

UNITED STATES OF AMERICA  
COMMODITY FUTURES TRADING COMMISSION

TECHNOLOGY ADVISORY COMMITTEE MEETING

Washington, D.C.  
Wednesday, February 14, 2018

1 PARTICIPANTS:

2 Opening Statements:

3 CHAIRMAN J. CHRISTOPHER GIANCARLO

4 COMMISSIONER BRIAN QUINTENZ

5 COMMISSIONER ROSTIN BEHNAM

6 Panel I: Blockchain and the Potential Application  
7 of Distributed Ledger Technology to the  
8 Derivatives Markets

8 JENNIFER PEVE  
9 DTCC

10 CHARLEY COOPER  
11 R3

12 DAN BUCSA  
13 CFTC

14 Panel II: Market and Regulatory Developments with  
15 Virtual Currencies and Related Futures Products

16 JERRY BRITO  
17 Coin Center

18 GARY DEWALL  
19 Katten Muchin Rosenman LLP

20 Richard Gorelick  
21 DRW

22 AMIR ZAIDI  
CFTC

Presentations: The Future of Machine Learning,  
Artificial Intelligence, and Computing Power

TIM ESTES  
Digital Reasoning

## 1 PARTICIPANTS (CONT'D):

2 Panel III: Developments and Challenges with  
3 Automated Trading Technologies4 LARRY TABB  
5 TABB Group6 BRYAN DURKIN  
7 CME Group8 YESHA YADAV  
9 Vanderbilt University  
10 of Cogen Technologies Linden Venture, L.P.11 Panel IV: Cybersecurity Developments and Best  
12 Practices13 NAEEM MUSA  
14 CFTC15 PHYLLIS SCHNECK  
16 Cyber Solutions

## 17 Other Participants:

18 ERIK BARRY  
19 Credit Suisse20 NEAL BRADY  
21 Eris Exchange22 JERRY BRITO  
CoincenterCHRISTOPHER CHATTAWAY  
Goldman SachsPAUL CHOU  
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1 PARTICIPANTS (CONT'D):  
2 RICHARD GORELICK  
3 DRW, Inc.  
4 CHRISTOPHER HEHMEYER  
5 Hehmer Trading and Investments  
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23 NEX Group  
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25 ALEXANDER STEIN  
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28 SUPURNA VEDBRAT  
29 BlackRock

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## 1 P R O C E E D I N G S

2 (10:03 a.m.)

3 COMMISSIONER QUINTENZ: Good morning  
4 everybody. If we could all take our seats please.  
5 I'm very excited to get started this morning. It  
6 is great to see so much energy and enthusiasm in  
7 the room today. It really matches my excitement  
8 around these topics and to finally have our first  
9 TAC meeting after about two years and only our  
10 third TAC meeting in four years. I was saying, if  
11 you think the market and technology has changed  
12 since then you're right, which is why we have such  
13 a robust agenda for the Committee to consider  
14 today. And it's just, it is wonderful to welcome  
15 all of our members here. I wanted to thank you for  
16 being here and, in some cases, traveling across  
17 the country or long distances to be with us today.  
18 I know that you had to rearrange your schedule on  
19 a short notice, given the cancellation of our last  
20 meeting. But we're really grateful to you for  
21 your participation.

22 And I'd also like to welcome some of our

1 new members, or all of our new members for being  
2 here. I hope you know what you got yourself into.  
3 We're excited to use all of your expertise to  
4 advise the Commission on your thoughts around  
5 FinTech and your thoughts around market  
6 developments. So, let me just actually take a  
7 quick moment to express my regret that Columbia  
8 Business School professor, Robert Farrokhnia is  
9 not able to join us today but we look forward to  
10 having him at a future TAC meeting. And before I  
11 recognize the Chairman and Commissioner Behnam I  
12 did want to take a moment to thank Dan Gorfine,  
13 the CFTC's Chief Innovation Officer, the Director  
14 of Lab CFTC and our acting chair and designated  
15 federal officer of the TAC for all of the work  
16 that he has put into this meeting as well as Jorge  
17 Herrada whose energy and enthusiasm are really  
18 contagious around these issues. A committee and a  
19 meeting and workflows are only as good as the  
20 leadership and the staff behind them and we have  
21 the best of the best here at the Agency. So thank  
22 you for all of your work.

1                   And with that, I'd like to recognize  
2                   Chairman Giancarlo and then Commissioner Behnam.

3                   CHAIRMAN GIANCARLO: Dan will go first.

4                   COMMISSIONER QUINTENZ: Oh we're already  
5                   running afoul of protocol. So....

6                   MR. GORFINE: Thank you. Good morning.  
7                   As the TAC designated federal officer and acting  
8                   chair of this Committee, it is my pleasure to  
9                   finally call this meeting to order. Before we get  
10                  started though, there are a few logistical items  
11                  that I've been asked to mention to the committee  
12                  members and invited speakers. Please ensure that  
13                  your microphone is turned on when you speak and  
14                  that you are speaking clearly into the mic so that  
15                  the web cast and the teleconference audiences can  
16                  hear you. If you would like to be recognized  
17                  during the discussions, please change the position  
18                  of your place card so that it sits vertically on  
19                  the table. For TAC members participating by  
20                  phone, please keep your phone on mute until you  
21                  are ready to speak and identify yourself  
22                  beforehand. Finally, and this may sound a bit

1       ironic given that this is a technology committee,  
2       but please refrain from using electronic devices  
3       during the meeting. We have a full agenda before  
4       us today and we want to ensure full participation  
5       by all members of the TAC. I will turn it back to  
6       Commissioner Quintenz who will be introducing  
7       Chairman Giancarlo and Commissioner Behnam for  
8       their opening remarks.

9                   COMMISSIONER QUINTENZ: Thanks Dan. Yes  
10       please, Mr. Chairman.

11                   CHAIRMAN GIANCARLO: Thanks Commissioner  
12       Quintenz, thanks Daniel Gorfine, thank you TAC  
13       members and to other participants and welcome to  
14       those watching here in the room and on the  
15       webcast. Today we will examine a range of  
16       financial technology or FinTech such as market  
17       data analytics, artificial intelligence, automated  
18       trading technology, cybersecurity, distributed  
19       ledger technology, oh, and of course, virtual  
20       currencies.

21                   FinTech and the enormous bursts of human  
22       creativity that underlies so much of it is having



1 a transformative impact on trading, markets and  
2 the entire global financial system. These changes  
3 have far ranging implications for capital  
4 formation and risk transfer, both here and abroad.  
5 Last week, I had the honor to testify before the  
6 U.S. Senate Banking Committee. And I said that  
7 the first element in the CFTC's engagement with  
8 FinTech and virtual currencies was to learn  
9 everything we can about the emerging technology.  
10 Good public policy and regulation can only be  
11 built on a thorough understanding of the subject  
12 matter and its potential application.

13 In May of last year, our Agency was  
14 pleased to announce the launch of its LabCFTC  
15 Initiative. And soon after, the appointment of  
16 our Director of LabCFTC and Chief Innovation  
17 Officer, Daniel Gorfine. In creating LabCFTC, we  
18 wanted the Agency to have the ability to keep pace  
19 with technological innovation. So LabCFTC is the  
20 focal point of our efforts to facilitate market  
21 enhancing innovation and fair competition for the  
22 benefit of the American public. But it also helps

1 to ensure that we can keep pace with changes in  
2 our markets and proactively identify emerging  
3 regulatory opportunities, challenges and risks.  
4 LabCFTC is situated within our office of general  
5 counsel, and that allows it to leverage the  
6 expertise of the CFTC's legal team and manage the  
7 interface between technological innovation,  
8 regulatory modernization and existing rules and  
9 regulations.

10           Since its launch, LabCFTC has held over  
11 150 meetings with entities ranging from  
12 established financial service firms, to start-up  
13 companies. It has conducted these meetings  
14 through office hour sessions in New York, Chicago,  
15 Washington and earlier this year, in Silicon  
16 Valley. Lab CFTC also published its first primer  
17 last October on the topic of virtual currencies.  
18 And soon, it will be seeking to crowd source  
19 topics for potential innovation competitions. In  
20 selecting Dan Gorfine to serve as the designated  
21 federal officer and acting chair of the TAC, the  
22 Commission sought to ensure that the efforts of

1 the TAC and LabCFTC were mutually reinforcing.  
2 Such cross pollinization and breaking down of  
3 agency silos, helps modernize our engagement with  
4 rapidly changing markets.

5           Moreover, LabCFTC was formed with  
6 bipartisan support. Whatever success it achieves  
7 will be bipartisan success. In the end, we share  
8 the same goal, to support our vital national  
9 interest in maintaining the world's deepest and  
10 most durable, competitive and vibrant risk  
11 transfer markets in this digital 21st century.

12           So this meeting is timely. We see what  
13 is on the horizon. We must be prepared,  
14 responsible and well-informed. As we confront the  
15 challenges ahead, we will continue to look to the  
16 work and ideas of advisory groups like this one,  
17 the TAC that is meeting today. Thank you once  
18 again.

19           COMMISSION QUINTENZ: Thank you, Mr.  
20 Chairman. Commissioner Behnam.

21           COMMISSIONER BEHNAM: Thank you. I'd  
22 like to begin by wishing Commissioner Quintenz a

1 Happy Valentine's Day. And equally important,  
2 thanking him for convening today's meeting and for  
3 his sponsorship and most importantly, his  
4 leadership of the Technology Advisory Committee.  
5 You proposed a comprehensive agenda and I look  
6 forward exploring these issues of far reaching  
7 consequence with you, Chairman Giancarlo and the  
8 TAC today and throughout 2018. I'd also like to  
9 thank Daniel Gorfine, CFTC Chief Innovation  
10 Officer, Director of LabCFTC and the TAC's  
11 designated federal officer for planning today's  
12 thoughtful and timely agenda. Finally, I'd like  
13 to thank the panelists for sharing their time and  
14 insight. It is nice to see many familiar faces and  
15 I look forward to meeting members who I have not  
16 yet met.

17 Committees like the TAC and also the  
18 Market Risk Advisory Committee and Agriculture  
19 Advisory Committees which I sponsor, both  
20 contribute to the overall mission of the  
21 Commission by providing a diversity of views and a  
22 high level of expertise on matters that evolve

1 rapidly and carry widespread and sometimes  
2 systemic consequences. These advisory committees  
3 ensure that the Commission remains abreast of  
4 market issues on the horizons that could  
5 revolutionize our markets in terms of stability,  
6 transparency and competition. Or, potentially  
7 disrupt markets with shock triggering liquidity  
8 events, increased systemic risk and susceptibility  
9 to fraud and manipulation.

10 Turning to today's agenda and the year  
11 to come, I commend the Committee for identifying  
12 and endeavoring to tackle a wide range of complex,  
13 novel and interconnected issues. Twice awarded  
14 Nobel Prize winner, Linus Pauling, once said the  
15 best way to have a good idea is to have a lot of  
16 good ideas. With that in mind and the combined  
17 knowledge in this room, I anticipate that the TAC  
18 is going to have a great year.

19 Leading off today's meeting are virtual  
20 currencies and their underlying blockchain or  
21 distributed ledger technologies. Given the events  
22 of the last several months, which included the

1 historic listing of the first Bitcoin futures  
2 contracts, the price of Bitcoin skyrocketing, the  
3 filing of multiple CFTC enforcement actions  
4 related to Bitcoin fraud and my personal education  
5 in Bitcoin, DLT, digital wallets, Ether, Ripple,  
6 proof of stake and something called crypto kitty  
7 which I understand is a blockchain collectable.  
8 It's no surprise that the TAC will be exploring  
9 these important regulatory developments.

10 As the CFTC continues to aggressively  
11 dive into these topics, educating ourselves,  
12 engaging with market participants and ultimately  
13 shaping regulatory themes and oversight, we must  
14 remain vigilant to transparency and  
15 accountability. To ensure that stake holders,  
16 customers and the general public may engage and  
17 have an opportunity to contribute to these sea  
18 change discussions. Pivoting to the future of  
19 data analytics, machine learning and artificial  
20 intelligence, as the agenda suggests, we need to  
21 encourage dialogue between the Commission, the  
22 industry and all other stake holders to ensure

1 that we provide appropriately tailored oversight  
2 and customer protections while ensuring  
3 accountability. Our regulations need to keep pace  
4 with technology. Our approach to oversight should  
5 reflect current technologies and demonstrate our  
6 capacity to participate meaningfully in the  
7 adoption of new technology.

8 In regard to automated trading  
9 technologies, I'm pleased that the TAC plans to  
10 resuscitate at least some of Reg AT. As I  
11 discussed and prepared remarks last week, the  
12 Commission issued proposals in 2015 and 2016 to  
13 establish pretrade risk controls in an effort to  
14 mitigate the potential dangers of an unchecked  
15 automated trading system. I'm happy to see that  
16 this issue will be discussed today as I think it  
17 is vitally important the Commission take immediate  
18 action on Reg AT as an automated trading system  
19 that perhaps runs amok can harm market  
20 participants.

21 As I said last week, the question of a  
22 market event, flash, crash or otherwise, is not

1 if, but when. I look forward to the discussion  
2 today and to future discussions with industry  
3 participants regarding thoughtful, appropriate  
4 regulation of automated trading. Inaction and  
5 regard to automated trading simply is not an  
6 option.

7           Lastly, I'm pleased that the meeting  
8 will close with the discussion of cybersecurity  
9 and emerging trends and best practices. As I've  
10 also said before, although each entity, private  
11 institution or government regulator must  
12 prioritize the protection and safety of its own  
13 organization. Cyber defense is an all hands on  
14 deck exercise that demands both financial and  
15 human resources to protect our institutions, data,  
16 identity and in many cases, sovereignty. To that  
17 end, cyber risk can not be viewed as a territorial  
18 exercise where we only seek to protect our own.  
19 Any attack on our government or private  
20 institutions presents broad market risk. And we  
21 must view it as such in order to address and  
22 eliminate any symptoms in a systematic manner.





1 Commissioner Quintenz, Daniel Gorfine, our  
2 panelists and the entire TAC. Thank you.

3 COMMISSIONER QUINTENZ: Thank you,  
4 Commissioner Behnam, for your Valentine's Day  
5 wishes. I hope you enjoy your cupcake. Let me  
6 just quickly give my own opening statement and  
7 then we'll turn it over to Dan for the panel.

8 Technological change in the derivatives  
9 market has really evolved rapidly over the last 22  
10 months since the last TAC meeting met. I'm  
11 hopeful that we can build upon all of the robust  
12 work that prior iterations of the Technology  
13 Advisory Committee have achieved. The Committee  
14 today is going to explore five main areas, each of  
15 which exemplifies how technology is impacting the  
16 functionality of global derivatives markets and  
17 how traders participate in them. These are also  
18 areas where the CFTC can demonstrate leadership  
19 and provide effective oversight that fosters the  
20 integrity, strength and the liquidity of our  
21 markets. My intent is for the Committee to use  
22 this meeting to identify the issues, and within

1 each of these areas that it wishes to explore in  
2 greater detail. With the ultimate goal of  
3 providing the Commission with actionable,  
4 practical advice.

5 In many cases, I anticipate that  
6 subcommittees may need to be formed to enable the  
7 kind of focused review and thoughtful  
8 consideration to arrive at those recommendations.  
9 The first area the Committee is going to focus on  
10 today is blockchain and the potential application  
11 of DLT to the derivatives market. DLT has the  
12 potential to transform how firms handle the  
13 execution, processing, reporting and recordkeeping  
14 of derivative transactions. Market participants  
15 may find that using DLT to satisfy their  
16 regulatory obligations results in greater  
17 accuracy, greater efficiency and less cost. But,  
18 they may also find that like with many new  
19 opportunities and technologies, DLT also presents  
20 challenges. Much work remains to be done in order  
21 to realize the full promise of DLT, from  
22 scalability issues to the complete digitalization

1 of derivatives markets, to DLT's compatibility  
2 with existing CFTC's regulations. There are many  
3 facets of DLT for the TAC to consider.

4           Next, the Committee will focus on market  
5 and regulatory developments involving virtual  
6 currencies and related futures products. The  
7 proliferation of virtual currencies and tokens  
8 over the course of the past year, while very  
9 exciting from an innovation standpoint, does raise  
10 a multitude of legal and regulatory questions and  
11 challenges. Definitional questions about whether  
12 a particular virtual currency or token is a  
13 security or a commodity continue to be debated.  
14 In addition to these foundational legal questions,  
15 the growing demand to trade virtual currencies  
16 also elevates the risk to consumers that is posed  
17 by potential fraud and manipulation on spot  
18 platforms. I share Chairman Giancarlo's view that  
19 we should be respectful of the enthusiasm of  
20 investors for new digital currencies and meet that  
21 enthusiasm with thoughtful, balanced regulation.

22           The CFTC should not attempt to make

1 value judgements about which new products are  
2 worthwhile and which are not. The markets,  
3 investors and consumers need to decide that for  
4 themselves. However, the CFTC should aggressively  
5 target fraudulent and manipulative behavior,  
6 whether in the derivatives market or in the  
7 underlying cash marketplace. I commend the  
8 Division of Enforcement's relentless efforts on  
9 that front to protect investors and the integrity  
10 of our markets.

11           The current regulatory framework of  
12 virtual currencies is a patchwork of state and  
13 federal jurisdictions. As the markets for virtual  
14 currencies mature, the Commission, along with its  
15 fellow state, federal and international  
16 regulators, should ensure a rational approach to  
17 regulatory oversight, not one based on fear or  
18 inexperience. Jurisdictional gaps should be  
19 identified and addressed. In conjunction with  
20 those efforts, and as I said at last week's Yahoo  
21 Finance All Market Summit, I think some type of  
22 self-regulatory organization, or SRO, for

1       cryptocurrency exchanges could spur the  
2       development of standards around cyber security  
3       policies, data retention, protection of customer  
4       accounts, trading practices and other issues.  
5       Self-regulation has a long history in derivatives  
6       markets. It is worth exploring whether an SRO  
7       model could assist cryptocurrency exchanges to  
8       establish and enforce standards that protect  
9       investors and deter fraud. I look forward to  
10      hearing from the Committee about the possibility  
11      of such an SRO. These are only a few of the novel  
12      issues that the Commission will grapple with as  
13      this nascent but burgeoning asset class continues  
14      to evolve. I hope the Committee's expertise can  
15      assist the Commission in developing smart policies  
16      that address the unique risks and opportunities  
17      presented by virtual currencies and related  
18      financial products.

19                 Next, the Committee will address machine  
20      learning, artificial intelligence and computing  
21      power. We're going to have the pleasure from  
22      hearing from Mr. Tim Estes, the President and

1 founder of Digital Reasoning. Digital Reasoning  
2 developed a product that uses machine learning to  
3 facilitate electronic communication and  
4 surveillance. The product uses machine learning  
5 to determine the meaning of words in emails and  
6 chats based on their context. The program is also  
7 designed to flag potentially problematic behavior  
8 of employees and mark those communications for  
9 further review. Mr. Estes will speak with us  
10 today about advances in machine learning  
11 technology and the future impact on financial  
12 markets.

13           Fourth, the Committee will examine the  
14 developments and the challenges posed by the  
15 modern trading environment and automated trading  
16 technologies. In the past, I have expressed my  
17 view that proposed Regulation Automated Trading,  
18 or Reg AT, was a missed opportunity by the  
19 Commission to explore the real risks of the modern  
20 trading environment. I believe the Commission  
21 should only pursue additional regulation in this  
22 space after it has identified specific risks

1 associated with automated trading, examined how  
2 those risks are being addressed through the  
3 market's incentive structure, and then determined  
4 if regulation can play a proper role in  
5 alleviating those risks. Once that threshold  
6 determination has been made, the Commission must  
7 work thoughtfully to calibrate the costs and scope  
8 of the regulation with the specific risks in mind  
9 it is meant to target. The Commission should not  
10 adopt automated trading regulations to address  
11 amorphous hypothetical concerns or simply for the  
12 sake of having them on the book. The TAC can  
13 serve as a forum to reconsider the risk of  
14 automated trading with a fresh eye. To the extent  
15 automated trading risk can be addressed through  
16 regulation, the Committee can look to explore what  
17 form that regulation may take. I'm hopeful these  
18 kinds of conversations can better inform us as to  
19 the true risks posed by automated trading and how  
20 we can best respond to them.

21                   Lastly, the Committee will discuss  
22 cybersecurity developments. I expect this



1 discussion will be an ongoing dialogue between the  
2 industry and the CFTC about what constitutes  
3 cybersecurity best practices. The TAC can  
4 facilitate discussions about how the Commission  
5 and market participants alike can improve data  
6 transmission, storage, archiving and disposal  
7 processes to protect against cyber threats. Thank  
8 you again to all of our members, to all of our  
9 presenters for being here and taking the time to  
10 share your expertise and vision with us and for  
11 rescheduling with us on such a short notice. I'm  
12 very excited to hear from you, let's get started.

13 MR. GORFINE: Great. Thank you all for  
14 your opening remarks. I would now like to build  
15 on what we just heard from Commissioner Quintenz  
16 and discuss the scope, plan and approach for the  
17 2018 TAC. Given the emergence, development and  
18 impact of financial technologies across markets,  
19 now is the time to be forward looking and  
20 proactive. We all need to consider how we can act  
21 to ensure continued market enhancing innovation,  
22 market integrity and the leadership of our

1 markets. To this end, the 2018 TAC will be keenly  
2 focused on pursuing workstreams that can drive  
3 actionable feedback and recommendations to the  
4 Commission. Today's meeting will be broad and  
5 seek to highlight key issues and topics involving  
6 financial technology that merit further  
7 exploration by the TAC and potential subcommittees  
8 throughout the course of the year.

9           Our format today will be to begin with  
10 brief presentations by our panelists,  
11 approximately 10 minutes each, followed by open  
12 discussion and questions from our TAC members. At  
13 the end of our key substantive sections, we will  
14 consider whether the recommendation to create  
15 subcommittees for further work would be  
16 appropriate.

17           Before we get started with our first  
18 panel, though, I want to take a minute to  
19 recognize the work of our colleagues in making  
20 today possible. Many have contributed, though  
21 again, I do want to highlight my colleague, Jorge  
22 Herrada, who is our head of technology for

1 LabCFTC. Jorge has been instrumental in pulling  
2 this together and he has helped to keep me sane in  
3 going through the process of postponement and  
4 rescheduling, so thank you very much Jorge. I  
5 also specifically want to point out Michelle Ghim  
6 and Bianca Gomez in our Office of General Counsel,  
7 who have also contributed significantly to today's  
8 meeting.

9           With that, let's jump to our first panel  
10 discussion which will cover distributed ledger  
11 technology initiatives and their potential impact  
12 on capital markets infrastructure and a future  
13 state of regulatory reporting. Our panelists are  
14 Jennifer Peve, from DTCC, Charlie Cooper from R3  
15 and Dan Bucsa from the CFTC. So if you'll please  
16 take the panel position, we'll get started with  
17 Jennifer, and all can move over there now. I  
18 think panel position might be a new term.

