturally follows from these principles:

- Modernization of Rules 605 (Market Quality Metrics) and 606 (Broker Routing Metrics);

- Passing of a trade-at rule for US equities, starting with including trade-at in the tick size pilot;
- Pilot to eliminate rebates, which includes a trade-at provision;
- More active SEC & FINRA monitoring and guidance on best execution rules;
- Full disclosure of all market center and Alternative Trading System filings;
- Mandating that ATS's use direct feeds instead of SIP to calculate NBBO and provide latency reports demonstrating that their ATS receives data before, or at the same time as, any other group in the company.
- A push for the SEC to provide open access to MIDAS and any other market data research tools for general study by academics and the public.
- Data feed reform to ensure that consolidated data is always **received** before any proprietary feed data. This includes proper incentives to maintain the consolidated feed and timestamp synchronization across all markets.

Investors Deserve to know how well their orders are being executed and where they go

On July 28, 2000, the SEC proposed SEC 11Ac 1-5, order execution statistics & SEC 11Ac1-6⁴⁰, routing and material relationship aspects disclosures. The rules, now known as SEC Rules 605 and 606 were adopted in response to increasing competition and resulting fragmentation in the market. The SEC sought to assure investors that the U.S. National Market System continues to meet their needs by ensuring the practicability of Best Execution of all investor orders, including limit orders, no matter where they originate. The Commission noted that fragmented markets may isolate customer orders from full interaction with other buying and selling interests. The Commission also noted that Internalization and payment for order-flow practices contribute to an environment in which vigorous quote competition is not always rewarded.

Brokers have a duty of Best Execution in accepting orders and routing them to a market center for execution. Brokers generally act as agents for their customers and, although not specifically defined, owe them a duty of Best Execution, which is derived from common law agency principals and fiduciary obligations⁴¹. It is incorporated both in self-regulatory organization rules and through judicial and Commission decisions in the antifraud provisions of the federal securities laws. The duty of Best Execution requires a broker to seek the most favorable terms "reasonably available under the circumstances" for a customer order⁴².

⁴⁰See: <http://www.sec.gov/rules/final/34-43590.htm#secv>

⁴¹ See: <https://www.finra.org/web/groups/industry/@ip/@reg/@notice/documents/notices/p003883.pdf>

⁴² SEC Order Handling Release at 48323, NASD Notice to Members 96-85 at 541

The SEC moved with decisive action, taking just five months to adopt a comprehensive framework of rules 605 & 606 and expediting the phase-in process by May of 2001 for both rules. For a period of time, the rules functioned as intended. Brokers increasingly sought Best Execution and regularly published various statistics regarding execution quality. Over time and in particular with the adoption of Regulation NMS, the rules became increasingly outdated and their usefulness, while still relevant, has diminished. In part, the rules have eroded due to the increasing complexity of order-types as well as speed and routing practices in today's marketplace. Rules 605 and 606 have not kept pace with these changes. The SEC even went so far as to say "improved visibility could shift order-flow to those market centers that consistently generate the better prices for investors and the Commission will assess the impact of the rules to determine whether additional action is necessary to further the Exchange Act's objectives for a National Markets System."

Fourteen years later, modernization of Rules 605 and 606 has not happened. As such, broker evaluation is a difficult and subjective process. Further, there is no clear, independent measure of market quality by which the SEC can judge the efficacy of the rules that have been passed, most notably Regulation NMS. The US equity markets changed dramatically with the adoption of NMS in 2007, but there is no clear, definitive proof that market quality has improved since then.

Recently Congress held a hearing about Regulation NMS⁴³ and it was no surprise that Best Execution and conflicts were at the center of the debate, but there was no mention of either rule. Transparency can play a major role in creating efficient markets and provides SEC staff with the necessary tools to ensure brokers comply with their duty to benefit investors. In fact, many brokers regularly route their limit orders to different destinations than their market orders. This is done in spite of the fact that, in some instances, those limit orders could be afforded an offsetting execution to the market order or receive faster execution through Rule 5320⁴⁴ (Manning). While this is technically legal, it is unethical. Should Best Execution principles be revisited (as we are urging), a reexamination of this practice must be part of that process. Further, the lack of qualitative measurements in the Options markets has led to increased conflicts associated with agency order-flow inducements⁴⁵.