19           MS. PEVE: Thank you, Dan. I'm Jennifer  
20 Peve, managing director of business development,  
21 office of FinTech strategy at DTCC. I'd like to  
22 thank you for the opportunity to present to this

1 Committee today on a technology innovation that  
2 has really captured the attention of our industry  
3 over the last several years, blockchain or  
4 distributed ledger technology.

5 The rapid pace of change that is facing  
6 our industry today, while nothing new, continues  
7 to accelerate. Technology innovations such as  
8 blockchain or distributed ledgers, have great  
9 potential to bring about transformative change in  
10 our industry. In keeping up with such rapid  
11 technology innovation is both a challenge as well  
12 as an imperative as it affects so many aspects of  
13 financial products and markets. It forces  
14 financial institutions and financial market  
15 infrastructure providers to really consider how  
16 emerging technology may disrupt our business,  
17 reshape how work is done, make better use of  
18 massive quantities of data, drive cost savings and  
19 modernize our infrastructure.

20 In addition, there is a need to  
21 understand how supervision, oversight, compliance,  
22 rules and laws, interact during this time of such

1 rapid technological change. It is essential that  
2 we work together across industry organizations,  
3 technology providers, market participants,  
4 regulators and policy makers to continue the  
5 collaboration and develop best practices for  
6 technology innovations so they deliver on their  
7 promise.

8 DTCC has been a strong advocate for  
9 continued collaboration across the industry, and  
10 commends the CFTC for its FinTech initiative,  
11 LabCFTC, the hub for the Agency's engagement with  
12 the FinTech innovation community. Together, TAC  
13 and LabCFTC provide great avenues to furthering  
14 the public/private partnership as we as an  
15 industry continue to advance the technology and  
16 address the challenges surrounding it.

17 As a premiere post trade market  
18 infrastructure for global financial services  
19 industry, DTCC automates, centralizes and  
20 standardizes the post trade processing of  
21 financial transactions, mitigating risk,  
22 increasing transparency and driving efficiency for

1 thousands of broker dealers, custodian banks and  
2 asset managers worldwide.

3 DTCC is industry owned and governed and  
4 has a 40 year history of leveraging technology to  
5 drive innovation and reduce risks and cost for our  
6 clients. We continue to build on that legacy by  
7 advancing the use of technology innovations to  
8 enhance post trade processing while ensuring our  
9 applications are consistent with key policy  
10 objectives of risk mitigation, market security,  
11 certainty, reliability and efficiency. DTCC  
12 actively explores how transformative technologies  
13 like blockchain, distributed ledgers, cloud,  
14 robotics, machine learning, artificial  
15 intelligence, can all enhance the post trade  
16 process by further mitigating risk and reducing  
17 costs.

18 In January 2017, DTCC announced it would  
19 replatform the trade information warehouse for  
20 credit derivatives using a combination of cloud  
21 and distributed ledger. The TIW is a repository  
22 which provides life cycle event processing

1 services for approximately 98 percent of all  
2 credit derivative transactions in the global  
3 marketplace. There are four main drivers for  
4 adopting the combination of cloud and distributed  
5 ledgers in technology for TIW. The first was, TIW  
6 needed a technology renovation. Second, the  
7 preexistence of standardized process flows and  
8 data models for credit derivatives. Third, it  
9 provided DTCC and the industry an opportunity to  
10 operationalize the technology on a business with  
11 appropriate and meaningful scale, while also  
12 mitigating risk and driving cost efficiencies for  
13 market participants.

14           And lastly, we had industry commitment.  
15 The decision to move forward was made in  
16 collaboration with client design partners who saw  
17 long term value in moving to the combined cloud  
18 and distributed ledger platform. The project is  
19 being led by IBM with Axoni providing the  
20 distributed ledger infrastructure and smart  
21 contract applications and R3 acting as an advisor.  
22 In addition, we continue to work closely with our

1 client design partners, financial market  
2 infrastructure, such as IHS Markit, and industry  
3 standard bodies such as ISDA, the International  
4 Swaps and Derivatives Association, throughout the  
5 development and implementation of this effort.

6           The initial phase of the project has  
7 been focused on two key objectives. First, to  
8 minimize the change and impact on market  
9 participants and second, to ensure the quality of  
10 the solution, such that we minimize any potential  
11 for operational risk to the industry. Post go  
12 live, we will roll out future phases of the  
13 project which will focus on node administration  
14 and adoption, allowing clients and other industry  
15 participants the option to adopt nodes and become  
16 more active participants of the network.

17           As with any technology innovation,  
18 operationalizing the technology with appropriate  
19 use cases, helps to strengthen the solutions and  
20 can often highlight limitations of the technology  
21 that must be addressed. Our work on the TIW  
22 project over the last year has given us a great



1 deal of real world experience in developing a  
2 replacement for a critical industry wide mainframe  
3 application. We've learned what works, what  
4 doesn't work. We've seen the technology's  
5 limitations and discussed work arounds or trade  
6 offs with our technology providers and our design  
7 partners. And we understand that this is still  
8 very much a work in progress.

9           One of the most important aspects of  
10 deploying any distributed ledger use case is an  
11 understanding of the distributed ledger  
12 architecture. There are a variety of distributed  
13 ledger architectures and it is important to  
14 perform due diligence on each and really examine  
15 how the various approaches meet the needs of a  
16 specific use case, as well as any potential  
17 trade-offs.

18           Three examples of components of  
19 distributed ledger architecture that one should  
20 examine include, data, privacy and sharing.  
21 Really understand how is the data propagated and  
22 to whom, what mechanisms are used for data

1 privacy. For example, data may only be  
2 distributed to counterparties who are party to the  
3 trade. But now consider how validations on things  
4 like a trade identifier are accomplished when data  
5 is propagated in many disparate distributed  
6 ledgers. There are also potential implications  
7 for participants who initially elect non-nodal  
8 access to a ledger network, and over time decide  
9 to then adopt a node. How do you think about and  
10 how do you migrate data from a non-nodal access  
11 point to a full on node.

12           Data storage: Where is data stored? On  
13 chain, off chain and what implications are there  
14 for meeting any data retention policies that  
15 exist, whether you're a network operator or you're  
16 a participant on the network? Smart contract  
17 functionality: What level of confidence and  
18 skills do you have in the language supported? How  
19 much functionality will be performed on chain  
20 versus off chain? And what, if any, latency is  
21 introduced because of the use of the smart  
22 contracts and where the functions are performed?

1           Other items include things like  
2           governance model, interoperability, scalability  
3           and performance. DTCC appreciates the  
4           Commission's efforts to harmonize technology  
5           standards and best practices and encourages the  
6           Commission to continue this important work. In  
7           addition, DTCC recommends that the Commission  
8           consider the following initiatives. Promoting  
9           common global data standards and interoperability  
10          for distributed ledger technology. A common set of  
11          global standards could promote widespread  
12          implementation and facilitate interoperable  
13          systems, thereby helping to prevent the creation  
14          of silo systems. Second, recognize the importance  
15          of and facilitate discussions concerning the  
16          establishment of governance framework for certain  
17          FinTech initiatives. The Commission and policy  
18          makers globally could partner with industry  
19          leaders to provide guidance in the establishment  
20          of such governance frameworks.

21                 I would be remiss if I didn't mention  
22          standards as another component of distributed

1 ledger implementation. The development of common  
2 standards and protocols required to support  
3 rearchitected practices and processes is critical  
4 when implementing DLT. Distributed ledger  
5 technology can enforce the use of standards and  
6 improve the delivery of data but it does not  
7 normalize or transform the data. One of the  
8 initial use cases DTCC explored was regulatory  
9 reporting. DTCC's global trade repository is the  
10 only non-commercial global provider of transaction  
11 reporting services for the CFTC and six other  
12 jurisdictions across the globe. The GTR maintains  
13 approximately 40 million open OTC derivative  
14 positions per week and processes over 1 billion  
15 messages per month.

16 Distributed ledger combined with other  
17 technology innovations such as artificial  
18 intelligence, have the potential to allow for more  
19 comprehensive transparency into the swap market,  
20 provide supervisors with enhanced oversight of the  
21 markets and a deeper understanding of risk on a  
22 real time basis. Ultimately, a more efficient

1 regulatory reporting framework. Advancing the  
2 application of distributed ledger to support  
3 regulatory reporting is heavily dependent on the  
4 global consistency of critical data elements. And  
5 therefore, regulatory harmonization of swaps data  
6 reporting requirements on a domestic and  
7 international basis should remain the key focus  
8 for the industry.

9 DTCC supports the efforts of projects  
10 such as ISDA's common domain model, a project  
11 around standardizing the industry's representation  
12 of derivative trade details and related processes,  
13 as well as IOSCO's critical data elements. It  
14 encourages all in the industry to work toward data  
15 standards.

16 In conclusion, innovation requires  
17 learning and experimentation. We remain  
18 optimistic about the future of distributed ledger  
19 or blockchain. We continuously and actively  
20 experiment with the technology, ensuring that  
21 distributed ledger initiatives align with and  
22 support our business goals and objectives and

1 deliver client value. We understand that  
2 distributed ledger technology is a nascent  
3 technology, but it is evolving rapidly, and the  
4 challenges we have today will be solved tomorrow.  
5 Significant industry commitment is required to  
6 realize the potential of distributed ledger, as  
7 changing industry business models takes time.  
8 Much of the value in the use cases being explored  
9 comes in changing the business processes, not in  
10 the actual use of the technology itself. And  
11 distributed ledger technology's success, defined  
12 by implementation timing, participants' ability to  
13 adopt, business value it brings will vary greatly  
14 by region and use case. Thank you.

15 MR. GORFINE: Thank you. Mr. Cooper.

16 MR. COOPER: Thanks very much.

17 Commissioner Quintenz, thank you very much for  
18 your leadership at the TAC and for inviting me to  
19 participate today. And to Chairman Giancarlo and  
20 Commissioner Behnam for your bipartisan leadership  
21 of the Committee, I think it's really important.  
22 I would be remiss if I didn't also make a comment

1 to the staff of Commission. I'm an alumnus of  
2 this building and the amount of work that goes  
3 into pulling something like this off and the  
4 broader initiatives of the Commission across  
5 enforcement, market surveillance, et cetera, rests  
6 heavily on the shoulders of a small lean staff  
7 that does a hell of a job. So, a shout out to  
8 those guys here in the room.

9 I'm going to go totally off script,  
10 which is not surprising for me. But I was  
11 thinking, I was on the plane down and I had this  
12 sort of -- I read the agenda and I thought, I'm  
13 going to fit right in the agenda. And then I got  
14 off the plane and I thought no, probably not. I  
15 think there is a more, I don't know about  
16 controversial, but there is a part of a  
17 conversation I think we need to have with the  
18 private sector and the regulators and how we can  
19 work together that I think is often not fleshed  
20 out as much as it could be. So if you'll permit  
21 me, I'm going to go a little off script.

22 We live in this really interesting time

1 where technological innovation and rapid  
2 technological innovation is something that's  
3 assumed. And we have an attention span problem.  
4 This is a day in the age of Twitter where we have  
5 massive tax policy debates in 140 characters and  
6 we don't watch three hour movies anymore, we watch  
7 things on our handheld devices on the subway on  
8 the way to work et cetera and our attention span  
9 gets less. But we also get to this point that we  
10 think technology evolves at all levels as rapidly  
11 as your smartphone. Right, I got a new phone the  
12 other day, and I'm not kidding, 24 hours later in  
13 the morning, there was a notification on my phone  
14 that I needed to update my software, because  
15 apparently the software that was on the phone I  
16 bought the day before was not the latest version.  
17 And we tend to think the technology will evolve  
18 that quickly. And blockchain is, I think,  
19 suffering in some ways from this expectations game  
20 that Satoshi, the initial White Paper on Bitcoin  
21 that came out in January 2009, nine years ago  
22 seems like a long time, and you would figure out



1 by now that blockchain would have taken over the  
2 world. Well, smartphone technology or certain  
3 types or retail technologies don't operate in the  
4 same way that large scale, enterprise grade,  
5 overhauls of the way systems and processes work in  
6 not just financial services but in all sorts of  
7 businesses that blockchain could be applied to,  
8 don't change that quickly.

9           The first email was sent in 1971. That  
10 was before I was born. I graduated college in the  
11 mid-90s and I didn't have an email account. There  
12 was an intranet account at Georgetown and I think  
13 I got sent homework assignments on it which I  
14 didn't really do which is not a surprise. But, if  
15 you think about it in that context, the internet  
16 that was conceptualized in the 40s and 50s,  
17 really, began in some ways in the 70s and didn't  
18 become mainstream until the 90s. Now, I'm not  
19 saying that blockchain is going to take that long,  
20 but my point is when we're having these  
21 conversations and people are wondering where are  
22 we in the evolution, why is it taking so long, why

1 are you doing all this experimentation. And you  
2 take a step back, you actually realize, things are  
3 happening really quickly from a large scale  
4 perspective. And the potential impacts of this  
5 technology in financial services, specifically in  
6 derivatives but broadly across all hosts of asset  
7 classes, is massive. This isn't a software update  
8 on a smartphone, right? This is a much bigger  
9 deal. This frankly goes to the very way in which  
10 capital markets operate. And if we are right, if  
11 companies like DTCC and ourselves and some of the  
12 others around this table are right, this could  
13 represent over the next five to ten years, a  
14 wholesale change in the way that all these markets  
15 operate and consequently the way in which you all  
16 at the Commission do your jobs. This is a big  
17 deal.

18 So that leads to the next question which  
19 is, okay, well, recognizing this is a big deal and  
20 recognizing change is happening at whatever pace  
21 is, where are we now? What the hell does that  
22 mean in 2018? 2018 is the year it's about to get

1 real. And what I mean by that is, commercial  
2 deployments, at scale, in the marketplace, of  
3 distributed ledger solutions, by regulated  
4 financial institutions, across asset classes. And  
5 I can give plenty of examples of that and happy to  
6 talk about that in some detail. But, there have  
7 been years of proofs of concept and people are  
8 bored with them and experiments and tests and  
9 whatever and people don't seem to think that's  
10 interesting. Well, that all served a purpose,  
11 right? Before we launch a commercial product into  
12 the marketplace, that market participants and  
13 regulators use, you damn well better make sure the  
14 thing works, right? And that's what the testing  
15 was about and that's what the proofs of concept  
16 were about. But now we're at a point where real  
17 applications are going to be put in the market and  
18 actually, live trades are being done as in the  
19 past couple of weeks on our platform and others,  
20 some of which is going to be made public in the  
21 next few weeks. But this is beginning, now we're  
22 real, okay? And this is going to come to an

1 example of what we're doing and this plea that I'm  
2 going to make to the Commission.

3 One of the things we're working on at R3  
4 is regulatory reporting. Now, regulatory  
5 reporting is enormous, right? You go across all  
6 the different asset classes that are covered in  
7 capital markets and non-capital markets. I mean,  
8 all sorts of different -- every type of financial  
9 institution. Whether they're a retail bank, an  
10 investment bank, a global transaction bank, a  
11 merchant bank, you name it, has requirements to  
12 report to you or some other regulator in their  
13 home jurisdiction, what types of activity they're  
14 doing, and they all have different standards and  
15 they different ways of aggregating data and what  
16 types of information does or does not need to be  
17 given. It's a big headache. So, it's not like,  
18 we're going to go from no regulatory reporting to  
19 blockchain regulatory reporting overnight. It's  
20 not like the industry shifts like that.

21 What we believe is going to happen is  
22 you're going to start seeing focuses on specific

1       asset classes, proving the model. Actually, so  
2       one of the things that Jennifer talked about,  
3       instead of DTCC going from no blockchain to  
4       blockchain overnight, they're focused on the trade  
5       information warehouse and CDS work within that  
6       part of the organization, to make sure that it  
7       works before they make this wholesale transition,  
8       right? We think that makes sense. There's not  
9       this light switch that goes and suddenly the world  
10      wakes up to blockchain.

11                 But to successfully do that from where  
12      we're sitting, we need to take you all along on  
13      that journey with us. That's why the work of the  
14      TAC and the CFTC Lab and the rest are so important  
15      to what we're doing. But there is a level beyond  
16      that and this plea will come in a second to get  
17      you involved. One example of what we're doing is  
18      a regulatory reporting application that we're  
19      building in conjunction with RBS, Santander and  
20      the FCA in the UK. Now, we're still scoping the  
21      exact project, what the application will look like  
22      and what their level of involvement will be, but

1 they were involved in a proof of concept that we  
2 did at the end of last year. It focused just on  
3 the mortgage market in the UK. Like I said, a  
4 discreet set before you extrapolate out in a  
5 bigger way. But this was an example of a federal  
6 government regulator in a major country, not just  
7 sitting back and listening and getting up to speed  
8 on things. They were in the lab with us with  
9 technologists and with regulatory specialists and  
10 with subject matter experts helping us develop a  
11 proof of concept that could be turned into a  
12 commercial product and giving advice on that.

13 That's a very specific example. And the  
14 agenda talks about regulatory reporting, about  
15 that, but this could be extrapolated out in all  
16 sorts of different things that effect regulators  
17 from KYC, to risk management to you name it. The  
18 Monetary Authority of Singapore is involved in so  
19 many blockchain initiatives, I frankly can't keep  
20 track. Almost two years ago, the Bank of Canada  
21 issued an instance of the Canadian dollar on  
22 blockchain technology. Now, that was in a test

1 environment. But, just to give you an indication  
2 of where they were, that was the summer of 2016.  
3 One of the things that we feel is really, really  
4 critical is getting regulators involved in that  
5 journey with us. Because at the end of the day,  
6 the worst mistake we could make as private sector  
7 entities is to build something that we think is  
8 really cool and absolutely fantastic and robust  
9 and we get ready to launch it and we come knock on  
10 your door and then we tell you and you look at us  
11 and say, well that was a really nice try but it  
12 doesn't work for the following five different  
13 legal or policy reasons. Well then, we've wasted  
14 millions of dollars in development, we've wasted  
15 time and energy only to find out that what we want  
16 to provide to the marketplace that would be a  
17 benefit to market participants, runs afoul of the  
18 goals, both the spirit and the letter of the  
19 regulations and the law in which you guys operate.

20 We want to pull you guys in, and so this  
21 is the plea. Put bluntly, we would ask as  
22 passionately as possible, for the U.S. regulators

1 and members of the agencies and departments of the  
2 U.S. federal government to become even more active  
3 than you already are. CFTC, the CFTC Lab, I think,  
4 is one of the only but it is certainly the most  
5 robust or most well-known of all the regulatory  
6 efforts in this space. You're leading the way  
7 compared to many of the other different regulators  
8 in Washington. But I can tell you, there are  
9 federal governments around the world in  
10 industrialized nations that are way outpacing the  
11 U.S. government. And that's a concern. Because  
12 fully a third of our clients, our partners, our  
13 investors, our members, whatever you want to call  
14 them of R3 -- we lead this consortium of over 200  
15 financial institutions and technology  
16 companies--are U.S.-based or U.S.-headquartered.  
17 They report to you, and they report to the Fed,  
18 and they report to the SEC, and they have all  
19 sorts of different regulatory regimes they need to  
20 take into account.

21 What that means is, their competitors in  
22 Europe or Asia or in other places where regulators



1 are outpacing the U.S., are gaining an edge. And  
2 we would suggest, we're a U.S.-domiciled company  
3 but we're global, right? We're headquartered  
4 here, But we have more people abroad than we do  
5 here in the U.S. now. We're involved in a level  
6 of sophistication and actual active involvement  
7 from different regulators around the world, to a  
8 level we don't see here in the U.S. yet. So the  
9 plea is to the extent that we can up that  
10 engagement. And actually, Chairman Giancarlo, I  
11 mean, really a thought leader in this space, a  
12 number of the different comments that you've made  
13 publically like, get in there guys. We need to  
14 take this seriously, we need to promote  
15 innovation. We could not agree with you more and  
16 we want to take you on that journey with us.  
17 Because again, if we don't do it right, we're  
18 going to mess ourselves up, but we're also going  
19 to mess up what you all are trying to do, and  
20 we're going to mess up your mission. This  
21 technology is not just for the private sector. If  
22 this technology is built appropriately and

1        deployed appropriately, it will make your jobs  
2        easier. It will make you more effective  
3        regulators.

4                    And active participation here, I'm not  
5        talking about just start writing a whole bunch of  
6        regulations before we know what the technology is  
7        or is capable of, that's not what I'm talking  
8        about. I'm talking about technological and  
9        business involvement where we bring you all into  
10       this journey with us so you really begin to  
11       understand and experiment with the technology and  
12       help us to develop it in an appropriate way that  
13       meets your needs as well as the private sector  
14       needs.

15                    So, I'm going to leave it at that,  
16        because I know we'll probably have a ton of  
17        questions, whatever.

18                    I know that probably didn't answer the  
19        topic on the agenda, but I thought this is a forum  
20        that, it just, I wanted to use it to throw myself  
21        at the altar and beg for whatever I can. So there  
22        you go. Thank you very much.

1 MR. GORFINE: Thank you. Mr. Bucsa.

2 MR. BUCSA: So Charley, here's my card.  
3 It looks like we'll be talking and I now get to  
4 follow up that very impressive, off the cuff,  
5 remarks with a buttoned up speech from a  
6 regulator. So, I'm a Deputy Director within the  
7 Division of Market Oversight. I'm in charge of  
8 reporting and data policy. My part of the agenda  
9 is meant to present a regulatory perspective on  
10 DLT use in reporting. Now, for the disclaimer,  
11 the views I'm about to share are mine and mine  
12 alone. They don't represent the Commission, any  
13 Commissioners or any other staff at the Agency.

14 I'm pleased to see some familiar faces  
15 around the room. I want to welcome the new  
16 members of TAC on this fine Valentine's Day. But,  
17 more important than Valentine's Day is that today  
18 is when pitchers and catchers report for most  
19 major league baseball teams, especially my beloved  
20 Chicago Cubs. Since baseball is in the air, I  
21 want you to consider the careers of Jamie Moyer  
22 and Rafael Palmeiro as we juxtapose America's

1 pastime with the possible application of  
2 blockchain to regulatory reporting. Feel free to  
3 Google those players during my remarks. I won't  
4 mind at all.

5           Similar to when these players were Cubs,  
6 DLT is relatively nascent and carries both  
7 potential and uncertainty. How the Cubs reacted  
8 to the risks and rewards of the two players serves  
9 as a reminder of how not to approach DLT for  
10 reporting. We need to take the time and make an  
11 effort to evaluate the costs and benefits of DLT,  
12 and whether it makes reporting better, cheaper and  
13 easier. From my perspective, the benefit of the  
14 TAC is to be forward looking and have industry  
15 advise the Agency on technological innovation. By  
16 forward looking, I mean years into the future and  
17 not the next news cycle, election or market shock.  
18 The Chairman has expressed the desire to transform  
19 away from being an analog regulator of digital  
20 markets, and that is not expected to happen  
21 overnight. The TAC is not the place for  
22 incremental steps and small measures but we

1 encourage you to think big. I don't wish to focus  
2 on slight improvements in efficiency in the near  
3 term, but whether we reshape the reporting regime  
4 via a five to ten year DLT strategy to enact a  
5 significant win that helps market participants,  
6 regulators and those that depend on the price  
7 discovery and hedging our markets provide.

8           The futuristic visions of regulatory  
9 oversight must contemplate how to incorporate DLT  
10 as it continues to improve and mature. The  
11 Commission must stay abreast of technological  
12 developments, while creating a rule set that does  
13 not stifle innovation, facilitates experimentation  
14 and protects the markets. The onus is on market  
15 participants hoping to take advantage of future  
16 technology to keep us informed, work in lock step  
17 with regulators, and consider regulatory needs  
18 during, and not after, development of  
19 applications. Trying to adapt a system to meet  
20 regulations as an afterthought is often costly and  
21 inadequate. The CFTC having a seat at the table  
22 affords us the opportunity to provide input and

1 minimize the burden of regulatory requirements.  
2 The Commission must ensure that its regulations  
3 remain technology neutral as much as possible,  
4 instead, requiring market participants to comply  
5 with principles without prescribing how these must  
6 be met unless necessary.

7           As the requirements of Commission  
8 regulations will apply to market participants,  
9 regardless of the technology they utilize,  
10 creators of FinTech and those that intend to use  
11 it, should consider compatibility of the  
12 regulations from the onset, or, if rules need to  
13 be reevaluated for novel technologies.  
14 Contemplating this interaction regarding  
15 blockchain between regulatory agencies and those  
16 they oversee, prompts the following questions that  
17 require further study. Could DLT benefit  
18 reporting parties and the regulatory community  
19 concurrently? Would DLT provide regulators with  
20 the market visibility necessary to fulfill our  
21 mission? What would the future state of reporting  
22 look like? Can the TAC help us determine if our

1 rules are permissive of new technologies and if  
2 not, where friction points exist? Despite this  
3 list of questions, we are encouraged the  
4 regulatory use of technology could offer three  
5 significant advantages.

6 First advantage: Better regulation  
7 through technology. DLT brings exciting potential  
8 from making reporting systems more reliable, more  
9 automated and less resource intensive. The  
10 evolution of DLT could allow regulators to access  
11 data automatically and seamlessly from reporting  
12 entities every time a trade is executed or posted  
13 on a particular blockchain without the need for  
14 human intervention or the use of intermediaries.  
15 This functionality could increase the speed with  
16 which regulators access data and improve the  
17 reliability of said data. More specifically,  
18 Commission access could be incorporated into  
19 distributed ledgers of reporting parties. This  
20 would allow for the Commission to be more nimble  
21 and efficient as it is up to date on market events  
22 as they happen, allowing for near real time

1 oversight of markets.

2           Second advantage: sharing of data and  
3 greater access via DLT. As the financial crisis  
4 demonstrated, the derivatives market is  
5 interconnected and global in nature, requiring  
6 regulatory coordination. Access to data across  
7 jurisdictional boundaries is a prerequisite part  
8 of the process. The TAC could explore how to  
9 apply FinTech to resolve the silo approach of the  
10 U.S. regulatory system. The CFTC could  
11 collaborate with other authorities on leading  
12 development of best practices to support regulator  
13 nodes on distributed ledgers. Imagine a set up  
14 where DLT helps transcend the fragmented  
15 regulatory structure by providing reference to a  
16 single, validated record of all financial  
17 information. Some of you are likely required to  
18 provide data to various regulators in an  
19 uncoordinated fashion. Those same regulators  
20 duplicate their efforts to ingest, validate and  
21 parse that overlapping information. From the  
22 regulators' viewpoint, jurisdictional turf wars



1 over collection and access to data, protracted  
2 negotiations over data sharing agreements,  
3 harmonizing data sets that were structured  
4 differently and transfers of sensitive required  
5 data would be remnants of a bygone era. Agencies  
6 would no longer be privy to only a sliver of a  
7 firms' activities, or subject to delays based on  
8 snapshots in time. Instead, every U.S. financial  
9 regulator whether tasked with market manipulation,  
10 monetary policy or systemic risk, would have  
11 immediate access to all the data available on the  
12 blockchain and be allowed to make fully informed  
13 decision based upon a holistic view.

14 Third advantage: reporting via  
15 blockchain. DLT should also bear fruit from the  
16 perspective of the market practitioner with  
17 reporting obligations. Firms can no longer be  
18 subject to providing piecemeal data, sometimes  
19 duplicative and often sensitive, to various  
20 regulators. Market participants would be absolved  
21 from having to create new systems to maintain and  
22 transmit records, transpose data utilized in the

1 regular course of business to match regulatory  
2 formats, complete an expansive list of forms and  
3 connect to and sometimes pay for intermediaries to  
4 report. While the Commission is disinclined to  
5 mandate the adoption of promising, yet relatively  
6 untested and undeveloped FinTech, the aim is to  
7 maintain fertile ground for innovation, and allow  
8 the germination of applications in the regulatory  
9 space.

10           Since the Agency would not force the use  
11 of DLT, the CFTC would leverage the transition of  
12 the new technology if and when market  
13 participants, on their own accord, decide to  
14 transition to a new way of doing things.  
15 Blockchain will most likely only be adopted for  
16 reporting if individual firms decide that it  
17 decreases burdens and presents a viable  
18 cost/benefit scenario or return on investment.

19           Staff will not be recommending that the  
20 Commission make that investment choice for firms  
21 and decree their technology development plan. The  
22 ensuing issues that need to be resolved are not

1 meant to dissuade focus on FinTech but are  
2 intended to highlight unknowns that need to be  
3 confronted while tempering enthusiasm that  
4 regulatory reporting via DLT is both a definitive  
5 and near term deliverable.

6           The first unknown: Standards and  
7 interoperability. The Commission's potential use  
8 of FinTech is affected by a number of variables  
9 that could erode the benefits of incorporating  
10 these technologies. The use of DLT will need to  
11 be subject to uniform standards that allow staff  
12 to successfully access and analyze the data. The  
13 current perception is that data itself and the  
14 methods of its transmission are not sufficiently  
15 standardized to be fully utilized by the  
16 Commission as a litany of blockchain consortiums  
17 and startups are operating. The same issues that  
18 plague the inception of any reporting stream would  
19 manifest themselves with inconsistency of format  
20 and allowable values if the design of distributed  
21 ledgers is not coordinated.

22           With a multitude of DLT solution

1 providers vying for market share, interoperability  
2 across blockchains becomes a concern for  
3 regulators. Without consistency, and if too many  
4 types of distributed ledgers persist, instead of  
5 the limited divergent data sources the Commission  
6 grapples with currently, we could be saddled with  
7 attempting to accommodate dozens of different  
8 distributed ledger data schema. Data as  
9 disorganized as this would be nearly unusable by  
10 the Commission, which would render moot the  
11 benefits of using DLT. In parallel with how the  
12 industry would not compel market participants to  
13 utilize FinTech, the CFTC would likely not be  
14 willing to build interfaces for both DLT and  
15 traditional data ingest in our business model with  
16 our budgetary constraints.

17           Second unknown. The CFTC retasking  
18 itself to use DLT. Even if interoperability  
19 develops, the approach such as the ISDA common  
20 domain model, will the CFTC have the wherewithal  
21 from a technology, expertise and resources  
22 perspective to understand and consume information

1 on the blockchain. The CFTC has expended time,  
2 money and intellectual capital to build tools  
3 based on existing data sources and delivery  
4 methods. The Agency is able to accomplish  
5 tremendous work with the current data setup.  
6 Before pursuing DLT, the TAC would need to advise  
7 on the development of a long term technology plan.  
8 This must include a determination of if and how  
9 the Agency could allocate funding to rebuild its'  
10 technology infrastructure and analysis methods to  
11 take advantage of FinTech as the mechanism of the  
12 future. Overpromising and underdelivering on  
13 blockchains, could prove to be a risky proposition  
14 if not planned appropriately.

15 Another challenge presents itself if DLT  
16 cannot make itself attractive to all entities with  
17 reporting obligations. It is conceivable that  
18 large, sophisticated and technologically advanced  
19 players will embrace FinTech, discern that it is  
20 in their best interest to apply it and blockchains  
21 become the lynchpin of some parts of financial  
22 activity. At the same time, it is equally

1 plausible that some entities with reporting  
2 obligations reach the opposite conclusion and  
3 decide not to abandon their existing systems and  
4 expend time and money for DLT. The CFTC would  
5 then be in the unenviable position of maintaining  
6 duplicative means for accessing data.

7           It is relatively easy to suggest that  
8 DLT be applied via sound bite or a blurb on social  
9 media. But it appears harder to figure out the  
10 details and implement the plan by answering the  
11 questions raised today. The takeaway is that we  
12 should try to explore the technology and fully  
13 evaluate its long term merits. We should not  
14 dismiss the role that it can play in the  
15 regulatory space since it is new and unproven,  
16 similar to young Jamie and Rafael.

17           So why don't I bother you with  
18 references to ball players in the last 1980s. The  
19 Cubs lacked the vision to appreciate what they  
20 could eventually become. Patience quickly ran out  
21 as doubt overshadowed confidence and both players  
22 were shipped out of the organization in the same

1 trade. Moyer had a fast ball barely topping 80  
2 mph and durability issues with chronic shoulder  
3 trouble. Critics worried that Palmeiro would  
4 never hit for power to justify a starting role.  
5 When it was all said and done, Moyer was a major  
6 league starter for a whopping 25 years, an  
7 all-star and a World Series champion. Palmeiro is  
8 only one of five players in the history of the  
9 game with over 500 home runs and 3000 hits, both  
10 magic numbers in baseball.

11 The lesson this teaches us is that while  
12 uncertainty exists in the blockchain for reporting  
13 discussion, we should not repeat the Cubs' mistakes  
14 and ignore the technology or shy away from carving  
15 out a new path. Instead, we should welcome the  
16 challenge as growing pains can be overcome and  
17 lead to success if nurtured correctly. I'm not  
18 advocating that we dismiss the regulatory  
19 applications, but highlighting issues that need to  
20 be resolved. At the same time, we must be  
21 cautious not to go all in without being cognizant  
22 of risks. We need the TAC's expertise to inform

1 us if we are thinking of the right ecosystem for  
2 DLT and reporting. Have we identified the  
3 appropriate challenges? How do we mitigate the  
4 concerns if the Commission were to proceed down  
5 this road? To sum up, if the feeling is that its'  
6 adoption could benefit both market participants  
7 and regulators by decreasing burdens, increasing  
8 standardization and improving the immediacy of  
9 market oversight, then we should take advantage of  
10 the tremendous opportunity of this exciting  
11 technology. Thank you.

12 MR. GORFINE: Thank you, Dan. I'd like  
13 to thank our panelists. And I will say as a Red  
14 Sox fan, I prefer to think of Jamie Moyer in  
15 Boston. But anyway, with that, I'd like to open  
16 it up now to some questions and just open  
17 discussion amongst members. But have in mind,  
18 what are the potential work streams that we would  
19 think could be the subject of a subcommittee  
20 during the course of the year. And then we'll  
21 consider whether we would want to recommend the  
22 creation of a subcommittee. I'll throw out a



1 first question, you're welcome to pick it up or  
2 ask your own or make your own statement. But, to  
3 pick up on what Dan had mentioned, what are folks  
4 thoughts in terms of the current business case to  
5 adopt DLT or these types of ledger technologies?  
6 Is there currently a business case and what do we  
7 expect adoption to look like? What is the pace of  
8 adoption going to be? And, if you could do the  
9 name tag vertical, on the, then we can go, we'll proceed  
10 that way.

11 MR. OCHERET: Chuck Ocheret, NEX Group.  
12 I mean, we're a market provider of all kinds of  
13 services and I'm primarily focused on DLT efforts  
14 surrounding post-trade services. The number one  
15 thing, I mean, in talking to lots of other people  
16 in the marketplace, that we get from distributed  
17 ledger technologies, are very different from sort  
18 of the broader spectrum of what people have been  
19 interested in for blockchain initially. We don't  
20 need things like anonymity, we don't necessarily  
21 need truly trustless consensus. In fact, that's  
22 not really what you want. There are two things

1 that we really get. We get this notion of proof  
2 of existence and non-repudiability. Which means,  
3 if we publish a result out to the world, we can't  
4 take it back, or we can prove to the world that  
5 we've published it. People know that it's been  
6 published and it has never been tampered with.  
7 So, you know, nobody can say, you never published  
8 that, we can prove that it existed and that we can  
9 never take it back once we've done it.

10 That seems to be the two primary things  
11 that people are really, really concerned about. A  
12 lot of the services that we provide are, you know,  
13 valued added proprietary services that require,  
14 you know, tremendous amounts of computation or  
15 tremendous amounts of external data. So things  
16 like smart contracts on the blockchain aren't  
17 really feasible. You know, that's where things  
18 like, you know, Corda from R3 does some things,  
19 does some of the thinking correctly. But those  
20 are the primary things that people seem to really  
21 care about. They want to have this one version of  
22 the truth or they want to have a source of one

1 version of the truth that everybody can be sure  
2 has never been tampered with or hasn't been  
3 changed in an non auditable way. I mean, you can  
4 obviously change your record as long as there is a  
5 record of all the history. So those are the  
6 things people seemed to be most concerned about  
7 and that's the primary thing people want seem to  
8 want to get out of this.

9 MR. GORFINE: Thank you. And I'll go to  
10 you, Mr. Knight.

11 MR. KNIGHT: Thank you. So, I wanted to  
12 tee off something that Mr. Cooper said about the  
13 regulators coming along on the journey. Not to  
14 take away from that vision because I think there  
15 is a there there that should be considered, but I  
16 want to flag some of the potential questions that  
17 we should be asking when we're talking about that.  
18 In particular, you know, if we're going to have  
19 the regulator at, serve as kind of a consultant  
20 to the firms, how do we make certain that that's  
21 fair? Like we wouldn't want a world where the  
22 regulator serves as a consultant to R3 and none of

1 R3's competitors, because that would give R3 a  
2 significant advantage.

3 We also need to be thinking about how  
4 are we going to avoid -- or, put it this way --  
5 how do we have a situation where, we wouldn't want  
6 to have this be mandatory. Right, like the only  
7 way you can come to market is if you contract, if  
8 you get a consultancy with the regulator. I mean,  
9 presumably we want a world where people can still  
10 in good faith develop a product and then bring it  
11 forth and see if it works or not, face whatever  
12 regulatory consequences they may face.

13 And finally, we should be thinking  
14 about, when we structure this, you know, and no  
15 disrespect to our very gracious hosts here. But  
16 like, we don't a world where the regulator is like  
17 a vampire, and once you let them into your house,  
18 you're powerless to stop them. We need to be  
19 thinking about, how are we going to, how do the  
20 regulators use their data, or what is going to  
21 happen with that data. If the regulators have  
22 access to data, how can it be used, under what

1 terms and how is that structured. Which is all to  
2 say that I think there is certainly something to  
3 be said for the regulator being engaged early and  
4 in a collaborative way, but we need to make  
5 certain that it is done well.

6 MR. GORFINE: Thank you. And Ms. Yadav.

7 MS. YADAV: Great, thank you so much to  
8 the panelists for a very insightful set of  
9 presentations. My comments really were in  
10 relation to thinking about and getting a sense  
11 from you about the integration of DLT technology  
12 into the workings of the clearing house. And in  
13 particular, looking at the many new risks that  
14 clearing houses are facing, following Title VII.  
15 And the advantages or potentially the risks that  
16 are be created by DLT in relation to settlement  
17 risks and counterparty risk in that regard.  
18 Obviously the implications of this will extend  
19 much wider in that context. For example, in  
20 relation to margin requirements, in relation to  
21 how regular reporting is going to happen. More  
22 broadly, of course, I just wanted to understand

1 more precisely, how some of the latency issues in  
2 relation to DLT reporting data robustness and so  
3 on might translate into an impact, eventually  
4 going forward the operations of clearing house and  
5 risk mitigation in that regard.

6 MS. PEVE: So there were a lot of  
7 questions in there. I think I'll start with, I  
8 think, as a clearing house of equities  
9 transactions, fixed income and equities, I think  
10 one of the challenges that we face when we look at  
11 distributed ledger technology right now is the  
12 performance and scalability aspects. So addressing  
13 and understanding, you know, how many transactions  
14 you need to process in a second, what kind of time  
15 to clear and settle, you know, requirements you  
16 need to meet and ensuring that whatever platform  
17 you're exploring, experimenting with can support  
18 that type of volume. Not only the volume that you  
19 transact on per second basis, per day basis, but  
20 also what peak volumes you might need to hit in  
21 order to address any regulatory requirements. So,  
22 I think that's one of our biggest challenges.

1           I will tell you that DTCC processes  
2           upwards of 25,000 transactions per second, in  
3           clearing equities, and that's something that we  
4           don't believe currently a distributed ledger can  
5           support. And that's not just instantiating the  
6           trades, but you have to consider putting the  
7           trades on the blockchain, the actual process by  
8           which those transactions are validated, what kind  
9           of processes are also being run on the blockchain  
10          and any latency involved, how many nodes can you  
11          scale up to before you see any, you know,  
12          degradation in performance. So, there's lots of,  
13          and that is not all of the factors that go into  
14          it, but there are lots of different architecture  
15          components that really help define how well a  
16          ledger runs. And again, each ledger, it is really  
17          important to look at multiple different flavors of  
18          those ledgers, because they all have different  
19          capabilities, right? And then you can start to  
20          play with some of the levers to better understand  
21          what works and what doesn't work.

22                 In terms of risk, I think, you know, a

1 distributed ledger can certainly assist with, you  
2 know, reducing settlement and counterparty risk  
3 but it's not a, it's not the only solution, right?  
4 And again, I think for clearing houses, there is,  
5 because of the performance and scalability  
6 challenges, it is some time before they are, you  
7 know, likely to be adopted in that capacity. And  
8 then on the reporting side, I think, you know,  
9 absolutely there is a great use case for it, but  
10 it is so dependent upon the harmonization of the  
11 data standards on a global basis that until we can  
12 address those data elements and standardization  
13 around those data elements, it makes it difficult.  
14 Not impossible, you know, technology can solve  
15 things every day, right? So, then certainly there  
16 is likely to be workarounds but you have to  
17 evaluate are workarounds going to be worth the  
18 outcome versus, you know, standardizing the data  
19 elements and getting a more streamlined input and  
20 output.

21 MR. GORFINE: Mr. DeWaal.

22 MR. DEWAAL: Thank you. Again, with



1       everybody else, I commend this meeting. I commend  
2       the work of the Commission and Dan in particular  
3       for organizing this. You know, one reaction and  
4       then one question. So, Charley, when you talked  
5       about why, you know, you talked about the  
6       evolution of the distributed ledger and the  
7       blockchain as being slow, I agree with you. But  
8       the reality of life is you've got step back. The  
9       blockchains, I'm not sure there is one blockchain  
10      out there, but the blockchains out there were  
11      developed initially as decentralized distributed  
12      ledgers. And so the rules of governance are still  
13      evolving. The way to change any particular  
14      blockchain requires a consensus. That isn't  
15      necessarily the most rapid. And maybe over time,  
16      the process of governance will improve and maybe  
17      the methodology of consensus will get a little bit  
18      faster and better and things will pick up.

19                   And I guess that leads me to just an  
20      observation. So I think that, at least what I'm  
21      hearing today, really there is two types of  
22      distributed ledger technologies in play right now.

1       There is the decentralized distributed ledger  
2       technology where nobody in particular necessarily  
3       runs it and it is just the cryptography and the  
4       encryption and the mathematics that hold it  
5       together and the rules of whatever the system is.  
6       And then there is the private or permissioned  
7       distributed ledger that relies on the technology.  
8       You know I wonder if Jennifer or Charley or Dan  
9       have a view regarding the viability of both  
10      models. Is there a place for both decentralized  
11      distributed ledger technology and the multiple of  
12      blockchains and the multiple of opportunities that  
13      are out there or is it only, are we only speaking  
14      about the permissioned.

15                   And one of the reasons I mention that is  
16      because most of the applications that I see, most  
17      of the consortiums that I see today are the big  
18      folks. They are folks who are trying to take  
19      advantage for existing businesses. To the extent  
20      you're looking at some of the decentralized  
21      applications that might be sitting on top of the  
22      Ethereum chain. They are the innovators, they are

1 the new guys. They're trying to figure out a new  
2 way of doing something. Are there different  
3 approaches, is there different viability for both?

4 MR. GORFINE: Thank you. I'm going to  
5 take two more questions or comments, Mr. Durkin  
6 and then we'll come over to Mr. Stein.

7 MR. DURKIN: My question, first of all,  
8 thank you for your presentations. You all did an  
9 excellent job. I want to just jump on a theme  
10 that Jennifer, in particular, has been  
11 underscoring. And I think we walked a similar  
12 journey together with the trade repository  
13 services and the requirements that came via  
14 legislation as well as the requirements from the  
15 CFTC. And that is, data standardization and  
16 harmonization is extremely important. I mean we,  
17 at the CME Group, while we think blockchain has  
18 promise for the financial services sector and we  
19 ourselves are continuing to explore various  
20 applications for our core business. We also feel  
21 it's incumbent upon all of us to pay attention to  
22 the work and the opportunities associated with

1 joining various initiatives to help us understand  
2 and be part of driving the standards, the policies  
3 associated with this technology.

4           For example, we're a longstanding member  
5 of the Linux Foundation. In fact, we've been  
6 actively engaged in developing their hyper ledger  
7 initiative. And part of that goal is committing  
8 ourselves to fostering open standards, encouraging  
9 diverse participation of market participants,  
10 cultivating the highest standards and protocols as  
11 this technology evolves. So trying to be at this  
12 in the formative stages, I think, is an imperative  
13 and an opportunity for the TAC to be focusing on  
14 this as part of a possible subcommittee.

15           We're also part of the PTDL which is the  
16 Post Trade Distributed Ledger Group and this is  
17 based out of London. It is made up of the largest  
18 global banks, the exchanges, the clearing houses,  
19 the custodians and global regulators. And we've  
20 been brought together and we were one of the core  
21 founding members to understand, how is this  
22 technology going to emerge, how could it possibly

1 be applied in terms of distributed ledger  
2 technologies to our industries and our businesses  
3 that we represent. We also continue to support  
4 fixed protocol initiatives and we serve on the  
5 fixed digital currency and blockchain working  
6 group as the co-chair and member of that. So the  
7 point being made here, there are opportunities,  
8 this is evolving. We do think that there are  
9 applications in various ways and we commend the  
10 Commission for taking this topic on and would ask  
11 that you consider it as a possible subcommittee.

12 MR. GORFINE: Thank you. Mr. Stein.

13 MR. STEIN: Thank you. So we laud the  
14 Commission and this group for looking at this  
15 exciting technology. It clearly has dramatic  
16 potential. However, I'd also like to point out  
17 that technology on its own rarely solves a  
18 problem. And I encourage this group, when you're  
19 thinking about the application of blockchain  
20 technology, we equally think about how to get it  
21 adopted. In a proof of concept in a white room,  
22 you can do lots of interesting things. But we

1 have a very sophisticated expensive financial  
2 infrastructure. So an equal amount of thought and  
3 work on how to get adoption is important.