⁴³ February 28, 2014 House Financial Services Committee hearing entitled "Equity Market Structure: A Review of Regulation NMS"

⁴⁴ See FINRA NTM 11-24

⁴⁵ See To Pay or Be Paid: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1954119

Now is the time to modernize Rules 605 and 606 before any other rules and changes are placed into the market. In modernizing the Rules, the following should be considered:

Modernize Rule 605/606 Execution Benchmarks, Measurements and Best Execution policy

Rule 605:

- Amend Rule 605 to capture the full range of order execution.
- Include dark and reserve orders as new order types.
- Require all ATS and Dark Pools to report under Rule 605.
- Shorten the reporting time-frame and require the reports be made available monthly 15 calendar days following the end of the preceding month. Require all historical reports remain freely and easily accessible.
- Require all quote and trade data to be carried out to the millisecond using proprietary feeds over the current SIP requirement.
- Require millisecond-level clock synchronization at every Exchange, ECN and ATS.
- Amend Rule 605 based on the time the broker's router receives the order.
- Replace execution time categories as follows:
 - Less than 500 microseconds
 - 500 microseconds – 1 millisecond
 - 1-10 milliseconds
 - 10-100 milliseconds
 - 100 milliseconds to one second
 - Current time categories
- Expand coverage to Odd-Lot orders especially since they are now tape reportable.
- Expand order buckets size categories:
 - 1-99 shares
 - 100 share increments to 9,999 shares
 - 10,000 – 24,999
 - Greater than 25,000
- Add Covered Trades.
- Expand Realized Spread into separate buckets (e.g. 50ms, 100ms...3minutes) to better identify adverse selection.
- Require "Immediate or Cancel", "Peg", "Flash" order types to be reported separate from Market Orders.
- Include Market Opening/Closing orders.
- Add "Realized Liquidity" by taking the displayed BBO size in relation to the size of the order.
- Include broker-dealer order receipt time as a measurement in addition to market center receipt time.
- Add Quoted Spread.
- Add Spread Leeway (Quoted spread divided by the Minimum Price Variation).

- Require all non-marketable limit orders to be set on a timer so that once they are displayed at the BBO, average time to execution is displayed.
- Require that execution data contains header information.
- Require Broker-Dealers who route orders to execution venues to make 605 data about those orders available.
- Statistics should be calculated for:
 - Orders that execute on the receiving platform
 - Orders routed out
 - Routed and not routed orders
- Expand Rule 605 to Exchange traded option securities.

Modernize Rule 605/606 Execution Benchmarks, Measurements and Enforcement

Rule 606

- Remove AMEX, NYSE and Nasdaq and replace with "NMS Securities."
- Add OTC Bulletin Board/OTC Market securities.
- Include category "Odd Lot Orders."
- Include category "Marketable Limit Orders."
- Include information on the percentage of shares executed versus sent.
- Include block transactions.
- Require Rule 606 cover 100% of order flow received.
- Require Directed Orders to be reported as a separate category from Non-Directed Orders, removing the current exemption.
- For executing venues: Require total payments or charges are reported by Broker-Dealer.
- For Broker-Dealers: Require total payments or charges received be reported under information concerning significant venues.
- For Brokers that send orders to internalized executing center, require payments or charges on the aggregate order-flow to be reported.
- Require the execution venue to be reported. In the case of options, report on exchange where the order executed rather than the intermediary.
- Require the reports be made available monthly 15 calendar days following the end of the preceding month.
- Require that all current and historic reports be freely and easily accessible and downloadable in a pipe delimited format.
- Require field of average payments received be reported out to the hundredths of a cent, rather than maximum's (e.g. less than \$0.01).
- Require Broker-Dealers to post explicit details regarding payments, costs and execution metrics agreed to by the executing firm.
- Require greater transparency around broker-dealer internal order routing practices and decisions.

Transparent reporting is a necessary first step prior to rolling out the broader structural changes under consideration. Qualitative reporting and disclosure of routing practices allows for analysis of the effects of order routing practices, competition, pricing and other metrics, which in turn allows for better outcomes and fewer unintended consequences of broader change.

Adopt a Trade-at regime for NMS securities.

Going Dark

Percentage of U.S. stock shares traded off-exchange, monthly



Broker-Dealer internalization and dark pool trading have grown dramatically since the adoption of Regulation NMS in US equity markets.