4 And also I'll say that those like DTCC  
5 and the CFTC, the infrastructure, the regulators,  
6 are most likely to be the source of the driving  
7 vision. There are members of the ecosystem, the  
8 buy side, that are unlikely on their own to create  
9 a standard that everyone will magically rally  
10 around. And so I encourage this group to embrace  
11 the full ecosystem and the buy side, in  
12 particular, as part of these discussions to ensure  
13 we both have a path to adoption and one that takes  
14 into account the varied perspectives of the  
15 different participants.

16 The last point I'd make related to some  
17 of this discussion, is there is a lot of hyperbole  
18 in blockchain and a lot skepticism as well. I  
19 think it behooves us to take a practical approach  
20 to look at these innovative concepts that Satoshi  
21 truly had some breakthroughs. Not in the  
22 underlying technology, but in how to combine known

1 technologies and look to figure out what is the  
2 most practical solution so that we can achieve  
3 what Dan Bucsa described as the efficiencies and  
4 the clarity without undermining the ownership and  
5 control of the intellectual property that I  
6 believe Brian mentioned. Thank you.

7 MR. GORFINE: Thank you all of our  
8 panelists and thank you for the comments and  
9 questions posed. I think that basically to  
10 summarize this conversation, I think we've just  
11 hit the tip of the iceberg. There is much to  
12 explore in terms of potential promise, as well as  
13 challenges and real world challenges. So I think  
14 based on what appear to be a number of trends or  
15 themes or work streams worthy of further  
16 exploration, I would, as the acting chair, move  
17 that the TAC recommend to the Commission that it  
18 consider creating a subcommittee on distributed  
19 ledger technology. Is there a second on that  
20 motion? There are many seconds on that motion.  
21 Are there any questions or comments before we move  
22 to a full vote? Okay, and if not, I will now call

1 for the vote on the motion. All those in favor of  
2 recommending to the Commission that the Commission  
3 consider creating a subcommittee on distributed  
4 ledger technology, please say aye.

5 COMMITTEE: Aye.

6 MR. GORFINE: All of those opposed,  
7 please say nay. Are there any abstentions? Okay  
8 with that, the motion carries.

9 And we will now turn to our next panel.  
10 It was well set up by Mr. Stein, talking about  
11 Satoshi and virtual currencies. So, our next  
12 panel will discuss virtual currencies, related  
13 Futures products and market and regulatory  
14 developments and challenges. Our panelists are  
15 guess speaker Jerry Brito from Coin Center, Gary  
16 DeWaal from Katten Muchin Rosenman and Richard  
17 Gorelick from DRW and Amir Zaidi from the CFTC.  
18 So if our panelists can take their position, we  
19 will begin with Jerry.

20 MR. BRITO: Mr. Chairman, Commissioners,  
21 Mr. Gorfine and members of the TAC Committee,  
22 thank you very much for inviting me to speak here



1       today. My name is Jerry Brito and I'm the  
2       executive director of Coin Center. It's an  
3       independent non-profit based here in D.C. that is  
4       focused on the public policy issues that affect  
5       cryptocurrencies and open blockchain networks like  
6       Bitcoin and Ethereum.

7                 Over three years ago, I had the  
8       privilege of presenting to the Global Markets  
9       Advisory Committee, then chaired by Commissioner  
10      Wetjen, at the first public meeting about Bitcoin  
11      and cryptocurrencies that the CFTC had held. The  
12      focus of that early meeting was on explaining what  
13      was Bitcoin and blockchain technology, how it  
14      worked and what were its social, economic and  
15      regulatory implications. We've come a long way  
16      since then and we've seen cryptocurrency  
17      technology and networks grow and capture the  
18      imaginations of technologists, entrepreneurs,  
19      investors and policymakers in a big way.

20                What I'd like to do today is give you an  
21      update on the developments we've seen in the  
22      technology and in public policy in the three years

1       since that first meeting. So let's start with the  
2       technological developments. The most obvious  
3       change looking at the landscape of cryptocurrency  
4       technology today is the proliferation of new  
5       cryptocurrency networks and tokens over the past  
6       few years. Three years ago, there were only a  
7       small handful of open blockchain networks in  
8       existence, with Bitcoin, the first cryptocurrency,  
9       being the 800 pound gorilla with almost 100  
10      percent market share. Since then, many new  
11      cryptocurrency networks and tokens have been  
12      developed and today, there are over 1500 tracked  
13      by Coin Market Cap, which is an industry website.

14                 Some of these are essentially copies of  
15      Bitcoin with few if any improvements or real  
16      differences to distinguish them. Others are  
17      remarkable efforts to extend the breakthroughs  
18      developed in Bitcoin to accomplish new things and  
19      allow for new applications. Ethereum, launched  
20      just two and a half years ago, is one of the most  
21      promising cryptocurrency projects to emerge since  
22      Bitcoin and today it accounts for 20 percent of

1 the market cap of all cryptocurrencies. Whereas  
2 Bitcoin's design goal is very simple and  
3 conservative, to be the first and foremost peer to  
4 peer electronic cash, Ethereum's design goal is  
5 incredibly ambitious. To be a decentralized  
6 global computer on top of which one can run any  
7 number of applications. From prediction markets  
8 and personal identity systems to insurance  
9 contracts and crowd source hedge funds. Indeed,  
10 of the 1500 token projects I mentioned earlier,  
11 about 600 do not run on their own blockchain  
12 network but exist on top of Ethereum.

13 Another set of new cryptocurrency  
14 networks are those like Zcash, Monero and Dash,  
15 which aim to improve Bitcoin's design by adding  
16 privacy protecting features. Privacy and  
17 fungibility are two of the most salient futures of  
18 cash but are missing from Bitcoin. These new  
19 cryptocurrency networks use advanced cryptography  
20 to allow consumers to keep their transactions  
21 private and selectively disclose these  
22 transactions as they wish or else are compelled to

1 through legal process or are required through  
2 regulation. It also turns out that private  
3 transactions are very important to financial  
4 institutions who have been experimenting with  
5 their own DLT solutions and have found that simple  
6 blockchains like Bitcoins are too transparent.  
7 Projects like J.P. Morgan's Quorum, an enterprise  
8 focused closed blockchain solution that is looking  
9 to incorporate technology from Zcash to keep  
10 transactions confidential to the involved parties,  
11 but verifiable to the larger network.

12 Finally, how these networks can scale to  
13 accommodate the thousands of transactions per  
14 second that would be necessary for global  
15 adoption, is a major technical challenge that has  
16 been one of the main focuses of developers over  
17 the past couple of years. Bitcoin today tops out  
18 at about 10 transactions per second. But employing  
19 second layer solutions like the Lightning Network  
20 or the Rating Network on Ethereum, can potentially  
21 allow for massive scaling by allowing for secure,  
22 off chain transactions and only using the

1 blockchain for settlements. This technology has  
2 been developed over the past couple of years and  
3 the first working networks launched this year.

4 Let me turn now to developments and  
5 public policy over the past three years. The top  
6 issues facing cryptocurrencies are consumer  
7 protection, securities regulation, tax policy and  
8 anti-money laundering regulation. Let's take  
9 those in turn. Regulation of actors in the  
10 cryptocurrency ecosystem to ensure consumer  
11 protection, has been done primarily through state  
12 by state money transmission licensing. The policy  
13 rationale here is that if a business is taking  
14 custody of consumer funds, even if it's just  
15 momentarily, in order to provide a financial  
16 service, they pose a risk of loss to consumers.  
17 To address that, they must first receive  
18 permission from the state, typically after passing  
19 a background check, posting a bond and meeting  
20 other requirements, before they can engage in  
21 business. Two problems emerge with this state by  
22 state regime.

1           First, is that firms must seek a license  
2           in every state in which they do business, in which  
3           they have customers. Which, for an internet  
4           business, means every state, even though it is  
5           made, the firm is made no safer to consumers when  
6           it passes its 50th background check than when it  
7           passed its first. Not only is this an inefficient  
8           and burdensome regulatory impediment to inherently  
9           interstate commerce, the state regulators have  
10          been generally slow to interpret and clarify how  
11          its licensing requirements apply to  
12          cryptocurrencies.

13           Second, because these laws were  
14          typically written decades ago, they are not  
15          written in terms of custody which is the risk they  
16          seek to address, but instead, in terms of  
17          transmission because before the invention of  
18          Bitcoin, custody was inherent in transmission.  
19          Cryptocurrency networks, however, allow one to  
20          perform many different activities that could be  
21          construed as aiding the transmission, and thus  
22          potentially covered by licensing requirements, but

1       which never involved custody and thus a risk of  
2       loss by a third party. Operating as a minor or a  
3       node on the Lightning Network or offering a  
4       non-custodial wallet service are all examples.

5                Just under three years ago, the State of  
6       New York created a technology specific license  
7       called a BitLicense which has been universally  
8       panned by the cryptocurrency and legal  
9       communities. Since then, other states have  
10      amended or interpreted their statutes with varying  
11      degrees of success. More promisingly, the Uniform  
12      Law Commission has developed a Uniform Virtual  
13      Currency Business Regulation Act that is excellent  
14      and is now being considered by several states.  
15      Unfortunately, attempts at state by state reform  
16      don't scale. State by state money transmission  
17      licensing additionally has no provision for market  
18      supervision for exchanges which is increasingly of  
19      interest to federal policy makers. I was  
20      therefore happy to see SEC Chairman Jay Clayton  
21      and Chairman Giancarlo in a recent Wall Street  
22      Journal op-ed say they would "support policy

1 efforts to revisit the state by state regime."

2           Speaking of the SEC, how the securities  
3 laws apply to cryptocurrencies is the next  
4 pressing policy question that has emerged over the  
5 past few years. Many of the hundreds of tokens  
6 that have proliferated recently, have been sold in  
7 so-called initial coin offerings, also known as  
8 ICO's, to investors who buy them with the  
9 expectation of profit based on the efforts of the  
10 party that is selling the tokens and their  
11 promises to build infrastructure through which the  
12 tokens will eventually have utility. Such tokens  
13 are clearly securities, and the SEC through  
14 investigative reports and enforcement actions,  
15 have begun to make this quite clear. It is  
16 important to note, however, that while many crypto  
17 tokens are securities, not all are. And I was very  
18 gratified to hear Chairman Clayton several times  
19 in a recent hearing, draw distinction between  
20 cryptocurrencies on the one hand and tokens that  
21 have been issued as securities on the other.

22           Cryptocurrencies like Bitcoin are



1 commodities, of course, as the CFTC has previously  
2 found. Questions remain, however, about the border  
3 between these categories and about how one can  
4 responsibly sell future tokens to investors.  
5 Anti-money laundering was the first area of  
6 regulation intersecting with cryptocurrencies that  
7 prompted a federal response in the form of  
8 Fincen's 2013 Virtual Currency Guidance. It is  
9 therefore no surprise that it is one of the most  
10 developed and stable policy areas. The rules here  
11 are pretty clear. If you are a cryptocurrency  
12 exchange or similar intermediary, you are subject  
13 to the Bank Secrecy Act and its obligations. And  
14 generally, all U.S. based exchanges comply with  
15 these rules. Over the past three years, we have  
16 seen Fincen issue supplementary guidance and  
17 engage in enforcement actions providing greater  
18 clarity. Offshore rogue exchanges, however,  
19 continue to be of concern to law enforcement.

20 Finally, on tax, the IRS issued in March  
21 2014, guidance finding that cryptocurrencies like  
22 Bitcoin are treated as property for tax purposes.

1 Which means, gains from sale or exchange are taxed  
2 as capital gains rather than ordinary income.  
3 However, unlike traditional government issued  
4 currencies, property does not have a de minimis  
5 exemption law. This means that each time you buy  
6 a cup of coffee with Bitcoin it is a taxable event  
7 and you are technically required to record, report  
8 and pay taxes on any gain that you experience,  
9 even if it is just a few pennies. This obviously  
10 introduces friction that undermines potential for  
11 using cryptocurrency for day to day payments or  
12 micro transactions.

13 Last year, representatives Polis and  
14 Schweickert, co-chairs of the congressional  
15 blockchain caucus, introduced legislation called  
16 the Cryptocurrency Tax Fairness Act that would  
17 create a de minimis exemption for personal  
18 transactions under \$600. It is a lot like what  
19 exists for foreign currency. There are many other  
20 policy questions that remain open in tax and in  
21 other areas of law, but those are the highlights  
22 and I'll stop there. And I look forward to your

1 questions. Thank you.

2 MR. GORFINE: Thank you. Mr. DeWaal.

3 MR. DEWAAL: Great, thank you, Dan. And  
4 thank you, Jerry, for completely anticipating  
5 everything I was going to say. I am going to  
6 completely speak on the fly. So last year at the  
7 FIA Law and Compliance conference, I had the  
8 privilege of leading the kickoff panel with  
9 Kimberly Johns. And it was entitled, Memory Lane,  
10 Those Who Forget History are Doomed to Repeat It.  
11 And I'm going to take one brief diversion to talk  
12 about something that probably occurred before most  
13 of the people around this table became part of the  
14 industry. And I'm going to take you back to the  
15 1970s. And in the early 1970s, the CFTC didn't  
16 even exist, the Commodity Exchange Authority  
17 oversaw this business and options on enumerated  
18 domestic agricultural commodities were banned.  
19 There was need for these products, hedgers,  
20 commercial users had reason to want to use these  
21 products but the products were generally banned in  
22 the United States.

1                   Commodity markets became very volatile  
2                   in the early 1970s. And there became quite a  
3                   market in world commodity options and they were  
4                   traded in London and unfortunately, some bad guys  
5                   decided to start offering and selling them in the  
6                   United States. It caused quite a problem. Bad  
7                   firms, Goldstein Samuelson ended up being put out  
8                   of business, folks lost their money. And frankly,  
9                   among other reasons, this is why this Agency  
10                  began. The Commodity Exchange Act was amended,  
11                  the definition of commodity was expanded so that  
12                  it included not only the traditional enumerated  
13                  commodities that were under the oversight of the  
14                  old Department of Agriculture, but lots of other  
15                  things, plus it gave the potential for expansion.  
16                  And the CFTC took that authority when it began  
17                  operations and it used that authority go after the  
18                  bad guys who were dealing with the commodity  
19                  options space.

20                  Sadly, despite bringing something like  
21                  55 injunctive actions between its formation and  
22                  1978, it couldn't keep up with the bad guys.

1       Moreover, there was confusion out there. What  
2       where these products? Are they securities, are  
3       the commodities? Sound familiar? Well, the  
4       reaction then fortunately is not what this Agency  
5       is doing today. For three years, this product was  
6       banned in the United States by the CFTC as well as  
7       then subsequently by Congress. And it was not  
8       until a pilot program was reannounced in 1981 and  
9       then some of the exchanges came around and  
10      proposed specific contracts to be traded on  
11      designated contract markets, that options trading  
12      began again in 1982. Now, all these years later,  
13      nobody thinks about commodity options as a  
14      problem. These are valuable tools used daily by  
15      commercial users, by producers, by hedgers. They  
16      are traded through on exchange contracts regulated  
17      by the CFTC. They are traded also OTC and no one  
18      thinks about them as a problem, they only think  
19      about them as a solution. But once upon a time,  
20      they were seen as a real problem and this Agency  
21      dealt with it, and not at that time, in a good  
22      way.

1                   We now fast forward. Bitcoin started  
2 trading in 2009. I'm not going to go over again  
3 the evolution of the laws. I think Jerry did a  
4 great job discussing the situation out there right  
5 now. But my concern is, is that unless there is  
6 some sort of rationalization process, it will  
7 impede the development of not just coins, coins  
8 are critical to the decentralized ledgers. They  
9 don't exist in a vacuum. They are the mechanism  
10 in proof of work blockchains where miners are  
11 rewarded, in proof of stake blockchains where fees  
12 are paid. Okay, these are the way that you  
13 incentivize folks to keep the system together. If  
14 you're only talking about centralized ledgers,  
15 sure, you don't need to worry about coins. But if  
16 you think that there's validity in decentralized  
17 ledgers and you think that the guys who are  
18 working on these Dapps that are sitting on top of  
19 the Ethereum blockchain, you know, may have some  
20 good ideas. These have to be thought about  
21 carefully.

22                   Now I just want to say a couple of

1 things about where the state of legislation is.  
2 The states absolutely began with the money  
3 transmitter rules and that's predominately where  
4 most of the states are today. New York State came  
5 up with the BitLicense which, I agree, hasn't been  
6 warmly received. Six, I think there are six folks  
7 out there that are either regulated as limited  
8 purpose trusts, effectively applying the BitLicense  
9 rules, or separately in New York State.  
10 Last week, New York State said you know what,  
11 we're going to expand the requirements about  
12 people with BitLicense and we are going to get  
13 into the requirements dealing with oversight and  
14 manipulation and fraud, et cetera.

15 But it's not the BitLicense replaced the  
16 money transmitter requirements, it's both. And  
17 it's not like anyone is talking about  
18 implementation of this new Virtual Currency  
19 Business Act replacing money transmitters. Maybe  
20 it will happen, but we're talking about potential  
21 additional regulations at the state level. Oh,  
22 and by the way, if you haven't caught the news in

1 the last couple of weeks, Massachusetts, New  
2 Jersey, Texas and North Carolina, the state  
3 security Commissioners have started bringing  
4 actions against so-called prohibited ICO's where  
5 there wasn't registration of securities. So we're  
6 now seeing a third branch potentially of states  
7 getting involved in this space. That's not a good  
8 environment.

9 I just want to spend a few seconds on  
10 the SEC's oversight. There is a very, very famous  
11 case, you hear it all the time, and it's been  
12 mentioned in a number of the SEC enforcement  
13 actions, the Howey case. And it talks about the  
14 fact that something is an investment contract,  
15 namely a type of security, if it is an investment,  
16 an enterprise with the expectation of profits  
17 through the managerial or entrepreneurial efforts  
18 of others. Howey actually uses the word  
19 substantial efforts of others but over time, the  
20 SEC certainly has just talked about the managerial  
21 or entrepreneurial efforts of others. And that's  
22 been a rule that the SEC has relied on to recently



1 go after the Munchie Dapp and is using to go  
2 exercise jurisdiction on some other ICO's and  
3 prohibited securities. And I agree, in most  
4 circumstances, a lot of the stuff out there  
5 absolutely looks like a security, something that  
6 needs to be registered or issued but is exempt.  
7 But not 100 percent.

8           If you think about the application of  
9 the Howey test to common things, suppose you  
10 bought a Tesla and one of the first Teslas out  
11 there. And you bought it because you know that  
12 Musk was going to be out there pushing this thing  
13 and saying it is great, it's wonderful, it's  
14 exciting. Well sure I'm buying it, but there's  
15 not too many places I can actually plug in my  
16 Tesla. I'm getting it for the investment value. I  
17 know that's first edition. Is that car a security  
18 because I'm expecting somebody else to promote it  
19 and there is hype going on about it? Privately  
20 issued gold coins. People buy them, people hold  
21 them, people expect to resell them for a profit.  
22 Are those securities because the minters are

1 promoting those?

2                   Ultimately there has to be some  
3 clarification. The distinction between a  
4 commodity, the distinction between a security may  
5 seem from a common sense perspective, clear, but  
6 there are very, very important issues around those  
7 that I think that this Committee could very much  
8 help clarify and move the regulatory discussion  
9 along. And hopefully that is something that we  
10 can do and I certainly would look forward to  
11 participating in that.

12                   MR. GORFINE: Thank you. Mr. Gorelick.

13                   MR. GORELICK: Thank you very much.  
14 Let's see if we can get this presentation working  
15 as well. While we're getting this going here, I'm  
16 just going to do a brief introduction. So I'm  
17 Richard Gorelick. I am the head of market  
18 structure at DRW Holdings. I appreciate the  
19 opportunity to participate in this important  
20 dialogue as a member of the Technology Advisory  
21 Committee. I've been on this Committee since it  
22 was reconstituted in 2010 and I welcome the

1 Commission's initiative to assemble it again now.

2 I was previously a co-founder and the  
3 CEO of RGM Advisors, a trading firm in Austin,  
4 Texas that was an active participant in a variety  
5 of electronic markets. Since DRW acquired RGM,  
6 trading businesses in September and I joined DRW,  
7 I have had the opportunity to learn about a  
8 variety of new markets, including this rapidly  
9 developing market for cryptocurrencies such as  
10 Bitcoin. The Commission has asked me to share a  
11 little bit about the market structure for the cash  
12 and futures markets for cryptocurrencies today and  
13 that's what I'm hoping to do momentarily here,  
14 let's see.

15 MR. GORFINE: And as you pull that up,  
16 at least for members, it is in your materials. You  
17 will see a printout of the presentation which  
18 we'll hopefully have up on screen in a moment.

19 MR. GORELICK: There we go. Thank you  
20 very much. So I'll start off by noting that I'm  
21 using the term cryptoassets. And this is intended  
22 to be a real broad term. A lot of the time we're

1 talking about cryptocurrencies but as it turns  
2 out, a lot of these are not, in fact, something  
3 that we would widely regard as currencies. They  
4 have very different characteristics. Some of them  
5 might be in fact crypto securities as we have  
6 talked about, some of those might be utility  
7 tokens or other things, I'm trying to use a broad  
8 term of cryptoassets.

9 DRW has been active in this crypto  
10 ecosystem for a number of years. DRW recognized  
11 Bitcoin and the underlying technology as an  
12 opportunity in 2012. Cumberland was founded in  
13 2014 as a subsidiary and a Bitcoin trading desk  
14 which has been uniquely positioned between the  
15 traditional financial industry where DRW has  
16 participated for a couple of decades and the  
17 nascent cryptoasset space. Today, Cumberland  
18 specializes in providing two sided institutional  
19 size liquidity to counterparties around the world.  
20 Cumberland also manages a long portfolio of  
21 cryptoassets and pursues various strategic  
22 opportunities in these emerging markets.

1                   So that's why we're involved and why I'm  
2 here today to talk to you about it. I already  
3 spoke a little bit about terminology. Bitcoin was  
4 the first cryptoasset launched in 2009 and today,  
5 as we've heard, over 1500 different cryptoassets  
6 exist.

7                   The volumes, the trading volumes and the  
8 market caps of these coins are still skewed toward  
9 Bitcoin and a small handful of others as these  
10 charts indicate. Bitcoin, Ethereum, Ripple and  
11 Bitcoin Cash are the top, both in terms of volume  
12 and market cap and the volume drops off  
13 considerably and market cap beyond those.

14                   In terms of the size of the market, the  
15 market has grown considerably over the last year.  
16 This chart starts in January 2017 and what you can  
17 see is that the overall market cap has gone from  
18 approximately 0 at this scale up to as high as  
19 over 750 billion in December and recently settled  
20 in the 400 billion plus range over the last couple  
21 of days. At the same time, the trading volumes of  
22 these coins has gone up from approximately 0 on

1       this scale to between 30 and 60 billion dollars of  
2       value per day. And so because of the sort of the  
3       shape of these curves and the trend and the  
4       increase in both market cap and volume,  
5       particularly at the end of last year, that's why  
6       there's been so much attention on this space in  
7       the last several months.

8                 Another thing to note in terms of market  
9       dynamics over the last year and a half as Jerry  
10       discussed a little bit is that at the beginning of  
11       last year, this was a market that was completely  
12       dominated by Bitcoin, over 85 percent of the  
13       market cap for cryptoassets was in Bitcoin at the  
14       beginning of last year. Over the course of the  
15       year, there was much more diversification. As  
16       much as we talk about the major runup in Bitcoin  
17       prices last year, it actually underperformed a  
18       number of these other coins. And so the result is  
19       by, in current periods, about 35 percent of the  
20       market cap is accounted for by Bitcoin.

21                 I want to talk a little bit about the  
22       trading conventions for cryptoassets. It's truly

1 a 24/7 market. It trades all night, all weekend,  
2 it trades on holidays, it just trades around the  
3 clock. Other markets like FX talk about being a  
4 24/7 market but do take some time off  
5 occasionally, this is really around the clock. A  
6 couple of the interesting dynamics, very small  
7 price increments. So generally for a Bitcoin  
8 which trades in the, you know, let's say, \$9000  
9 range as of today, the tick increment, the price  
10 increment, is one penny. So it's much smaller  
11 than a lot of the markets on the equities and the  
12 futures side that we're used to for assets that  
13 trade at that price level. And at the same time,  
14 the lot size is very small. There is really  
15 essentially no limit on the smallest size that you  
16 can trade of a Bitcoin. Right now, it is a point  
17 seven zeros and a one of a Bitcoin. It is also  
18 known as a Satoshi. I think it's, if I've done my  
19 math right, it is one one hundred millionth of a  
20 Bitcoin is the smallest size that can trade in.  
21 Often you see very small sizes on the trading  
22 screen. The combination of these tiny price

1 increments and these very small lot sizes for  
2 trading, in this spot market means that you have a  
3 highly fluid and often very thin order book on the  
4 exchanges that trade.

5 I'm going to talk a little bit about the  
6 spot exchanges. There are over a hundred  
7 exchanges around the world that trade Bitcoin and  
8 other top cryptoassets in what I'm calling the  
9 spot market. And you know I put exchanges in  
10 quotes because it doesn't really fit into the  
11 regulatory framework of how we traditionally think  
12 about exchanges in more mature and more regulated  
13 markets like the futures markets and the equities  
14 markets around the world. The largest exchanges  
15 include a number of exchanges around the world. I  
16 think the important thing to note here is that  
17 they're not all based in the United States.  
18 Bitfinex is based in Hong Kong. Coinbase, their  
19 G-Dax exchange is based in the U.S. Bitstamp was  
20 founded in Slovenia and then subsequently moved to  
21 UK and Luxembourg. And as you go down the list,  
22 you notice that there is Japan, there is



1 Singapore, there is various UK and European  
2 presences. This is truly sort of a global market.  
3 And as I mentioned our trading desk, Cumberland,  
4 we're an active participant on a number of  
5 exchanges that have meaningful trading volumes.

6 The Korean exchanges received a lot of  
7 attention in the last couple of months and they've  
8 grown in importance. In December, it was reported  
9 that about 20 percent of the world's cryptoasset  
10 volumes were in South Korea. This was the third  
11 biggest market in the world after the U.S. and  
12 Japan. New regs went into effect at the end of  
13 January that had the impact of slowing that down a  
14 little bit, but we'll have to see how things play  
15 out over time. But that's a lot of discussion  
16 about the Korean exchanges in recent months.

17 Generally speaking, I think trading on  
18 these spot exchanges can be challenging,  
19 particularly if your goal is to trade across  
20 multiple spot exchanges. It's difficult to weave  
21 together liquidity across multiple exchanges and  
22 jurisdictions due to a number of factors.

1 Technology on these platforms is very  
2 non-standard, particularly if you're coming from  
3 the traditional financial industry, these don't  
4 look like the normal protocols that we're used to.  
5 There are concerns about deceptive trading on  
6 these platforms like wash sales and spoofing and  
7 other types of market manipulation. There's not  
8 standard best practices. Every exchange does  
9 their own thing in a different way and we're  
10 really behind the ball in sort of developing  
11 standard ways of doing business with these  
12 exchanges.

13           Banking relationships have been fickle.  
14 And what's happened here is that exchanges have  
15 had hard times getting banking relationships in  
16 various jurisdictions. Sometimes they get them  
17 and then they lose them and they move them around  
18 and that has created difficulty at times moving  
19 money in and out of these venues. Because of the  
20 need to post both money and coins at all of the  
21 exchanges on which you want to trade, it's very  
22 capital efficient to trade across multiple

1 exchanges. There are obvious well-known concerns  
2 about cybersecurity and concerns about the  
3 transparency at the exchanges about who runs these  
4 exchanges, what their financial wherewithal is,  
5 what their practices are and what exactly they're  
6 doing on exchange. And then it's slow, it can be  
7 very slow to move money and coins in and out of  
8 these various exchanges.

9           You know, on top of that, the fees are  
10 higher than we're used to in sort of more mature  
11 financial markets. So there's a lot of challenges  
12 in dealing with these spot exchanges.

13           Another thing to note is that it often  
14 appears that the markets are crossed. Meaning  
15 that it looks possible that you could just buy on  
16 one exchange for less than you could just sell on  
17 another exchange. The Korean exchanges, for  
18 example, had a period of time that sort of mostly  
19 has gone away since the new regulations have gone  
20 into effect at the end of January where the  
21 pricing on the Korean exchanges for Bitcoin was  
22 much higher than the prices on other markets. At

1 the bottom of this screen, you see an example of  
2 just a quote that I pulled a few weeks ago where  
3 on Bitfinex, Bitcoin was trading at about 12.6  
4 thousand dollars and on a major Korean exchange,  
5 Upbit, it was trading at 15.3 thousand dollars.  
6 In theory, crosses like this should be eliminated  
7 by arbitrage. And I think a lot of people look at  
8 this and say wow, there's a lot of money to be  
9 made just by arbitrage. But there are structural  
10 reasons for these prices differences including the  
11 limitations and delays and difficulty in getting  
12 in and out of these exchanges and that needs to be  
13 kept in mind.

14           Algo trading is another topic that I've  
15 been asked about. It is developing in pockets of  
16 the crypto markets. But most exchanges today are  
17 hosted in the cloud and as a result, low latency  
18 is not yet a significant differentiator in these  
19 markets. The latencies, the times that we  
20 generally hear about for trades to execute are in  
21 the seconds to tens of seconds range at this  
22 point. While people are trying to speed that up

1 in areas, that is not a dominant feature of the  
2 market yet.

3 Over the counter trading in this market  
4 is very important. A meaningful portion, I've had  
5 difficulty on getting firm estimates of exactly  
6 how much, but a meaningful portion of all  
7 cryptoasset market volumes are occurring away from  
8 these exchanges. Many are with over the counter  
9 traders. DRW's subsidiary Cumberland trades with  
10 counter parties in the over the counter markets in  
11 institutional size. I think the advantage is for  
12 some market participants of trading in these over  
13 the counter markets, is that the ability to trade  
14 in large institutional sizes, the abilities to get  
15 competitive, all-in pricing and the ability to  
16 quickly settle and get paid usually in less than  
17 24 hours are all features of the over the counter  
18 market that may be advantageous relative to the  
19 sort of difficult to weave together, exchange  
20 space.

21 Bitcoin futures launched in December.  
22 The CFE launched Bitcoin futures on December 10th,

1 the CME followed on December 17th. And our view is  
2 that other exchanges are likely to launch  
3 cryptoasset based futures contracts in the coming  
4 months. The creation of these products is a real  
5 positive for the cryptoasset industry. It  
6 demonstrates the overall maturity of the business  
7 as an asset class. It's very good to have  
8 established and regulated exchanges involved with  
9 the landscape. Our view is that as new products  
10 are launched in the future and as new exchanges  
11 get involved, we would like to see a good healthy  
12 dialogue between the exchanges and both the  
13 financial community and the cryptoasset community  
14 that will trade and participate in the development  
15 of these markets.

16 Challenges remain with the settlement  
17 mechanisms. The first round of settlements went  
18 relatively smoothly but we continue to have  
19 concerns that the way that these futures contracts  
20 are pegged to these cash markets which are less  
21 transparent, could result in dislocations in the  
22 future and this is something we're watching

1       closely and hoping to work with the exchanges on  
2       as things go forward. We've expressed our view  
3       that we would like to see physically settled  
4       cryptoasset contracts to help deal with some of  
5       these concerns. We recognize that that may be a  
6       little bit longer in coming.

7                 Quick comparison of the CFE and the CME  
8       products in terms of the market structure there.  
9       The contract size on the CFE is one Bitcoin while  
10       it is five Bitcoins at the CME. That sort of  
11       helps normalize your view about the size of these  
12       markets. The open interest at the CFE is about  
13       6000 contracts, about 2000 at the CME. CME is a  
14       little bit larger if you look at it in terms of  
15       Bitcoin terms. Daily volumes are comparable at  
16       between 5 and 15000 Bitcoins worth of contracts at  
17       each exchange. Both are cash settled with  
18       different settlement mechanisms. The CFE  
19       settlement mechanism relies on the auction price  
20       on the Gemini spot exchange while the CME  
21       settlement mechanism relies on a price average  
22       across four spot exchanges at present. Tick

1 increments are also much bigger than we see in the  
2 cash market. On the CFE product, it's a \$10 per  
3 Bitcoin tick increment and \$5 on the CME. This  
4 compares to one penny on a lot of the cash  
5 markets.

6 In terms of foreign regulation, Chairman  
7 Giancarlo's gone through in some of recent  
8 speeches and detailed a lot of the regulatory  
9 approach overseas and it is very different. I  
10 think the important thing to note is that these  
11 are truly global markets, it is truly a global  
12 asset class. So the ability of any one regulator  
13 in any one jurisdiction to do a lot in this space  
14 is limited by that sort of global nature. That's  
15 not to say that we shouldn't try, we certainly  
16 should, but we need to do so in a way that is  
17 respectful of the fact that there are other  
18 markets and other jurisdictions where this trading  
19 occurs.

20 Governments around the world are trying  
21 to figure out how to regulate Bitcoin and other  
22 cryptoassets with various approaches. China



1 banned some exchanges in September. As I  
2 mentioned, recently the new regulations in South  
3 Korea are requiring trading through what they're  
4 calling, real name bank accounts, to improve on  
5 some of the anti-money laundering and KYC  
6 concerns. Japan has been really a thought leader  
7 in this space and has put forth regulations that  
8 require exchanges to register and apply to the FSA  
9 for authorization. And the last time I checked,  
10 there were over 15 exchanges that had registered  
11 and were being supervised under this new  
12 regulation in Japan. France recently announced a  
13 formation of a task force to propose a new  
14 framework for regulations in this space.

15 My other members of the panel here have  
16 done a good job of talking about the U.S.  
17 Regulatory guidance. But I will concur that while  
18 there's been a lot of guidance and a lot of  
19 investor education in recent weeks and months from  
20 the CFTC and the SEC, there is still room for  
21 improved clarity around what the rules are.  
22 Particularly around some of these definitional

1 issues about what is a security, what is a  
2 commodity, what is an asset, you know what are the  
3 rules and how do we determine what is what.

4           So my overall proposal for the  
5 regulatory approach is that the U.S. should adopt  
6 a smart principles-based regulatory framework that  
7 encourages professional and responsible market  
8 participants to build and invest in cryptoasset  
9 businesses in the U.S. To do so, the market is  
10 going to require more certainty as to the legal  
11 status of these cryptoassets, better guidance  
12 about how financial institutions can provide  
13 services to the cryptoasset businesses and zero  
14 tolerance for fraud, scams and abuse. And I  
15 commend the CFTC and the SEC for recently making,  
16 getting very involved in this space and talking  
17 about their view that that's their primary focus,  
18 is to make sure these markets are safe for all  
19 participants coming in. I'm going to suggest a  
20 TAC working group to look into these issues in  
21 depth to make specific recommendations to the CFTC  
22 consistent with this approach. Thank you.

1                   MR. GORFINE: Thank you very much. Mr.  
2                   Zaidi.

3                   MR. ZAIDI: Thank you. Thank you for  
4                   having me today. My name is Amir Zaidi, I'm the  
5                   Director of the Division of Market Oversight here  
6                   at the CFTC, and I've been asked to talk a little  
7                   bit about a related aspect to this whole  
8                   conversation is our recent retail commodity  
9                   transaction interp, specifically, the actual  
10                  delivery exception to our jurisdiction over these  
11                  retail commodity transactions and, more  
12                  specifically, with respect to virtual currencies.  
13                  Before I start, I will also give the standard  
14                  disclaimer that these are my own views, since I  
15                  see our general counsel staring at me.

16                  As you all know, there are several well  
17                  established platforms in the U.S. as my panelists  
18                  have gone over, engaging in U.S. retail investors  
19                  in a growing number of virtual currencies that are  
20                  available for trading. As previously noted by the  
21                  Commission, the underlying cash marketplace for  
22                  virtual currencies remain largely unregulated, and

1 the CFTC has limited statutory authority over  
2 them. We do have anti-fraud, general anti-fraud  
3 authority. The Commission also has statutory  
4 authority to treat these certain leverage, margin  
5 or finance retail commodity transactions as if  
6 they were a commodity futures transactions. This  
7 means that certain virtual currency platforms  
8 offering these retail commodity transactions to  
9 U.S. retail investors must register with the  
10 Commission as DCMs. This also means that trading  
11 in such transactions may also trigger Commission  
12 registrations for certain intermediaries and asset  
13 managers. Like I said, the Commission's  
14 jurisdiction over these retail commodity  
15 transactions includes an exception when actually  
16 delivered to the purchaser, actual delivery to the  
17 purchaser occurs within 28 days from the date of  
18 the transaction.

19 As per relevant Commission and  
20 jurisdictional precedent, a finding of actual  
21 delivery is focused on possession and control.  
22 Accordingly, the proposed interpretation attempts

1 to properly recognize when a purchaser has  
2 sufficient possession and control over virtual  
3 currency in retail commodity transactions. The  
4 main point of this proposed interpretation is to  
5 clarify that actual delivery of a virtual  
6 currency, to qualify for that exception from the  
7 Commodity Exchange Act, requires purchaser freedom  
8 to utilize the commodity purchased no later than  
9 28 days from the date of the transaction.

10 At this point, the seller and any  
11 platform involved should no longer be able to  
12 prevent, use or otherwise take away any amount of  
13 that virtual currency purchased using leverage or  
14 margin. The Commission notes that it drafted this  
15 proposed interpretation with a balance in mind, to  
16 avoid impeding upon market enhancing innovation  
17 while ensuring integrity for U.S. retail investors  
18 when the transaction falls within the Commission's  
19 jurisdiction.

20 So the baseline interpretation, in the  
21 proposed interpretation, contains two primary  
22 factors required to demonstrate actual delivery.

1 The customer having the ability to take possession  
2 and control of that entire quantity of the  
3 commodity, whether it's purchased on margin or  
4 using leverage or any other financing arrangement.  
5 And the second, to use it freely in commerce both  
6 within and away from any particular platform no  
7 later than 28 days from the date of the  
8 transaction. And secondly, the offeror and the  
9 counterparty seller, including any of their  
10 respective affiliates or other persons acting in  
11 concert, with the offeror or counterparty seller  
12 on a similar basis not retaining any interest in  
13 or control over any of the commodity purchased on  
14 leverage, margin or other financing arrangement at  
15 the expiration of 28 days from the date of that  
16 transaction.

17 The interpretation goes on to note four  
18 examples to further elaborate on this baseline  
19 interpretation. In the example one, it requires a  
20 full blockchain audit trail demonstrating that the  
21 transfer of the virtual currency from the  
22 purchaser to the seller within 28 days from the

1 date of the transaction, when a platform is  
2 involved to intermediate the platform would  
3 transfer the purchased virtual currency to the  
4 purchaser within that 28 days. In example two,  
5 there is a little bit more flexibility, allowing  
6 certain virtual currency platforms the ability to  
7 offer wallets for use by their customers and to  
8 act as the depository if the purchaser agrees,  
9 while ensuring that the platform ultimately gives  
10 up any control over the purchased virtual currency  
11 once that 28 days has passed from the date of the  
12 transaction.

13 In example three, it provides that mere  
14 book entries are not enough to demonstrate that  
15 actual delivery occurs; something more will be  
16 necessary to conform to the baseline  
17 interpretation. And then the final example  
18 explains that actual delivery must have actually  
19 occurred at some point. This means that actual  
20 delivery is not satisfied if the transaction is  
21 simply rolled, offset, netted out or otherwise  
22 cash settled. We also have a, obviously, this is

1 a proposal so we're asking for comment. The  
2 Commission asked multiple questions to the public  
3 to further refine the interpretation. A few  
4 examples: the Commission asked about the meaning  
5 of certain terms such as title, depository,  
6 control. Further, the Commission asked about the  
7 adequacy of that 28 day delivery period, the  
8 restrictions on liens beyond the 28 day period and  
9 the potential for a unique regulatory regime for  
10 these types of transactions. The comment period  
11 is still open until March 20th, I believe, so  
12 another month to get your comments in and we'd  
13 appreciate those and look forward to reading them.  
14 Thank you.

15 MR. GORFINE: Okay, great, thank you and  
16 I'd like to thank our panelists. You walked  
17 through market developments, existing legal  
18 regulatory questions and challenges, trading  
19 activity, and then a view from the CFTC, so thank  
20 you. I want to open it up again to questions and  
21 discussion so you can start thinking of comments  
22 and again please place your card upright if you



1 have a question or comment. Before I do that  
2 though, I'd like to actually turn to Mr. Durkin  
3 and Mr. Chou to talk a little bit about recent  
4 updates with respect to Bitcoin futures and  
5 Bitcoin options trading that's been taking place  
6 on your respective exchanges. I'll start with you  
7 Mr. Durkin.

8 MR. DURKIN: Thank you Mr. Gorfine and I  
9 just want to compliment the Commission for it's  
10 efforts and leadership in the successful launch  
11 and introduction of our Bitcoin futures contract.  
12 I also want to compliment Commissioner Behnam for  
13 his leadership with the MRAC and the discussion of  
14 this topic a few weeks ago.

15 To bring you up to date, as the world's  
16 largest futures and regulated marketplace, we did  
17 feel that CME was a natural home for the  
18 establishment of our Bitcoin futures contract.  
19 One of the key strengths of our offering was  
20 predicated on our already successful Bitcoin  
21 reference rate, which we introduced in November of  
22 2016, and that reference rate was introduced to

1 provide greater transparency to this spot Bitcoin  
2 market. Now, the Bitcoin reference rate is a once  
3 per day reference rate based on the U.S. dollar  
4 price of Bitcoin and it aggregates as it was  
5 alluded to here: data from four exchanges, be it  
6 Bit Stamp, GDACs, ITBIT, and Kraken.

7 That real time reference rate aggregates  
8 demand for buying and selling Bitcoin and it's  
9 brought into an aggregate of an order book, which  
10 reflects the real-time, again, U.S. dollar price  
11 of Bitcoin. So we were pleased that we were able  
12 to introduce that some 14 months ago, which then  
13 brought us on to the launch of our contracts.

14 So the contract was launched on December  
15 18 and to date we're averaging approximately 1,397  
16 contracts daily, which translates into 83 million  
17 notional. Sixty-five percent of that volume has  
18 traded during U.S. hours, 35 percent of that  
19 volume is traded during non-U.S. hours. We have  
20 over 900 unique accounts that are routinely  
21 trading across all of our client segments. Market  
22 maker volume has been approximately 27 percent of

1 the product since launch. 73 percent of the volume  
2 is non-market maker customer volume. Retail  
3 customers have represented approximately 13  
4 percent of the volume. The buy-side is  
5 representing approximately 15 percent of the  
6 volume, props around 70 percent, banks, a little  
7 bit over 1 percent.

8           Seventy percent of the volume, since  
9 launch, is U.S., 30 percent of the volume  
10 represents non-U.S. Our open interest is 1,936  
11 contracts or the equivalent of 81 million in  
12 notional, and that open interest is growing each  
13 day and that has been the case since launch. We  
14 have very active quoting, volume and open interest  
15 across all of the expirees, which is very exciting  
16 in the context of the buildup of the contract.

17           And we're very pleased with the risk  
18 management associated with this contact. So, it  
19 was very fundamental to us that we implement a  
20 variety of risk management tools, such as higher  
21 margin levels, position and price limits, product  
22 controls, to appropriately manage and aggressively

1 manage the risk of this contract. And I'm very  
2 proud and pleased to say that every single aspect  
3 of that has performed according to standard.

4 MR. GORFINE: Thank you. Mr. Chou, I  
5 believe I may you have some slides that perhaps  
6 Amir is going to power for you over there.

7 MR. CHOU: Thank you Amir, and I really  
8 appreciate the assist on this one. So first I  
9 want to say that the agenda is really fantastic in  
10 that obviously the topics are very timely but also  
11 very synergistic. If you deal with things like  
12 distributed ledger technologies and Bitcoin,  
13 obviously cyber security is going to be something  
14 that's top of mind as well. So I hope that as we  
15 go throughout the rest of the day we can bring  
16 back some of the topics that were discussed this  
17 morning in a way that those things can interface.

18 So my name is Paul Chou, I'm the CEO  
19 co-founder along with Zach Dexter and my CTO and  
20 actually my wife here, Juthica, happy Valentine's  
21 Day. She's very forgiving about this kind of  
22 thing.

1                   And we started LedgerX four years ago  
2                   and we're currently a swap execution facility and  
3                   derivatives clearing organization registered with  
4                   the CFTC. And our focus is entirely all  
5                   crypto-currencies. And in particular what we  
6                   focus on is derivatives around physically settled  
7                   crypto-currencies, so in a sense you actually get  
8                   the underlying Bitcoin or other digital currency  
9                   that the contract actually references.

10                   So this first slide up here, you know,  
11                   on the surface LedgerX looks no different from any  
12                   other kind of clearinghouse operation you might  
13                   imagine. We take dollars for sure, and our  
14                   specialty is we also get crypto that's actually  
15                   pledged to the clearinghouse to underlie a lot of  
16                   derivatives trades that interacted on our SEF.

17                   So when we talk about things like  
18                   physical delivery in settlement, what we mean is  
19                   that they actually send it to a clearinghouse  
20                   address that only we control. So that the DCO at  
21                   that point has full positive control over all of  
22                   the crypto that we manage. And an example the

1 transaction might be, for example, a customer  
2 comes in and wants to buy a call option. You know  
3 they send U.S. dollars to us. We have a customer  
4 that wants to sell a call option against Bitcoin.  
5 They deposit Bitcoin to the DCO entity, we hold it  
6 for them and at the expiration of the call option,  
7 if the customer chooses to exercise then we pick  
8 the strike price, give to the call seller and  
9 actually deliver the underlying Bitcoin. So  
10 that's like a really key point for us because a  
11 lot of our customers need the underlying Bitcoin  
12 for a lot of their operations.

13           So what I'll note is that I think  
14 Bitcoin and other digital currencies have like a  
15 really great future in terms of collateral. It  
16 always struck us as a great collateral instrument.  
17 You can send it to us 24/7, 365, you don't have to  
18 worry about banking hours; in fact, a lot of our  
19 customers send Bitcoin send Sunday at 4p.m. and  
20 within a few hours they're actually able to trade  
21 with that collateral in hand, so I think that's a  
22 very powerful use case.