As of February 2014, 36% of US stock trading volume is transacted off-exchange. In 2010, in response to growing dark volume, the SEC issued a concept release seeking comments on all aspects of a trade-at rule⁴⁶. Trade-at was further expounded upon following the market events of

May 6th, 2010 from the CFTC & SEC Joint Advisory Committee on Emerging Regulatory Issues⁴⁷. In their findings, the committee recommends that:

“The SEC studies the costs and benefits of alternative routing requirements. In particular, we recommend that the SEC consider adopting a ‘Trade-at’ routing regime.”

Trade-at regimes are found in U.S. Markets

Unlike the equity markets, all options trades must be executed on an exchange⁴⁸. There is no Trade Reporting Facility (TRF) as is found in the equity markets and no off-exchange internalization is

⁴⁶ See SEC Concept Release <https://www.sec.gov/rules/concept/2010/34-61358.pdf>

⁴⁷ See Joint Advisory Committee on Emerging Regulatory Issues recommendations: http://www.cftc.gov/ucm/groups/public/@aboutcfto/documents/rel/jacreport_102811.pdf

⁴⁸ See Securities Exchange Act Release Nos. 42894 (June 2, 2000), 65 FR 36850 (June 12, 2000) (File No. SR-Amex-99-36); 42835 (May 26, 2000), 65 FR 35683 (June 5, 2000) (File No. SR-CBOE-99-10); 42848 (May 26, 2000), 65 FR 36206 (June 7, 2000) (File No. SR-PCX-99-18). See also Securities Exchange Act Release No. 42455 (Feb. 24, 2000), 65 FR 11388 (Mar. 2, 2000) (concerning the NYSE’s “facilitation mechanism”).

permitted. Moreover, the strength of the options model was borne out on May 6th, 2010 when the options markets were able to absorb the spikes in volatility better than the underlying equities⁴⁹. In the Report from the CFTC/SEC to the Joint Advisory Committee on Emerging Regulatory Issues, staff noted:

"In general, the options markets and participants reported that trading in options did not experience similar disruptions as in the underlying securities markets",

Furthermore, there were no significant liquidity shortages reported in the options markets on May 6th and very few trades were broken or adjusted. Another unique aspect of the options markets is there are thirteen exchanges aggressively quoting displayed liquidity which is significantly greater than what is found in the equity markets. Furthermore, liquidity in the options markets across the thirteen quoting exchanges shows greater displayed liquidity than what is found in the underlying equity markets in many NMS securities⁵⁰.

Recently, Congress passed H.R. 3448 "The Small Cap Liquidity Reform Act of 2014" which seeks to widen spreads to a minimum increment of \$0.05. The Act, among other items, requires that the SEC determine the increment at which the securities of such companies are traded⁵¹. Congress realized that simply widening quoted spreads without making a determination of the trading increment could lead to greater internalization, thus diminishing the intended goal of enhancing displayed liquidity on Small Cap securities. As the Commission considers the increments, Healthy Markets strongly suggests the Commission also consider adopting a Trade-at pilot in conjunction with widening spreads.

The benefits of a Trade-at regime outweigh the burdens.

A trade-at program should begin as a pilot, allowing for the Commission and others to study the effects to help determine whether the pilot should be expanded or eliminated. Recently Canada and Australia adopted Trade-at regimes to dissuade off board trading. In creating a trade-at for NMS securities, Healthy Markets invokes features adopted by both Canadian⁵² and Australian markets. Namely, provisions for a trade-at should, at a minimum, have the features described below:

⁴⁹ See Report from the CFTC/ SEC to the Joint Advisory Committee on Emerging Regulatory Issues (1.D. 62): <http://www.cftc.gov/ncm/groups/public/@nab/enf/documents/1d62/staff-findings/50610.pdf>

⁵⁰ See Illiquidity Premia: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1784968

⁵¹ See H.R. 3448: <http://beta.congress.gov/bills/113th-congress/house-bill/3448/text>

⁵² See IIROC: http://www.iiroc.ca/Documents/2012/77c0at22-004e-417d-9217-a160b3fcb5c5_en.pdf