1                   There are certain customers of ours and  
2                   clearing members that don't ever deposit dollars  
3                   at all. They can send Bitcoin to us through all  
4                   manner or variety of swaps and transactions and  
5                   options and then when they're done convert it to  
6                   Bitcoin and actually withdraw it to their personal  
7                   account.

8                   So this I think was like a very  
9                   fascinating use case, what crypto currencies can  
10                  do that other things can't because they've  
11                  essentially not even touched the U.S. banking  
12                  system at that point. So it's something that we  
13                  think we do very well especially at LedgerX  
14                  because the physical settlement of it is actually  
15                  quite important. Next slide please.

16                  Alright, so I want to go over a little  
17                  bit about the different players in the ecosystem.  
18                  There are a lot of things that are really not that  
19                  different from normal commodity markets. Bitcoin  
20                  has natural longs, it has natural shorts, it has  
21                  long-term investment managers, and it has like  
22                  short-term traders and market makers as well.

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So, I always try to emphasize to people that we can use a lot of analogies with other commodity markets for the participants that do work in the Bitcoin ecosystem and there are many.

So a classic example, for a long-holder, natural long, would be a miner. So this individual or institution has spent many years investing in infrastructure, designing specialized chips, paying for the electricity behind that and also employing people and you get a commodity as a result.

So it's not too different from say like a British Petroleum that also invests U.S. dollars in infrastructure and gets what's sort of evolved to oil commodity out and they have those price risks as well.

So what a long-holder might do is to take the Bitcoin that they've actually mined over the years and do collar rights against them. That's a very classic trade for this sort of thing.



1                   That way they can get U.S. dollars  
2                   today, we hold a Bitcoin as collateral against  
3                   those collar rights and they can use those U.S.  
4                   dollars essentially to invest in research and  
5                   development for their next generation of chips or  
6                   to expand their factories and stuff like that.

7                   Long-holders obviously are very  
8                   interested because Bitcoin is potentially like an  
9                   uncorrelated asset class to like most other asset  
10                  classes. What we've seen over the last couple of  
11                  years in financial markets is that things tend to  
12                  be moving a lot more together than people would  
13                  like and adding some portion of your portfolio to  
14                  crypto could be very valuable addition to what you  
15                  do.

16                  And finally market makers are obviously  
17                  attracted to things that move and things that have  
18                  quite a bit of volatility and in Bitcoin and  
19                  digital currencies we have volatility in spades;  
20                  it moves a lot. And so I think there are a lot of  
21                  traditional people who used to trade nat gas or  
22                  other commodities that are now looking at crypto

1 as a way to make markets and sort of capture  
2 spreads around them. Next slide please.

3 Okay, so this is a particular trade I'll  
4 highlight and one of the things that we're seeing  
5 in the market that was covered by various news  
6 outlets. And basically it was done from our  
7 public reporting. There was an individual that  
8 bought 1 million dollars worth of premium. So  
9 that's not 1 million dollar position, that's a  
10 million dollars worth of call premium. That  
11 Bitcoin by the end of December of this year would  
12 be above \$50,000, so, you know, we're starting to  
13 see some distributional views that very  
14 sophisticated market participants have.

15 So, to give you a sense of scale, if  
16 Bitcoin were to end at \$50,000 by the end of this  
17 year, the entire market cap of Bitcoin, not even  
18 any other digital currencies, would be about a  
19 trillion dollars. So you know, as the Commission  
20 and the Technology Advisory Committee do look at  
21 this, we are starting to have oversight over  
22 something that could be, one day, a

1 trillion-dollar market cap entity. And that's  
2 really important to put that out there.

3 More importantly, options -- that's what  
4 we specialize in -- also give us a view of what  
5 market participants think is the riskiness of  
6 Bitcoin going forward. So even if you have no  
7 intention of actually trading options on Bitcoin,  
8 say you only trade spot Bitcoin, this gives us an  
9 unprecedented tool of market forward expectations  
10 as to how much it's going to move and therefore  
11 risk managers who are looking at their spot  
12 positions, can scale their positions accordingly.  
13 And that's something that visibility I think has  
14 been kind of lacking for quite some time now.  
15 Next slide please.

16 I talked about other things that LedgerX  
17 has seen in terms of trading, what I want to  
18 mention is something that all of these unique  
19 things about Bitcoin that we're seeing in  
20 clearing. Most of the people here on the  
21 committee have probably heard of things like hard  
22 forks. Bitcoin is software, so every once in a

1 while somebody develops a new version of the  
2 software and if you're holding Bitcoin in  
3 November, you might be holding two different  
4 coins, two coins, in December based on a hard  
5 fork.

6           So this graph up here in this photo is  
7 basically all the hard forks that happened for  
8 Bitcoin in December alone. So you can see that if  
9 you held one BTC you have a plethora of other  
10 coins down the line.

11           So it's almost like a dividend in some  
12 sense but it provides a lot of interesting and  
13 unique challenges for a clearinghouse, because you  
14 list a put option, for example, on Bitcoin and it  
15 expires in a year, and the put option holder wants  
16 to exercise it and put the underlying to it, what  
17 are you asking them to put? Was it just the  
18 original coin or is it some subset of the coins  
19 that forked over the last couple years?

20           And so we have, as you might imagine,  
21 very rigorous conversations about this exact issue  
22 with our clearing members. Some choose to just

1 withdraw their Bitcoin from our clearinghouse  
2 before a fork happens, some people don't believe  
3 that the other forks will actually have value and  
4 so people are constantly doing different  
5 strategies to manage this and take the risk.

6 But I wanted to highlight this as  
7 something that's unique to crypto currencies and  
8 also something that's unique for, as the industry  
9 develops, best practices for this and other  
10 questions that the Technology Advisory Committee  
11 is sort of uniquely suited to address and  
12 establish best practices and industry standards.  
13 Thank you.

14 MR. GORFINE: Thank you, Mr. Chou. So,  
15 I do want to open it up now to questions or  
16 comments or statements from our members. Again  
17 with an eye towards what are some potential work  
18 streams that this committee may consider. Let's  
19 see. I see Mr. Curley.

20 MR. CURLEY: Thank you very much, Dan  
21 for having me on the panel and to the Commission  
22 as well. So I wanted to focus on a couple of

1 points that were referenced at least in passing by  
2 the panel. The first is custody, and custody is  
3 something that is really taken for granted and  
4 really fundamental to both consumer protection and  
5 to the functioning markets.

6 So that's something that we definitely  
7 see as an area that could merit some attention by  
8 something like the TAC in the following sense that  
9 there are differences between what custody means  
10 for different types of assets. So we experience a  
11 lot of questions about people who ask why am I  
12 becoming a bank for this reason?

13 It's because there is a recognized  
14 regime for trust companies or banks that can  
15 perform custodial functions but the observations  
16 often times for these parties is really -- they're  
17 proposing to do something very different than what  
18 the banking supervisor would otherwise be asking  
19 them to do. They're facing technology challenges  
20 different because of the nature of the assets  
21 they're holding.

22 And it's often a very diverse set of

1 assets, tens hundreds of Bitcoin and equivalent  
2 crypto assets that they might be wanting to deal  
3 with and therefore it's kind of a different  
4 problem than custodying a security or cash, other  
5 types of assets that have more traditional  
6 structures.

7           So that's definitely something I invite  
8 the panel to be honest, whether they are  
9 experiencing similar things, and that with the  
10 second aspect being related to it and that's  
11 accounting. So again, accounting being a  
12 challenge that we see as parties facing pretty  
13 regularly in terms of what the accounting  
14 standards are, how to deal with the keys without  
15 undermining the anonymity or other features of the  
16 platform.

17           But again, fundamental to assuring that  
18 assets are there when they're expected to be and  
19 that the value that it represented in derivative  
20 or other markets is tied to something that's there  
21 in fact.

22           MR. BRITO: To custody what I would say

1 is, it is a question that so many different laws  
2 are required or predicated on whether you have  
3 custody or not. And that's an open question of  
4 what constitutes custody, I think part of the  
5 actual delivery question is about that.

6 What I would recommend to the TAC is  
7 that they look at the Uniform Law Commission's  
8 Virtual Currency Business Regulation Act, which  
9 has a little to do with what you're doing here,  
10 however this committee of the ULC spent two years  
11 thinking about this.

12 The licensing in that Act is, turns on  
13 custody and they developed a definition of  
14 control, this is what they call it. And we think  
15 it's the best that we've seen, so I would  
16 recommend that you look at the definition of  
17 control in the ULC Act when thinking about  
18 custody.

19 MR. GORFINE: Okay, I'll go the Mr.  
20 Knight next.

21 MR. KNIGHT: Thank you and thank you to  
22 the panel for a great presentation. I would



1 recommend that the TAC consider a working group to  
2 look at regulatory rationalization in the space.  
3 And one area, one sort of deeper question I think  
4 we should wrestle with is, given the sort of  
5 flexibility and versatility of virtual currencies  
6 or assets have shown and the fact that we're  
7 wrestling over the terms indicates it, it's like  
8 the story of the elephant and the three blind men,  
9 right?

10           You're looking at -- the regulators are  
11 looking at it from different perspectives and  
12 thinking it's a different thing and you find this  
13 elephant regulated by the tusk, tail, and trunk  
14 regulators all at the same time. And so one thing  
15 we might want to look into is whether or not the  
16 functional approach that we generally use makes  
17 sense, or if some other approach where the fact  
18 that it is a virtual asset in and of itself is  
19 what drives a regulation versus what is the  
20 underlying economic reality that the virtual asset  
21 is being used to conduct.

22           And I don't say that to think that the

1 virtual asset specific view is necessarily the  
2 right one, but we should at least contemplate it.

3 MR. GORFINE: Thank you and maybe we'll  
4 just work down the line. Ms. Yadav, we'll start  
5 with you, and then I see a few cards up and we'll  
6 just work down.

7 MS. YADAV: Thank you so much again to  
8 all the panelists, really fantastic presentations.  
9 One question that I'd be interested in getting  
10 some more clarity from the group is in relation to  
11 the question Paul sort of mentioned, the existing  
12 volatility of the assets.

13 In addition we've obviously seen a  
14 number of events happen externally, for example,  
15 the hack of the Japanese exchange, we've seen  
16 China crack down on exchanges, Korea cracked down  
17 on exchanges, in addition obviously in the  
18 Ethereum blockchain we saw the DAO hack as well as  
19 the resetting that followed.

20 All of these have sort of unpredictable  
21 sort of disruptive events that are happening  
22 within this marketplace. To what extent are the

1 exchanges that are transacting on Bitcoin  
2 referenced assets and/or the clearinghouses that  
3 are dealing with collateral pertaining to Bitcoin  
4 and other crypto assets? How are they supposed to  
5 protect themselves against the costs and potential  
6 volatility that's going to be exerted by these  
7 unpredictable, uncontrollable events that are  
8 happening, seemingly uncontrollable events that  
9 are happening in this space?

10           And to this question I think it would be  
11 interesting to think about how new this question,  
12 in fact, is, and in that context to what extent do  
13 exchanges need new tools, clearinghouses need new  
14 tools, and new ways of thinking, and are modelling  
15 the kind of risks that are coming up in this  
16 space. So, that's really one question that I  
17 think would be an interesting one for the working  
18 group going forward.

19           MS. VEDBRAT: So I have two questions.  
20 One, Paul, you showed how many forks have taken  
21 place like just in one month alone, so, I would be  
22 interested to learn a little bit more on what

1 causes the forking and do you have any depth of  
2 insight into how many times a particular Bitcoin  
3 could potentially fork?

4 And then the other is much more for the  
5 working group, and that is actually to have a  
6 better understanding for the broader market if  
7 they have exposure to like Bitcoin or Bitcoin  
8 futures.

9 Recognizing that currently some of the  
10 offerings are comingled from a default fund  
11 perspective with existing contracts, so is that  
12 the safest way for participants that may not  
13 directly be participating for existing assets that  
14 they may be participating in or should it be a  
15 segregated model or perhaps like some sort of  
16 additional collateral that may need to go into the  
17 default fund? But that's probably something that  
18 the working group could look at more holistically  
19 for these markets for these products.

20 MR. CHOU: Yeah, so let me talk briefly  
21 a little bit about both of those questions.  
22 Bitcoin is a very unique commodity for sure,

1 right? It's the only thing that I can think of  
2 that if there's a fundamental architecture flaw or  
3 quantum computers break the underlying  
4 cryptography overnight, it's a commodity that can  
5 go to zero and stay at zero forever. So that's  
6 extremely risky.

7           For oil you can always burn it for heat,  
8 for wheat you can always mill it for food.  
9 Bitcoin is still in its infancy, so those risks  
10 for sure have to be considered. And whether to  
11 segregate them or not is I think a good question  
12 that I think people should talk about in terms of  
13 the clearing function.

14           In terms of forks, essentially forks can  
15 be limitless. Basically anybody around here can  
16 create a slightly different version of Bitcoin  
17 today. The real question ends up kind of like  
18 circulating around whether it will have any value  
19 or not.

20           So, there are more high profile forks  
21 than others, just because people believe in the  
22 technical merit of those four coins and therefore

1 other changes will actually support trading those  
2 forks so you can monetize it. But if a fork goes  
3 unnoticed, there's no way to actually monetize it.

4           And so it's a complicated question for  
5 us again because of our derivatives business and  
6 long dated nature of some of our contracts because  
7 you have to see, okay do we believe this fork is  
8 going to be supported and if so is it going to  
9 have wide support with other spot exchanges, is it  
10 only going to be, you know, purchased, available  
11 in a Chinese exchange that a lot of our customers  
12 can't get to?

13           So those are all questions that we have  
14 to think about extremely carefully so it is  
15 complicated but I always liken it to what a  
16 special dividend is sometimes for stocks.  
17 Obviously when Microsoft issued their one time  
18 special dividend, a lot of options and futures  
19 were manually adjusted, the strike price-wise, to  
20 accommodate for that and I sort of suspect that  
21 we'll see something similar going forward with  
22 Bitcoin, too.

1                   MR. GORFINE: Mr. Stein was smart. He  
2 heard my rule that we're just going to go down the  
3 lines so then your card went up, but no we'll go  
4 to Ms. Peve and then Mr. Stein.

5                   MS. PEVE: Just briefly, it seems as  
6 though there could be a good opportunity to create  
7 somewhat of a framework around the different types  
8 of digital currencies if you will and even looking  
9 -- if you look at digital assets that's nothing  
10 new to our world.

11                   Digital currencies could include things  
12 like points and gaming tokens but crypto  
13 currencies as well. And then when you breakdown  
14 crypto currencies you can look at types that have  
15 exchange of value versus utility and just  
16 understanding how those play against something  
17 like a points program where you can buy goods and  
18 services. You know, in any airport now you can  
19 use your points to pay for food and drinks, et  
20 cetera. So I think there could be an opportunity  
21 to just kind of outline a framework around how  
22 these crypto assets fit into the umbrella of

1 digital assets that we know and love.

2 MR. DEWAAL: It's actually a very, very  
3 interesting observation, so we get asked a lot  
4 times, clients ask us to speculate as to what is a  
5 particular crypto asset and so we look at a number  
6 of different characteristics today. We look  
7 obviously at was this crypto asset issued as part  
8 of an ICO, was the ICO before or after the actual  
9 project was launched, what was the purpose of the  
10 underlying technology for the coin? In fact, does  
11 the coin have utility outside of the technology of  
12 which it's supporting, meaning is it used in  
13 currency?

14 So we start looking at number of  
15 different characteristics and I think it's an  
16 excellent point and I think it's something that  
17 the regulators are going to have to look at going  
18 forward. It's not just -- the issue isn't whether  
19 it's been issued in an ICO or not, as I said I  
20 think you can stretch the Howey Test way too far  
21 to include everything if you want, and that's just  
22 meaningless.



1                   But I do think there are criteria and  
2                   there's probably even mathematics, there's  
3                   probably even quantum data. One thing is, is  
4                   that, keep in mind this agency does have  
5                   experience in this area. Today there are futures  
6                   contracts based on stock indices and depending on  
7                   whether the stock index is considered broad based  
8                   or narrow based it falls basically under the  
9                   jurisdiction exclusively of the CFTC or shared  
10                  jurisdiction with the SEC.

11                  And these industries change. Everybody  
12                  knows about the 21 day DOW order, but there was a  
13                  21-day order before that against an international  
14                  exchange because in fact the characteristic of  
15                  their index had changed and they weren't keeping  
16                  track of it and it moved into a different  
17                  regulatory environment.

18                  So there is precedent for coins that  
19                  might change characteristics and for monitoring it  
20                  and recognizing that it falls under a different  
21                  regulatory scheme.

22                  MR. GORFINE: Mr. Stein?

1                   MR. STEIN: So despite all of the  
2 excitement and growth and the numbers, Paul, you  
3 shared, institutional involvement still remains  
4 quite low and one of the key drivers there is  
5 regulatory clarity. Obviously, what are these  
6 things? That's very important. Another one that  
7 we hear over and over again is how do the AML, the  
8 OFAC rules affect this space? I highly encourage  
9 the committee to look at those areas as well  
10 because without a solution there, a lot of the  
11 infrastructure that supports the institutional  
12 investor isn't coming into the marketplace.

13                   I would point to the success of a member  
14 organization like FINRA and how well self-policing  
15 has kept up the standards so that anti-money  
16 laundering rules and regulatory compliance are  
17 enforced. There may be an opportunity in this  
18 space to do something similar. Thank you.

19                   MR. GORFINE: Yes, please. Mr. McHenry.

20                   MR. MCHENRY: Yes, is there any concern  
21 about the concentration in the mining function? I  
22 understand they're responsible for maintaining the

1 block ledger. I understand that there's a great  
2 deal of concentration in terms of mining amongst  
3 four or five large organizations so I was just  
4 wondering if that's an area that needs to be  
5 regulated as well or what your thoughts were on  
6 that.

7 MR. BRITO: So mining concentration is  
8 certainly an issue. It's something though that I  
9 think naturally over time we'll see this  
10 concentration become diffused for several reasons.  
11 One is that the number one input to mining is  
12 electricity. And so miners are going to be  
13 seeking the cheapest sources and most efficient  
14 energy sources they can. And so while we have  
15 seen that a lot of mining activity happens in  
16 China where there's a lot of excess hydro  
17 activity.

18 For one thing we've seen an assist from  
19 the Chinese government in essence, pushing mining  
20 out of the country so we're going to see it go  
21 elsewhere but also we're seeing a lot, a race to  
22 find efficient sources of energy around the globe.

1                   We're seeing it in Iceland, we're seeing  
2                   it coming up in Nevada, we're seeing it in  
3                   Washington state. And so, you know, I think  
4                   that's going to drive that. I think also the  
5                   folks that are building the technology fully  
6                   recognize the risk there and are looking for  
7                   technological ways to address it as well.

8                   MR. DEWAAL: The other thing is, keep in  
9                   mind that the mining issue only really exists in a  
10                  proof of work blockchain. So if it's a proof of  
11                  stake where there's different methodologies of  
12                  deciding who's going to conclude the block and get  
13                  the fees associated with that, mining becomes less  
14                  of, is not an issue.

15                  MR. GORFINE: Okay, if there are no  
16                  further questions or comments, I would say based  
17                  on this robust discussion and I think we've  
18                  identified a number of worthy work streams or  
19                  maybe perhaps too many worthy work streams, I  
20                  would move that TAC recommend to the Commission  
21                  that it consider creating a sub-committee on  
22                  virtual currencies. Is there a second?

1 MR. CHATTAWAY: Second.

2 MR. GORFINE: Okay. Are there any  
3 questions or further comments at this time? Okay,  
4 I will now call for the vote on the motion. All  
5 those in favor of recommending to the Commission  
6 that the Commission consider creating a sub-  
7 committee on virtual currencies please say aye.

8 COMMITTEE: Aye.

9 MR. GORFINE: All those opposed please  
10 say nay. Any abstentions? Okay, with that, the  
11 motion carries and remarkably at this time we're  
12 going to be able to keep with our agenda, which I  
13 didn't think we were going to be able to do  
14 time-wise as we got started here but TAC will be  
15 taking a one hour lunch break. We will resume  
16 again at 1:30 p.m. So thank you all.

17 MR. GORFINE: Okay, I would like to call  
18 the TAC meeting back to order and being our next  
19 session with a discussion of advances in machine  
20 learning and artificial intelligence and their  
21 current and future impact on markets, market  
22 participants, and regulators.

1                   Our presenter today will help us think  
2                   about the role of technology in our markets and  
3                   will help us set the stage for our next two  
4                   panels, which address automated trading and cyber  
5                   security. With that, our presenter today is Tim  
6                   Estes, President and Founder of Digital Reasoning.  
7                   I'll turn it over to you Tim.

8                   MR. ESTES: Thank you very much. First  
9                   I wanted to thank the CFTC for the invitation to  
10                  come and present. It is a really remarkable set  
11                  of people here around the table. The visibility  
12                  you have into one of the fastest changing  
13                  industries in the world is also quite interesting  
14                  to see how you dialogue about those things. How  
15                  you end up trying to drive the adoption of change.

16                  So what I came to talk about today was  
17                  really artificial intelligence and how it's  
18                  applied in this industry. In an area that I think  
19                  is going to be very interesting to you,  
20                  particularly in terms of how conduct risk can be  
21                  managed in very, very different ways than it  
22                  traditionally has been managed.

1                   This is an area that clearly for some  
2                   time and judging by the rate and frankly the  
3                   volume and the size of certain fines and  
4                   activities, it feels like technology for all of  
5                   its innovations has not turned back the tide yet.  
6                   And I want to give some hope.

7                   So today what I hope to do is tell you a  
8                   story that is interesting and is true, so stories  
9                   that are true in AI are really important, you'll  
10                  find that there aren't as many as you think. With  
11                  any great hype wave there is reality and there is  
12                  all these hopes and we're going to talk enough  
13                  hopefully about where hope has turned into real  
14                  outcomes that will potentially make our markets  
15                  safer, will make our population and the American  
16                  people and investors around the world feel more  
17                  secure with legitimate reason.

18                  So, without further ado, I'll just kind  
19                  of just jump into it. Some of this is a little  
20                  bit of the story of the company I was really proud  
21                  to build from college years, 17 years ago. And so  
22                  I'm a very proud UVA grad and Wahoo and I am very

1 happy to hopefully represent that well. I'm in  
2 Virginia and I live actually in Tennessee so the  
3 other group that I'm very proud to represent is  
4 Nashville. I think we have at least one person  
5 here on this panel so AI Nashville and a Wahoo are  
6 part of the personal story and let's jump in to  
7 the more interesting story about how technology is  
8 changing in the industry.

9           So this is very interesting graphic that  
10 came my way about a little over a year ago. Those  
11 that are in investment research and finance might  
12 know what this is, this is the mentions in  
13 earnings call of Artificial Intelligence because  
14 it turns out that almost every public company is  
15 an AI company now if you listen to earnings calls.

16           So just like every bank in now a FinTech  
17 company, it looks like everybody else is moving to  
18 be an AI company or both. So what is AI actually  
19 being used for and I won't get too far into what  
20 Artificial Intelligence is because I think it's  
21 better explained how it's applied because the  
22 truth is Artificial Intelligence is just software



1 the way it will be done in the future and the way  
2 the story will be done today.

3           There will be no software that does not  
4 have AI in it within a decade. All of that will  
5 be commoditized. And so, imagine systems where  
6 the code you write today may look different and  
7 change without you or your IT infrastructure  
8 changing it, and that being the norm. We have a  
9 transformation of looking at this as engineering  
10 and looking at it more like biology, of systems we  
11 can manage by training or perturbing but not  
12 because we can connect all these dots anymore.  
13 They will be too complex.

14           And so we are entering a phase that  
15 moves beyond kind of an early phase of computer  
16 science, it's going to be very different. Now,  
17 where is this applied today? Most of the  
18 application of Artificial Intelligence in the  
19 world is getting people to use more of their  
20 attention to look at advertising. To spend time  
21 watching TV, online, to spend time checking your  
22 newsfeed, whether the news is true or fake.

1                   And what's interesting is that that's  
2                   because there's a heritage from the West Coast and  
3                   other places of using technology that way. And I  
4                   put this out there because I want this to be  
5                   little bit of a call to arms particularly for the  
6                   generation that I've grown up in, maybe the next  
7                   generation younger than me, that there are places  
8                   to use this that are far more interesting.

9                   One of the things that we do outside of  
10                  this domain is we're very pleased and very honored  
11                  to be involved in fighting human trafficking. So  
12                  Digital Reasoning partners with THORN and runs the  
13                  largest anti child sex trafficking system in the  
14                  country. And Ashton Kutcher testified about this  
15                  about a year ago, so we view that as one use case  
16                  where AI can do great things for good. And I  
17                  think that this is a case, in terms of monitoring  
18                  our markets, which is equally interesting.

19                  We started Digital Reasoning in a post  
20                  9/11 world of an unlimited amount of chatter with  
21                  all kinds of risks in it that people did not know  
22                  what was wrong until it was way too late. And

1       that was a world that many of us that grew up  
2       around that time, and I was getting out of college  
3       at that time, sort of swore to never let happen  
4       again. And I know many people here that are based  
5       out of New York, you're in banking but many of you  
6       had experiences, had direct knowledge of people,  
7       and have similar conviction.

8                   And so that is something that was very  
9       deep and driving us. Now, that learning about  
10      language is going to come into play here. Because  
11      it turns out that human language, human  
12      communication is potentially the most interesting  
13      signal that any machine has ever had. Why is it  
14      so interesting? It's actually how we educate  
15      every child we have. And if we want machines to  
16      be more human-like we have to educate them and  
17      that means they have to understand us, they have  
18      to understand our language; that is our great  
19      resource.

20                   So now taking that background to Wall  
21      Street, the country obviously experienced a very  
22      interesting and similarly traumatic event, though

1 not violent, but traumatic in a lot of the ways  
2 with the crash in 2008 and all the consequences  
3 that came out of that. And at the company we  
4 built, Digital Reasoning, we saw that there would  
5 be need there as well.

6           So a few years later, 2 or 3 years  
7 later, I will credit the financial institutions,  
8 some of which are here in the room, with a vision  
9 to actually say could you use technology to  
10 understand human language, what people are talking  
11 about, who they're talking to, when they're  
12 talking, what are the behaviors that are involved  
13 in those conversations, what do they show?

14           In a world where people are looking to  
15 apply Artificial Intelligence, there basically was  
16 belief that all the processes that were human  
17 orientated could start to be understood and used  
18 for all kinds of new applications and one of the  
19 biggest ones was around risk.

20           So I will go into that. What we're  
21 seeing now is broad adoption in financial services  
22 on the concept of AI amidst belief that it will

1 transform this industry. And I want to talk very  
2 concretely, against all this hope, there still is  
3 kind of a giant suspicion of our institutions that  
4 manifests in sometimes in very extreme ways that  
5 has to be improved upon, that has to show there's  
6 been a change.

7           And when we see the data that emerges  
8 from very recent scandals, the last 2 to 3 years,  
9 we find that in chats, in emails, in content, our  
10 egregious behaviors, that if we had known what  
11 people were talking about we would have easily  
12 seen what they were going to do.

13           So, the number one premise that emerged  
14 from our work in Wall Street starting early around  
15 2012 and 2013 with people like Goldman Sachs,  
16 Credit Suisse, and others, was if you wanted to  
17 predict human actions you must first discover  
18 human intentions.

19           This is a very unusual thing for an  
20 action to happen before someone expresses an  
21 intention. We generally call it being a  
22 sociopath. For normal human beings that actually

1 want to just get richer and don't care about the  
2 rules, they express things that show that's what  
3 they intend to do. If it's a complicated  
4 situation such as price fixing and manipulation of  
5 markets, it can't be done by one person very  
6 often, which is why we had so many collusion  
7 scandals and issues in the last several years.

8           So I think what we found was that the  
9 same thing that could find aliases of bad guys and  
10 different types of intelligence to prevent them  
11 from attacking our troops aboard or our people  
12 here at home, that that technology could find very  
13 subtle indicators of intent inside communications  
14 inside banks. And that finding those indicators  
15 was a way to preempt these things from happening.

16           So in 2012 we started working with  
17 several of the leading banks in the world such as  
18 Goldman Sachs, UBS, and we, over the last several  
19 years actually implemented some technologies that  
20 I'll show that apply teaching a machine about  
21 language, that apply that approach, to find  
22 certain kinds of conduct which previously no

1 machine could see, and much less could a machine  
2 process at scale of billions of emails a year.

3           So we would not have known, frankly,  
4 that that is the place we could have been helpful  
5 and served a more valuable purpose without the  
6 guidance of these parties. So I want to start by  
7 saying some of our leading institutions made this  
8 investment, not as a direct reaction, to trying to  
9 comply or deal with consent decrees and other  
10 types of activities, they knew they could do  
11 better and they went out and searched and they  
12 found it, and they invested, and they built this  
13 preemptively where they could.

14           And some of that work has been broadly  
15 recognized. Recognized in terms of how we take  
16 essentially military orientated technology and  
17 moved it forward.

18           So let me get into the meat of what this  
19 is. A lot of this was backdrop knowing this was a  
20 public meeting and to give a little bit of the  
21 story. The biggest barrier to the adoption of  
22 Artificial Intelligence today in any sense is the

1 investment and process to educate a machine from  
2 data.

3           There are a myriad number of  
4 technologies and techniques that can take well  
5 formatted and well-organized data and build  
6 models, which can predict things and scale those  
7 models across a lot of data. The hard part is we  
8 don't have the curriculum to educate the machine  
9 in nearly all cases and the data we want to  
10 educate it on is generally highly sensitive and  
11 highly protected. For good reason; it's customer  
12 information, it has deep, personal, private  
13 information in it, so we have had to figure out  
14 ways to accelerate the education of machines to  
15 make this type of approach economically viable and  
16 effective.

17           When you read about large AI failures,  
18 systems that cost 60 plus million dollars and take  
19 multiple years and don't deliver something, you'll  
20 see more of these on the news. When you have this  
21 much excitement, if you follow the Gartner Hype  
22 Cycle, it is generally followed by a trough of



1 disillusionment they call it. And I have a hunch  
2 that 2018 will see a little more disillusionment  
3 than hope because how can we have more hope and  
4 hype than today?

5           And I want to kind of give hopefully  
6 this advisory committee some ideas about what  
7 we've seen and I don't say it in a definitive way  
8 if this is the case, I can only state what we have  
9 seen and where we have seen some effectiveness.

10           But what we have seen is, if you make  
11 the investment in educating the machine, not by  
12 sheer brute force, but by building a process that  
13 allows you to know where the data is in an  
14 enterprise, in a financial services institution,  
15 it allows a way to get the most yield from human  
16 time, which is very precious to teach a machine,  
17 you can show much faster effectiveness of AI on  
18 almost any problem.

19           So starting from that high level, let me  
20 go a level deeper into what we had been doing. We  
21 had tried to take this automation approach of  
22 teaching a machine and we have used examples and

1       unfortunately still one of the very best data sets  
2       available of a lot of bad behaviors, ENRON email.

3                So those that have worked in this space  
4       know this data set very well. It's occasionally  
5       fun to find something that you never heard brought  
6       up before, but teaching a machine how to figure  
7       out that there's an attempt to conceal by deleting  
8       references to very specific information, it's a  
9       kind of subtly that previously wasn't possible.

10               We know concealment, secrecy are  
11       generally leading indicators of other kinds of  
12       behaviors, which this Commission actually has to  
13       run enforcement actions against.

14               So, to put those pieces together, the  
15       first big piece that I wanted to make kind of  
16       clear in terms of our judgment of what's important  
17       in this space is the technology to educate the  
18       machine and being able to focus on how you teach  
19       machines. For education of machines will become  
20       an increasingly bigger issue.

21               The next part is, we're getting beyond  
22       what I'd call the transistor era of AI, where you

1 have little building blocks, individual analytics  
2 that do certain things being very interesting.  
3 There are many options for most of these analytics  
4 and just as people rarely compete on transistors  
5 anymore, we're moving up a stage to the CPU of AI.  
6 Of integrated systems, much like a brain has very  
7 different functions that have to work together and  
8 share information and electrical signals across it  
9 to function as a person.

10           These AI systems have many different  
11 components. They are designed with pieces that  
12 flow information from one to the other. Pieces  
13 that deal with signals coming in, context that's  
14 accumulated over time, what we would generally  
15 call global knowledge, the using of knowledge  
16 that's global to reinforce how you predict  
17 something that you're seeing again new.

18           And it's that local and global that  
19 complete integrated system that becomes more and  
20 more human like because these systems, the secret  
21 of these systems ultimately is they have  
22 infinitely scalable memory compared to human

1 beings. When this works the way it should whether  
2 it's a year from now or 5 years from now, I do not  
3 think it's 10 years, almost nothing that has  
4 happened in the past that was a problem should  
5 ever happen again if we have access to the  
6 information to feed the machine. Because it  
7 should see with perfect recall what has happened  
8 in the past.

9           And that is a, I'll use that to seed a  
10 the question to this whole group later of what is  
11 important to teach a machine never to forget but  
12 what we have seen is that if you look at this  
13 integrated system vision, a critical part of it is  
14 understanding human language. So a lot of our  
15 investment outside of how you teach a machine in  
16 general is what can you do with human language.

17           And I'll give you a very direct kind of  
18 walk through. So when you're dealing with  
19 communications, which are honestly probably the  
20 most interesting part of determining what  
21 happened, because if you have an email or chat  
22 where someone clearly said something, there is

1 very little debate after that. It's not  
2 circumstantial, it's not a behavioral pattern, and  
3 so we will get these kind of chats, that's been  
4 where a lot of this bad behavior's been for the  
5 last 4 or 5 years, some in email but more and more  
6 in chat.

7           And we will pull out the metadata, who  
8 talked to who, when it happened, what the building  
9 blocks of words are that are used, beyond that  
10 what are things that are groups like Electronic  
11 Trading, what are phrases that the system infers,  
12 what kinds of entities come up? People? Quotes?  
13 Activities? Monetary units?

14           And then being able to take whole  
15 regions of text based on previously seen examples  
16 and extrapolate that these words together, not  
17 because of this specific word, the legacy systems  
18 that are in place today, what are called Lexicon  
19 based systems, that is how they work. What Digital  
20 Reasoning built first with banking was taking  
21 examples and having the systems figure out what  
22 was similar even when almost none of the words

1 match or none of the words match, which is what a  
2 human can do because a human knows this words is  
3 similar to this word, without having big giant  
4 dictionary in the sky.

5           And so we have built up the way to find  
6 these key indicators and then to show them in  
7 applications, what we call intelligence  
8 assistance, and now that's very much like a human  
9 reading these emails, reading these chats, and  
10 triaging it to know what's important. And systems  
11 today that have 99 percent false positive rates  
12 and consume a lot of resources are now moving into  
13 systems that have one tenth those false positives  
14 or recall rates of 75 percent on certain models.  
15 So just revolutionizing this entire area because  
16 the system can figure out how to disqualify things  
17 that are false positives.

18           And now we've moved beyond that to go  
19 not just against text, we're now doing this  
20 against audio communication. That's the next  
21 frontier. The ability to get accurate transcripts  
22 from traders talking with dialects, in trader

1 speak because with a true machine learning system,  
2 you can actually learn the language model, if you  
3 will the domain, the education of a certain area  
4 and have the system learn it from the customer's  
5 data.

6 So this is one of the last piece of the  
7 puzzle is the ability of it to learn from  
8 customers' data is ultimately the ability to  
9 empower every customer to take the best practices  
10 they have in terms of enforcement, teach a machine  
11 and scale that. And that is very different. Now  
12 we're no longer going to be human resource limited  
13 with high end experts for investigations. In  
14 theory those investigators could teach a machine  
15 and what they see can be seen everywhere.

16 As I mentioned earlier, we have learned  
17 how to build certain models of conduct using a  
18 process that defines, finds data, represents that  
19 information, predicts on it, and evaluates it, and  
20 does things like boasting. As you've seen in your  
21 own activities in your own enforcement actions, it  
22 is remarkable how people will do something

1       terrible and they actually brag about it on coms  
2       later. Why? Because the systems in place weren't  
3       watching.

4                So, I've talked you through a little bit  
5       of the process of how you would go through and use  
6       the language of things like chat to find certain  
7       kinds of issues. But that's just the beginning  
8       really. When you find an issue in a chat, it only  
9       really makes sense if you can put it into context  
10      of what a person's done over time. Because these  
11      things are rarely a single event in terms of  
12      talking about something and leading exactly to the  
13      market manipulation event. There is normally a  
14      buildup. There is something to the effect of  
15      interest in a deal, followed by secrecy, followed  
16      by changing the venue to an unmonitored  
17      communication and then moving forward from there  
18      into the terrible activity to make themselves  
19      money and then to hide it.

20               And whether it's volatility indices that  
21      are potentially attempting to be manipulated or it  
22      is FX and Libor as we have seen in the past, the



1 instrument may change; the intentions of the human  
2 being do not. That's just the latest thing where  
3 the rules haven't been written yet. So to be  
4 proof, proven out against the future is to  
5 understand intent because humans don't change.

6 Now clearly this group is right at the  
7 forefront of trying to drive change through  
8 enforcement. I thought I would bring up a very  
9 recent one. And without isolating any particular  
10 group or bank because there are ones for a lot of  
11 people have happened in the last 2 or 3 years. I  
12 thought it was interesting to look at the kind of  
13 language that it's almost hard to believe a  
14 computer could recognize. But the language of,  
15 okay but what sort of level do you want to push it  
16 to? That in the context of the surrounding  
17 language can actually trigger a machine to say  
18 this needs to be looked at. And it can now.

19 So to prove it, we actually ran some  
20 CFTC transcripts that were provided from cases and  
21 we had to look at traders that had been, I guess,  
22 what is the old phrase? Names have been changed

1 to protect not the innocent in this case. But  
2 this is real data; this is data that you've used  
3 in your investigations.

4 As you see, when people type in chat  
5 they don't really care about getting the spelling  
6 right. And when people type in chat they'll use  
7 odd slang like whack it. But when you see a deal  
8 and then you see people acting in a certain way  
9 with some examples, the system can flag certain  
10 events.

11 And I don't act like this is easy, I  
12 don't act like this is trivial, in fact there's a  
13 reason a 17 year old company that took 10 years or  
14 R and D in the defense and intelligence community  
15 to show even the beginnings of these capabilities  
16 that banks would then invest in and try. And it  
17 took many years working with banks, with their  
18 expertise to begin to teach a system to do this.

19 And I think that's why you'll see the  
20 disillusionment because many people will promise,  
21 as we like to say, often imitated but never  
22 duplicated, many people will promise but there's

1 real hard work. And if this was easy, then I do  
2 believe that banks would absolutely deploy it and  
3 some of them are very aggressively, but it is not  
4 because it's easy. It's because they're willing  
5 to put in advanced technologies to prevent future  
6 risk.

7           And so we have run some of your chats  
8 and we found certain collusion and boasting events  
9 with the models we have and we would hope that the  
10 kinds of data that we're running today live in  
11 about half of the top ten investment banks in the  
12 world, where visual reasoning is in production use  
13 today, that this is going to eventually prevent  
14 some of the activity because as we understand  
15 human intention and behavior through language and  
16 through other types of data we can actually begin  
17 to preempt some of the behavior that has actually  
18 made us all not very happy.

19           So I did want to end by saying we love  
20 certain partners in this process, we work closely  
21 with partners like NASDAQ and being able to pull  
22 together other data, market data because language

1 is a piece of the puzzle. We argue it's one of  
2 the bigger pieces because it tells you where the  
3 smoking gun is but it's part of behavior and as we  
4 get into behavior you'll end up looking at other  
5 things.

6           And so this is all converging to  
7 something, which is around what we call holistic  
8 surveillance. And from holistic surveillance from  
9 many different channels, text and audio and market  
10 behavior and eventually a behavioral perspective  
11 that sees every individual over time and looking  
12 for changes in that individual's behaviors,  
13 attitudes. It opens up the door to many things,  
14 and it opens up the door particularly to avoiding  
15 the activities versus reacting to them.

16           So I'll leave you with a couple of  
17 questions. The first is now that we have seen  
18 what is possible in some of these places, and as  
19 they work to adopt it, we do believe that the  
20 traditional approaches of using large list of  
21 words, what are called Lexicons, is a failed  
22 legacy technology. We believe there are other

1 approaches that are also still failing us today  
2 and I would, I guess my curiosity is, how long  
3 when an innovation is shown and proven out, is it  
4 reasonable to wait to say that it's a new  
5 standard? A year, two years, five years? How  
6 many things have to happen?

7           So that I'd love to have because I think  
8 it has to be reasonable. It is not free, it is  
9 not easy, but obviously given the import of this,  
10 that is a question I would love to have, the panel  
11 potentially jump in on.

12           And then the second question is how, are  
13 there ways that we can start to better enable,  
14 safeguard, the ability of all of our members,  
15 people in this industry, to share models so that  
16 they can learn from one another. If educating the  
17 machine is the hardest part, then you would expect  
18 if we can create some levels of exchange of  
19 derived knowledge, not data, I want to be very  
20 careful, I know there's a whole other challenge in  
21 sharing data, but if there is a way to share  
22 learnings and operationalize them, what are ideas

1 around that area?

2 Because we think once a few banks start  
3 to get some traction with this and show the  
4 outcomes of this new approach, that it should,  
5 those things should be available to be shared and  
6 no bank, no buy-side firm should worry about  
7 potential risk with them trying to do a good  
8 thing.

9 So I'll leave you with those two  
10 questions and I'm happy to answer any question  
11 that you have about this. I haven't touched on  
12 areas of revenue, areas of where profiling  
13 customers, finding insights, market color, there  
14 are so many applications of AI in this space, but  
15 I didn't want to focus on one. I think there's  
16 plenty of depth there. And I guess at that point,  
17 I'll end my opening remarks and just say thank you  
18 for your time.

19 MR. GORFINE: Thank you very much, Tim.  
20 I mean the goal of your presentation was to be  
21 thought provoking and it was certainly that. And  
22 you start thinking about the application of these

1 technologies in the use case that you described  
2 and there's many other potential applications or  
3 use cases of this type of machine learning  
4 technology so it certainly is quite thought  
5 provoking.

6 But you posed some questions, which is  
7 great because it makes my job easier, so maybe  
8 I'll start with Charles, if you want to kick off.

9 MR. COOPER: I'm actually going to ask  
10 another question instead of responding because I'm  
11 out of my depth here on AI. Where do you think we  
12 are in terms of the expectations versus reality  
13 mismatch? We talk about a lot about hype cycles;  
14 you talked about the period of disillusionment I  
15 think was the expression you used. Where is AI  
16 now versus where people think it is and how long  
17 do you think it will take to get to where people  
18 think it is?

19 MR. ESTES: So I think about it in terms  
20 of what are the kinds of use cases where it can be  
21 effective today and then what are the promises use  
22 cases where people are going to have to break a

1        few picks before they see the gold.

2                    The number one use case today where it  
3        can be effectively used is in triage. A  
4        sufficient level of judgment about many kinds of  
5        data to say this data is not worth human attention  
6        and this data is. So I think there are all kinds  
7        of use cases, whether it's in sales, whether it's  
8        in risk as we described, that is something that I  
9        expect that will be ubiquitously adopted and could  
10       dramatically create productivity gains among many  
11       fields in banking.

12                    Now let me give you an example of where  
13        I think maybe some expectations have been set and  
14        maybe they won't be met. Thirty years ago,  
15        actually I would even go back as far as 45, 50  
16        years ago with the first wave, there was a  
17        renaissance theory called Expert Systems where you  
18        could teach a system many, many, many things and  
19        create rules and scenarios and the system was  
20        there essentially as the collective knowledge of  
21        all the people that taught it to help people make  
22        better decisions.



1                   I think for 2 or 3 reasons how hard it  
2                   is to educate that machine, how hard it is to back  
3                   test some of its judgments in certain contexts,  
4                   the lack of transparency and new deep learning  
5                   models, other kinds of areas, it's going to take  
6                   some time before effective expert systems in the  
7                   new AI return the value that has been promised.

8                   And so my belief is that triage will be  
9                   adopted very radically but I think some people  
10                  will take big bets on building giant expert  
11                  systems with lots of knowledge and be disappointed  
12                  in what they really produced. We've seen this  
13                  already in healthcare and I think it's really hard  
14                  to teach a doctor to be a better doctor because  
15                  what doctors taught that system ends up biasing  
16                  what that system comes up with and then doctors  
17                  start rejecting it and people don't adopt it.

18                  So you have to think about all the human  
19                  dynamics because human nature doesn't really  
20                  change and having something do the grunt work for  
21                  you, people love. Once they trust it. And the  
22                  second part is, it telling you to do it

1 differently than you're doing it, that's a harder  
2 thing to pull off.

3           So and then do you enforce that from the  
4 top down even if you know it works, lets say you  
5 know and your expert system is better than most of  
6 your employees. Do you enforce and tell your  
7 employees I don't care about your judgment  
8 anymore? There's going to be things that society  
9 has to work out and I think that's what will hold  
10 back some of these things.

11           And there will also be a lot of things  
12 where we commoditized that transistor level of AI  
13 but without systems you're going to have a lot of  
14 people try running whole programs on a set of  
15 transistors barely wired together and it doesn't  
16 really work in real data.

17           So that will be the other side, so if  
18 you haven't realized how to test it on actual data  
19 versus the test data because a lot of these big  
20 advances in AI like in image recognition, you know  
21 the cat detector that Google had and others, you  
22 all may have seen, those advances happened because

1 we had done massively curated data sets where we  
2 could teach the machine.

3 And those same models run against  
4 different types of data prove radically less  
5 effective. So the generalization of the machines  
6 is still very much a work in practice which is why  
7 the most advanced work in places like Deep Mine  
8 are focused on very different techniques than just  
9 supervised education or if we focus on  
10 reinforcement where its' environment continued to  
11 educate it but we're still very early in that  
12 actual science.