- Define “better price” to mean a minimum of one trading increment except when the difference between the best ask price and the best bid price is one trading increment. In such cases, the amount shall be a minimum of one-half of one trading increment.
- Permit the SEC to designate a minimum size for orders that are not displayed in a consolidated market display.
- Permit the SEC to designate a minimum size for block orders that must be displayed in a consolidated market display.
- Provide that an order entered on a marketplace must trade with visible orders on that marketplace at the same price before trading with dark orders at the same price on that marketplace.
- Require, subject to certain exceptions, an order entered on a marketplace that trades with an order that has not been displayed in a consolidated market display to either:
 - receive a better price, or
 - be for more than 50 standard trading units or have a value of more than \$100,000.
- Mandate that Price-Improving Orders may only occur at the mid-point of the NBBO spread at the time of order-execution.
- Begin selection of Trade-At pilot securities with the roll-out of the decimal pilot for Small Cap securities. In doing so the Commission should seek to select ½ of the decimal pilot securities for inclusion in a Trade-at Pilot. This selection must be randomized.

Healthy Markets believes that such an approach would lead to sound data, allowing for a reasonable determination as to whether such a pilot should be expanded or eliminated.

Re-Examination of Maker-Taker

The maker-taker model has become the predominant economic model for exchanges in the US stock market. Under this model, those who post orders are called “makers.” If an aggressive order crosses the spread, that is called the “taker.” In this model, generally, exchanges pay rebates to the “makers” and charge fees to the “takers.” The exchanges make the “vig,” the difference between the rebate and fee. This “vig” generally ranges from \$0.0003 – \$0.0015. Generally, longer-term investors are “takers” while Market Makers will be the “makers” (though this statement is not meant to be construed as always true. Certainly long-term investors will enter positions passively at times). The fees paid to “take” liquidity vary, but are capped by regulation at \$0.003 through Rule 610 “Access Rule” of Regulation NMS¹¹, and generally trend towards that cap, as would be expected.

¹¹ See Reg NMS File No. S7-10-04 ID (27) <https://www.sec.gov/rules/final/34-51808.pdf>

Healthy Markets believes Maker-Taker suffers from many flaws, including but not limited to:

- A lack of transparency around net-pricing. The publicly quoted price is not the actual price when access fees are accounted for.
- The incentivizing of churn and volume-trading for rebate collection, rather than liquidity provision and price discovery.
- The conflict-of-interest created for brokers (most notably retail brokers, but certainly anyone acting as an agent) to route "cost effectively" by default. This results in brokers attempting to minimize access fees and maximize rebates while charging their clients a fixed price (either per-trade in retail or per-share for institutions) and keeping the cost savings / rebates for themselves.

While many will argue that economic forces and free market competition are enough to address these problems and to determine the equilibrium business models for exchanges, Healthy Markets would argue that this is naïve and overly optimistic. We are already in an environment of price controls and heavy regulations. It should be clear that nearly all lit trading venues (and certainly all venues with substantial volume) have become maker-taker with access fees for taking liquidity at the cap determined by the SEC. This is the result of a race-to-the-bottom in which each exchange is forced to increase rebates, add liquidity tiers and increase fee complexity in order to compete with the other exchanges. Other models cannot be successful in this environment where the predominant supplier of liquidity is driven by rebate collection and has driven out most other suppliers of liquidity.

There is an argument to be made that brokers will still remain sophisticated and will route order flow to ensure Best Execution for their clients. Unfortunately, the definition of Best Execution has become outdated and can still be claimed despite clear evidence that brokers are routing for their own interests rather than the interests of their clients. In one of the only studies to examine this conflict-of-interest, a study from Notre Dame by Battalio, Corwin and Jennings (March 2014)⁵⁴ offers "strong evidence that venues with high take fees (liquidity rebates) offer inferior limit order execution quality." The authors present substantial evidence that order routing decisions are governed by the fee schedules rather than execution quality, making the following conclusions:

"Limit orders resting on venues with high take fees require more time to fill than those on venues with lower take fees."

⁵⁴ See: Can Brokers Have it all? http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2387462

"For take fee differences exceeding \$0.0001 per share, the lower take fee venue has higher measured limit order execution quality."

"The decision to route the bulk of one's limit orders to a single venue offering the highest liquidity rebate is inconsistent with a broker's fiduciary responsibility to obtain best execution."

"Inverted venues have shorter queues and are at least as likely to receive marketable orders as the traditional venues."

"Several large, national brokerage[s] are making order routing decisions that appear to be consistent with the goal of maximizing order flow rebates. ... Proprietary data suggests this type of order routing results in lower fill rates and increased adverse selection costs."

Healthy Markets strongly supports a pilot program to eliminate rebates⁵⁵. The pilot program could be run concurrently with the tick size pilot, as it can be run in an entirely different class of securities designated by market capitalization. Such a program would shift the incentives for liquidity providers away from capturing rebates and towards spread capture. It would encourage a greater diversity of timescales for providing liquidity, especially when done in conjunction with a trade-at provision. Current liquidity providers believe that rebates are necessary on lit exchanges to compensate for the high levels of adverse selection that result from a high level of off-exchange trading. Healthy Markets understands this concern and therefore would argue for a similar trade-at provision in this pilot as in the tick size pilot – that half of the pilot securities also have a trade-at provision. Healthy Markets believes that the designation of a group of securities with no rebates and the implementation of a trade-at provision will demonstrate substantially superior metrics for liquidity and spreads. Healthy Markets also believes that, under these reforms, much of the order book instability associated with illiquidity contagions will disappear.

When Rule 610 of Regulation NMS was adopted, no studies were conducted as to the appropriateness of a fee cap. This is true in spite of the fact that Rule 610 was one of the most controversial aspects of the new Regulation. It is only through a pilot program that the effects of these rule changes can be adequately monitored and compared. We believe that the results will be clear and quick and that it will be obvious, in short order, that the pilot should be made permanent.

⁵⁵ See : <http://HealthyMarketstrading.com/wp-content/uploads/2014/03/ssm-id1584026.pdf>

Improved Technology Across the Industry

There is no doubt that the technology revolution that has swept the Financial Services industry has brought incredible benefits. Those benefits have brought down trading costs over the last 20 years in an unprecedented fashion. As we work to implement reforms, it is critical to ensure that we do not negatively affect any of those improvements in markets. It is our belief that there are several important but simple things that can be done, which will have significant impact on market quality and public trust in markets.

Healthy Markets has identified many problems that have accompanied these technology changes. These problems include:

- Research
 - Markets have become difficult to study. The amount of data to study is immense, and requires resources (computing and storage) and skills (finance and parallelized research design) that many academics (and the public) don't have.
 - Obtaining data is even more difficult. There is no free, public source for complete depth-of-book data on markets, and no data on dark pool IOIs and lit market IOCs. When academics are able to obtain data, it's either very limited (i.e. Nasdaq makes its data available) or it is sponsored by an HFT firm or broker. When the results of the research don't conform to the sponsor's agenda, access is cut off.
- Complexity
 - Technological complexity has resulted in a much higher incidence of technology problems. Infrastructure is highly connected, and in some cases poorly maintained. The SIP is the perfect example, where incentives are not aligned for keeping the technology competitive with high-performance systems.
- Transparency
 - It has become easier to hide behind technology and reduce transparency.
 - The explosion of Alternative Trading Systems has increased a part of the market where there is no visibility, either from a quoted price discovery perspective or from a regulatory filing perspective.

Healthy Markets believes there are actually three simple answers to address these problems:

1. MIDAS reform
 - a. Add Dark Pool IOIs and market-wide IOCs to MIDAS. MIDAS should be able to study this huge part of the market that it is unable to see right now. Quotes in Dark Pools are just as important as those in lit pools. Ultimately, obfuscated participant ID's should be associated with each quote and trade to allow MIDAS to do proper research. Both of these efforts should be kicked off immediately.
 - b. Provide open access to MIDAS to all qualified researchers, academics, and even the public. Anybody who wants to study markets should be able to. The value of this step cannot be overstated. The open source movement has shown the world that there is a better, more collaborative way to build software and study problems. There is no

downside to this, other than cost of Amazon instances, and the value received for that cost would be tremendous.

2. Data feed reform

- a. All exchanges should synchronize their system clocks to the microsecond. This is no longer difficult or burdensome, and is a critical step towards understanding cross-market dynamics. It would also allow participants to see a more similar NBBO though they may be geographically dispersed.
- b. Mandate that any ATS that matches trades in a manner dependent on the NBBO has to use direct feeds to calculate the NBBO. Furthermore, for those firms that do not strictly run an ATS, they have to produce reports that demonstrate that their latency to process the feeds and receive data **within the application** is the same as, or lower than, any other business unit that receives those feeds. This is critical to ensure that they do not simply route the direct feeds in, but process them so slowly as to replicate SIP performance (or worse). Firms should be made to understand the principles behind this, and should be audited on a regular basis to demonstrate they are adhering to those principles.
- c. A longer-term goal should be to have SIP performance that is the same as, or superior to, direct feeds. While direct feeds carry depth-of-book information that is important for some participants, they should never be **received** before the same update on the consolidated SIP feed. This is an important distinction for regulators to make – the perspective needs to shift from when data is transmitted from a market center, to when that data can first be **received** by a participant. Focus needs to be on data receipt time, not data transmission time.

3. Regulatory Filing Reform

- a. All ATS filings should be made immediately public. All future filings should go through the same public comment process as SRO filings. It is a simple historical circumstance that ATS filings are hidden from the public while the burden is on SROs to file publicly. This does not serve the public interest in any way, and makes it easy for media and others to sensationalize and demonize what is occurring in this part of the market. There should not be any reasoned argument against this.
- b. FINRA should change how they are going to be reporting dark volume statistics. Once again, this data should be made readily available in a programmatic fashion for free. FINRA should ensure that all data can be accessed either in a delimited file format or via API, and this access should be free. There is no excuse for a regulator to try to profit from data that is being made publicly available.

Once again, Healthy Markets' guiding principles are what the entire industry should aspire to:

Transparency, Quality Metrics, Data Freedom and Displayed Liquidity. When discussing technology, we should also aspire to simplicity wherever possible, and an understanding of complex systems wherever necessary.

**RESPONSE TO WRITTEN QUESTION OF SENATOR BROWN
FROM JOE RATTERMAN**

Q.1. Since at least 2012, former high-frequency traders have been expressing concerns about exotic order types that technically comply with the SEC's regulations, but which allow high-frequency traders to jump the queue and exploit price advantages that come from latencies.

NYSE announced in May that it was eliminating 15 order types. However, NYSE continues to allow high-frequency traders to use some predatory order types, like "Post No Preference Blind," in which high-frequency traders' bids to remain blocked from the market and then jump to the top of the queue.

Nasdaq has a similar order type called "Post Only with Automatic Re-Entry," DirectEdge has "Hide Not Slide," and BATS offers "Only Post Only."

When I asked Mr. Sprecher about these order types at the hearing, he said:

[A]s you say, I'm uncomfortable with having all these order types. I don't understand why we have them. And I've started unilaterally eliminating them. The problem that we have is that orders today are—decisions on where orders go are not made by humans. They're made by computers that are so-called smart order routers. And many of these order types exist to attract the orders. And I'm trying to balance cleaning up my own house—I live in a glass house, and I'm trying to clean it up before I criticize others. At the same time, I can't make the New York Stock Exchange go to zero. It would be bad for this country for the New York Stock Exchange to no longer have trading activity. So, it's why I've been outspoken. I hope that other exchange leaders will follow my lead. I'd like to get us all working together to eliminate these types.

I'd be happy if we can do it as a private sector initiative. I'd be happy if the SEC ordered us to get rid of them. I'd be happy if Congress took action. Any way we can reduce them, I'd be happy . . .

I can't take the New York Stock Exchange to 1 percent, but I appreciate your allowing me to talk about this publicly to you all and to the camera and a microphone. Because I think that I need to put pressure on all my colleagues to follow my lead.

My question is this: will you work with Mr. Sprecher to eliminate predatory order types from your exchanges, including the specific order types identified above?

A.1. My perspective is that an order type should satisfy one of two primary objectives, and if it doesn't, then and only then should it be eliminated from the market.

The first primary objective would be to allow a member to maintain compliance with the current regulatory environment. Rather than remove these order types, we should re-examine the regulatory requirement that drove the development of the order type to begin with.

The second primary objective of an order type would be to allow a member to fully express their intentions for the handling of their order in electronic form, so that the exchange can make electronic

decisions during the life of that order that conform to the member's original intentions. Much of the order type functionality that exists is simply electronic "check boxes" for how the exchange needs to manage the order at each decision point during the order's lifetime.

Order types that don't meet one of these two criteria should be considered for retirement, and that's how I have historically thought about reducing the complexity from within our own platform's software code base.

I don't believe that we have any order types that would be considered predatory, but if we ever determined that an order type on our system had been used in a predatory way, we would first seek an enforcement action against the firm who employed the predatory approach, and we would review whether the order type inherently attracted predatory behavior, and if so, we would take actions to eliminate the predatory nature of the order type or even the order type itself.