13 MR. GORFINE: We're going to have time  
14 for 2 more questions or comments but let me go to  
15 Christopher.

16 MR. CHATTAWAY: Thank you again Tim for  
17 presenting. That's good to hear that Goldman  
18 Sachs is a client. I had a question; you spent a  
19 good amount of time on surveillance, or conduct  
20 surveillance. I'm specifically responsible for  
21 electronic trading in the FICC businesses and in  
22 that context where you're building automated

1 systems that need to have very discrete and  
2 reproducible behaviors, how do you foresee AI  
3 influencing the sort of trading decisions made in  
4 those businesses?

5 MR. ESTES: I think that's actually, so,  
6 I mean the easy answer is the humans that are  
7 making the decision, I can see AI being kind of  
8 the chief filter ahead of the information that  
9 drives that decision making. And I think the step  
10 after that is going to be how do you have all that  
11 knowledge come together to where you can actually  
12 have a shared discussion that has a virtual  
13 construct.

14 So I think essentially going from  
15 radically augmenting the information that's  
16 important to make decisions to essentially  
17 creating committee decisions where the machine is  
18 a partner and then looking at a lot of data, and a  
19 lot of outcomes over time, you'll probably over a  
20 3 to 5 year horizon I think, not a 1 to 2 year,  
21 you'll look at can we let the machine do some of its  
22 own strategies?

1                   Now there are a lot of risks in that,  
2                   like actual decisions based on data that are not  
3                   just sort of heuristical decisions. And I know  
4                   actually this already happens in the market, so  
5                   this is not science future this is present, but  
6                   the present is very dicey. So I think that we  
7                   have work to do to figure out how that would be  
8                   managed to regulate it and it's going to take  
9                   sandboxes to get there. So that's my hunch is  
10                  probably the 3 levels.

11                  We're going to go from triage to  
12                  autonomy over time. The question is how long and  
13                  what are the safeguards between those two  
14                  endpoints.

15                  MR. GORFINE: Okay so let's take two  
16                  final comments or questions. We'll go with Yesha  
17                  and Supurna.

18                  MS. VEDBRAT: It's actually a question  
19                  on something that you've asked of us and that is  
20                  about how do companies comes together to help  
21                  increase the sharing or enhance the intelligence  
22                  of the surveillance system, what are you thinking?

1       Is it like the phrase is that our individual  
2       teachings may come up with, help to create a  
3       library of sorts or what are you thinking in that  
4       context just so that I have a better idea?

5                 MR. ESTES: Well I'm actually maybe  
6       three steps behind you in sort of thinking that  
7       far in implementation. The three steps are, are  
8       there essentially safe harbors that allow banks to  
9       experiment with exchanging derivative artifacts  
10      from data? Where they don't, basically they're  
11      lowering their risk threshold to try, because I  
12      actually think it's the legal and the concerns  
13      that hold it back. It's not actually technology.

14                So I think that if there was  
15      encouragement to have the freedom to try and some  
16      safe harbors for that, you would see a natural  
17      sort of adoption of the market to try to create  
18      network effects on key issues. But I just think  
19      right now there is just a lot of risk aversion to  
20      the possible side effects and if we can make an  
21      impact there at a governmental level then I think  
22      the market will take care of the problem because

1 it will be natural to share that risk knowledge  
2 for essentially well intentioned self interest.

3 MS. YADAV: Thank you Tim. We actually  
4 discovered that we're next-door neighbors in  
5 Nashville.

6 MR. ESTES: It's amazing.

7 MS. YADAV: So thank you so much Tim.  
8 So I guess some of the questions that we've talked  
9 about in this panel already are related to new  
10 products. Very new asset classes are being  
11 created.

12 Looking at cryptoassets, and so on, that  
13 are very, sort of, nascent history. So in the  
14 context of these very new products, how do you  
15 deal with AI when there is really no data or the  
16 data has been created and the history of the data  
17 is very new and it's very hard to discover what  
18 filter mechanisms and statistical modelling you  
19 need to make sense of that data.

20 And particularly given that the  
21 marketplace that we live in, sourcing that data  
22 from these very specialist FinTech firms is

1 probably very expensive, so how do you overcome  
2 that issue? And one interesting point that you  
3 made which was fascinating, which is that we want  
4 to make machines human-like in certain respects,  
5 and I can see why that would be really important  
6 as Supurna was saying about surveillance and  
7 looking at language, but what about when it comes  
8 to training?

9           As Christopher was saying, maybe we want  
10 to get rid of humanity in relation to that. So  
11 how do you make that determination between what  
12 parts of human beings we want and what parts of  
13 machines we want at a certain point in time?

14           MR. ESTES: Yeah so I actually think  
15 that the questions are very related. So to go to  
16 the first point, the strategy we've taken  
17 ultimately was about finding human behavior by  
18 finding intentions that run ahead of behavior and  
19 that is independent of products.

20           So we think that if you look for human  
21 risk, whatever the current thing is, even if  
22 there's not much data on that, there's still



1 plenty of data about people doing bad things with  
2 other products. So I think we have a little bit  
3 of insulation there, I don't necessarily want to  
4 say we have full, I think it makes more structured  
5 data or metadata driven detection system much,  
6 much more difficult because those require data of  
7 that kind and if it doesn't exist it becomes a  
8 problem.

9           So I think that there's good proxies for  
10 the new data by looking intentions. Now to me  
11 that's a great case of a human judgment being  
12 implemented in AI that we'd want to model, which  
13 is find the parts that are invariant and focus on  
14 getting those first, and then work on the more  
15 subtle areas. So, I think that's a strategy,  
16 that's a humanlike principle.

17           Let's take an example of humanlike  
18 principle that we don't want, that we want to  
19 avoid as much as possible, prejudice and bias and  
20 mistakes. So in those areas we want the  
21 objectivity AI can bring and the transparency of  
22 it, so that's where I think that you actually have

1       an ability, so if you think, if AI is essentially  
2       just a label for educating machines, transferring  
3       knowledge that's in data and in human heads and  
4       judgments against that data and move that into a  
5       model or a set of models, a giant family of  
6       models, like I think right now we talk about  
7       models in terms of few things, a few patterns,  
8       there will be thousands to millions of models,  
9       like little brains running in all of our  
10      industries not too long from now.

11                 And that's why it will become impossible  
12      for us to really look at it like code engineering  
13      problem, it will be more like a bunch of cells and  
14      knowing what type of things to perturb the system  
15      with to make the cells do certain things. So  
16      basically I think engineers will become more like  
17      doctors.

18                 Having said that, in this case what you  
19      want is you want still some of those engineering  
20      properties to have audit and reporting. I mean we  
21      can't really dump our brains out onto a table, we  
22      wouldn't know what's in the stuff in here. We

1       have to have it write out like a lot of -- you  
2       give a test, right, how do you explain what  
3       somebody knows? You test them.

4                 But what if you have nearly infinite  
5       processing and storage? Well, you can run a test  
6       which is almost entirely exhaustive, so something  
7       that a human could not actually sustain to go deep  
8       into all the things they know of why they did  
9       something, you could have a machine just keep  
10      going and going. So it becomes a lot like  
11      inductive proof in math, and I think that there is  
12      sort of a next way of looking at this, which  
13      essentially is more in the inductive space, but  
14      it's such scale that it becomes approximately  
15      certain.

16                And that will be where it's kind of  
17      between human, where it's not fully certain  
18      because it's not just deductive, it is learning,  
19      it's adapting, but it's at such ridiculous  
20      inductive scale that you know that it's  
21      essentially true as much as we know many things  
22      are true. So that's my guess.

1                   MR. GORFINE: Thank you very much Tim,  
2 we appreciate it. And this is actually a very  
3 good segue to our next panel topic, so I would now  
4 like to turn to the next topic on our agenda in  
5 which our panelists will discuss developments,  
6 challenges, and risks around automated and  
7 algorithmic trading technologies and potential  
8 areas for regulatory consideration. Our panelists  
9 are Larry Tabb of Tabb Group, Brian Durkin of CME,  
10 and Professor Yesha Yadav, a CFTC Special  
11 Government Employee and Professor of Law at  
12 Vanderbilt University.

13                   We're going to start with Larry and  
14 we're going to rely on a very, very advanced  
15 technology called the telephone. So Larry should  
16 be on the line right now and he has a presentation  
17 that he'll walk us through. Larry, I hope you're  
18 there.

19                   I'm told Larry is on. Larry, if you're  
20 there and you can unmute?

21                   MR. TABB: Unmuted, can you hear me?

22                   MR. GORFINE: Yes, we can. Excellent.

1                   MR. TABB: Okay. Okay, great, thanks.  
2           I want to thank the Commissioners, the Chairman,  
3           my fellow TAC members. I'm going to kind of do an  
4           algo trading level set for you. So the agenda,  
5           you know that I'm going to go through pretty  
6           quickly on the next page. Your type of algos,  
7           common differences between futures and equities,  
8           where speed fits in, a little bit about MiFID II  
9           but not too much, and a little on algo regulation.

10                   The next page, slide 3, it says three  
11           types of algos across the top. The way I look at  
12           the market, even though it's way more complicated  
13           than this, there are three general types of algos.  
14           The first is alpha generating algos. It's about  
15           54 percent of total equity trading volume. So a  
16           lot of it is market making liquidity provisioning.  
17           The other side of liquidity provisioning is  
18           basically finding opportunities and picking off  
19           liquidity providers. And then there are a lot of  
20           arbitrage algos used to keep futures and cash  
21           together. Options, cash, your ETFs, and futures  
22           and cash, and basically keeping everything in

1 line, you know, price-wise.

2 On the other side, the next set has  
3 quantitative strategies. They tend to be more  
4 technical. Very much, you know, data-driven. We  
5 think this is about 16 percent of total equity  
6 volumes. Of that we think about five percent  
7 would be categorized as HFT. About 11 percent is  
8 non-HFT. This is more on the equity side.

9 And then there are execution algos.  
10 There are buy-side algos. You know, we're  
11 reviewed at about 45 percent of buy-side flow  
12 directly goes through algos. And then a lot of  
13 the trading that goes through high-touch brokers  
14 get wind, you know, gets put into algos. After  
15 that it's a very large percentage of the buy-side  
16 flow winds up going through some sort of algo,  
17 again on the equity side.

18 If you go to the next page, this is kind  
19 of a chart between the difference between equities  
20 and futures. Generally, on the futures side, the  
21 bottom right, products generally trade one product  
22 in one venue. They trade on exchange there's one

1 queue. It's kind of hard to do things over the  
2 counter. And the queue is, you know, first come  
3 first served.

4 On the equity side there's a tremendous  
5 difference. There are 12 exchanges, soon to be  
6 13. There are roughly 33 equity ATS's. There are  
7 roughly 35 major brokers and market makers  
8 providing quotes to institutional investors.  
9 There's eight major wholesalers that are providing  
10 retail execution, and four ping networks which is  
11 basically an electronic market maker.

12 So from an equities perspective, there  
13 are roughly 92 routing decisions, where do I go  
14 and how do I trade and how does each of these  
15 different venues operate? So it's a much more  
16 complicated, and to a certain extent, there's 45  
17 formal queues to be first in line. And especially  
18 on the equity side with order protection, becoming  
19 first is very important to how you get executed.

20 So the next page, slide 5, when equity  
21 -- when liquidity is fragmented, the tick size is  
22 really important, basically fragmentation in tick

1 size basically means that speed becomes really,  
2 really important, because there's a lot of  
3 arbitrage between all of these different venues.  
4 And where to become the top of queue, where can  
5 you get queue positioning becomes very important.  
6 And depending upon your strategy, you may want to  
7 be at the top, or you maybe want to be in the  
8 middle, or there's a lot of jockeying around.

9           So small size and being very quick  
10 becomes really, really important, and to a certain  
11 extent many of these venues have different  
12 charging mechanisms. So there's a big gain in  
13 terms of, not gain gain, but there's, you know, in  
14 theory, as to where do you want to be in the  
15 queue, and not just the queue in one platform, but  
16 the queue across the holistic market. And that  
17 has a lot to do with whether you're lit or dark,  
18 or what the pricing model is, and where, how  
19 aggressive do you want to be in terms of posting  
20 your liquidity, and how visible do you want to be.

21           I said when there are multiple venues,  
22 or queues, speed becomes really, really important.



1 That's not as much so in a futures world where  
2 there's fewer queues because to a certain extent,  
3 you know, if you want to be top of queue in a  
4 futures market, you've got to get to the front and  
5 then size, it becomes you either, you know, your  
6 larger order basically stays there longer until it  
7 gets filled. Or the person who wants to jump that  
8 queue needs to pay a much higher tick size to get  
9 in front.

10 So in the equity side, speed becomes  
11 incredibly important. Speed becomes important in  
12 futures, basically, to tie cash and futures  
13 together.

14 If you go to slide 6, also depending  
15 upon your architecture and what you're trying to  
16 accomp -- or depending upon what you're trying to  
17 accomplish, architecture means a lot. So on the  
18 left side of this picture you have a typical  
19 buy-side trader or even a buy-side execution algo  
20 trying to determine where do I want to be to get  
21 the price that's being displayed. So I have to  
22 collect market data from all the different venues,

1 put them all in order, determine where do I want  
2 to route.

3           Whereas if you're in an alpha algo  
4 architecture, basically, a market maker, a lot of  
5 times they're co-located at all these venues and  
6 you're dealing with a very small time delay, you  
7 know, just reading one venue, reacting to that  
8 venue, providing liquidity, and taking liquidity.  
9 So generally, market maker algos operate much  
10 quicker than buy-side algos.

11           Slide 7 really talks about MiFID, talks  
12 about unbundling. That's really, you know, and  
13 then you're looking because of my research gets  
14 unbundled, I have to pay for it separately,  
15 enables the buy-side trader to really take more  
16 control over their execution process. Within  
17 MiFID II there's a very significant change  
18 especially in the equity market structure side.  
19 Tries to ban broker dark pools and limit dark  
20 trading. Requires a lot of buy-side end of day  
21 reporting, and then they wind up with  
22 exchange-trade derivatives clearing, you know,

1 being much more open but that's postponed to 2020.

2           The issue here that I want to make is  
3 really around market structure regulation and  
4 really, that third major bullet. You know,  
5 because ESMA wanted to really try to push more  
6 liquidity into lit pools, they tried to -- they  
7 banned broker dark pools, and tried to limit dark  
8 MTFs, but they've opened up a channel called  
9 systematic internalisers which is going to, you  
10 know, pretty significantly change the use of  
11 capital, how systematic internalisers and market  
12 makers interact with the buy-side. And it's going  
13 to pretty dramatically impact how the European  
14 market center acts.

15           And I use this to kind of talk about  
16 regulation, which is kind of the next slide. You  
17 see your little logo there. And if you go to  
18 slide 9 where I have kind of my thoughts on  
19 regulation, and here I'm kind of, you know,  
20 probably going to upset a bunch of people. But my  
21 thoughts on regulation are that, you know, I think  
22 the regulators, you should be trying to create a

1 level playing field not pick winners and losers or  
2 business models.

3 Focus on transparency, fairness,  
4 systematic risk, clearing. Focus on ensuring that  
5 the market is fair, clearing margin safety, things  
6 like that.

7 The other thing where I don't think the  
8 regulators have focused enough on is transparency.  
9 And increasingly, as the market moves to becoming  
10 more automated, the issue of time stamps and clock  
11 sync becomes increasingly important where instead  
12 of markets or regulators determining how we want  
13 our market to work, and how we think that if we do  
14 these changes the market will react, it becomes,  
15 if you look at where the regulators have kind of  
16 forced the market to move, very often that's not  
17 what exactly happened.

18 You know, you have MiFID trying to close  
19 down dark pools, but now it opens this whole  
20 systematic internaliser process, which that's a  
21 whole other discussion. You've got the  
22 implementation of SEFs in the US trying to create

1 limit order books. And we're not seeing a whole  
2 lot of use of those real-time limit order books.  
3 You have the US options market even though it was  
4 regulated a long time ago. You're creating --  
5 you're seeing in the options market just  
6 overwhelming amounts of data and challenges and  
7 quoting, you know, 600,000 instruments on a  
8 real-time basis over 14 exchanges.

9           You wind up with some very unintended  
10 consequences which, actually, gets to my last  
11 slide is, you know, my bottom line on market  
12 structure regulation is let's be able to measure  
13 stuff. If we can measure stuff, if we can get  
14 down to fine enough grain time stamps, if we can  
15 get the clock sync right, we can really better  
16 understand how my broker is serving me, and  
17 whether they're actually doing a job.

18           And if they aren't, well then, you know,  
19 I can switch brokers, or pressure them to do a  
20 better job. Whereas if I wind up having sweeping  
21 market structure changes, very often they're not  
22 going to really turn out the way we wanted them to

1 turn out. And so that's kind of the end of my two  
2 cents of pontificating.

3 So like the carpenter said, you know,  
4 the carpenter adage goes you measure twice, cut  
5 once. I think our topic should be measure twice,  
6 regulate once. Let's make sure that we know what  
7 we're, you know, where we're going before we wind  
8 up implementing tremendous change. And with that,  
9 I'll put myself on mute or be on the call.  
10 Thanks.

11 MR. GORFINE: Thank you, Larry. I think  
12 actually on the list here we have Mr. Durkin next.

13 MR. DURKIN: Thank you very much. First  
14 of all, thank you Commissioner Quintenz for  
15 overseeing and revitalizing the technology  
16 advisory committee. Chairman Giancarlo, thank you  
17 so much for your support on the importance of  
18 this. Mr. Gorfine, very excited about your  
19 leadership in this whole program. Commissioner  
20 Behnam, thank you so much for your support as  
21 well.

22 I say that because I have an over

1 seven-year history, at least, with the Technology  
2 Advisory Committee and the work of the CFTC  
3 particularly in this regard. And if you go back  
4 and look at my comments over those years, they've  
5 been very consistent in the context of applauding  
6 the CFTC for its leadership in this regard and in  
7 this evolution of these markets and the automation  
8 of trading. Because you have been leaders in this  
9 regard in bringing this community together of  
10 esteemed colleagues to help inform policies,  
11 guidelines, and principles has been very  
12 formidable in what I believe to be the leadership  
13 that the futures industry represents. So thank  
14 you for that.

15           The efforts that you all, and we have  
16 all, undertaken together over this journey have  
17 led to some very important and highly notable  
18 principles-based guidance involving a wide range  
19 of subjects that directly impact and are related  
20 to the advancements and technology, and the  
21 progression to an increasingly automated  
22 environment in which we all operate. Among this,

1 this guidance has informed our industry. It's  
2 informed the Commission. I'll go so far to say  
3 it's informed the globe, and the context of risk  
4 management, pre and post-trade protocols, system  
5 safeguards, access to colocation facilities,  
6 messaging policies, and most recently, regulation  
7 AT.

8 Now it's not at all surprising that  
9 traders today have increasingly turned to  
10 automation to optimize trade execution, and to  
11 increase their operational efficiency, and enhance  
12 risk management. With the development of  
13 automated trading, algorithmic trading has  
14 unquestionably emerged, contributing to  
15 significant volume and growth across all asset  
16 classes in providing greater liquidity, tighter  
17 bid-ask spreads. This liquidity generated by the  
18 traders in these markets in turn is relied heavily  
19 upon all types of market participants to achieve  
20 their risk management and their investment  
21 objectives, and allows them to do so at a lower  
22 cost.



1                   It's very important to recognize that  
2                   algorithmic trading, like non-automated trading,  
3                   engages in a variety of activities such as market  
4                   making, arbitrage, hedging, and employs many  
5                   diverse strategies in each of these contexts to  
6                   achieve their risk management objectives. A  
7                   significant proportion of algorithmic traders  
8                   active on CME Group markets, they contribute  
9                   substantially liquidity, undoubtedly, by providing  
10                  continuous markets in our products.

11                  A major benefit of proprietary trading  
12                  that I would like to remind all of us of, or, as  
13                  has been referred to, professional trading firms,  
14                  was highly demonstrated and very publicly  
15                  demonstrated in the October 15th, 2014 US Treasury  
16                  market flash rally where proprietary trading firms  
17                  played a key role in the liquidity provisioning  
18                  and price discovery during a highly significant  
19                  and highly volatile market condition.

20                  During the period leading up to and  
21                  including most of that volatile period of that  
22                  day, proprietary traders, or commonly referred to

1       PTFs, increased their trading activity in the  
2       ten-year Treasury note futures market. They  
3       provided the majority of the order book liquidity  
4       at a tight bid-ask spread, and in contrast that  
5       day, during that most volatile period, bank  
6       dealers widened their bid-ask spread, and  
7       generally pulled back their participation.

8                 Now it's important to note that, while  
9       the event itself was highly significant, continued  
10      pricing spurred on by prop traders, or PTFs,  
11      filling that void that was left by other  
12      participants, allowed the general market  
13      population to continue transacting even during the  
14      most volatile period of that day leading to a much  
15      more orderly marketplace. Now the criticality of  
16      proprietary traders extending liquidity during  
17      this important market event should not be lost.  
18      And it's something that I would argue that this  
19      committee should take a look at going forward for  
20      the following reasons.

21                 As we evaluate the impacts of new  
22      regulations on these markets, regulations must be

1 appropriately tailored to our markets. Capital  
2 treatment for proprietary traders, for example,  
3 who make markets in exchange-traded derivatives,  
4 ignores the actual risks and correlations between  
5 the positions of participants offering liquidities  
6 on both sides of the market.

7 More specifically, they lack the  
8 recognition of delta adjustments for options and  
9 recognition of netting sets for options positions  
10 which ultimately results in a reduction in  
11 liquidity during stress conditions. This happens  
12 by applying inappropriate costs to market maker  
13 exposures, and this is a direct result of the  
14 supplemental leverage ratio.

15 Now we recently observed the impacts of  
16 this treatment in the equity derivatives markets  
17 where spreads on the S&P options on February 5th  
18 and 6th widened significantly more during  
19 similarly stressed markets in the past. Now based  
20 on our market intelligence that we've received, we  
21 understand the widening of the bid-ask spreads to  
22 be primarily driven by capital costs, again,

1 associated with the leverage ratio.

2 Now what is our role as CME Group or as  
3 an exchange in automated trading? Well, I assure  
4 you that the CME Group shares, as I'm sure all of  
5 our colleagues around this table, share a common  
6 objective of promoting transparency and integrity  
7 in our financial markets, and doing so in a manner  
8 that preserves the vibrancy, the competitiveness,  
9 and the leadership of our global markets.

10 Unquestionably market integrity is one  
11 of the cornerstones of our existence. I assure  
12 you it is a cornerstone of the existence of CME  
13 Group's business model, and our company employs  
14 substantial human resources, technological capital  
15 and capabilities to protect and continually  
16 enhance the reliability of our markets, and also  
17 to mitigate the potential for market disruptions  
18 through the usage of its risk controls and the  
19 systems safeguards that have been developed over  
20 the years.

21 Our protections against spoofing and  
22 other market abuses are integral to these efforts.

1 We view that CME Group has been a leader in  
2 promoting integrity, efficiency, and transparency  
3 of global financial markets. We've done so deeply  
4 with the guidance of the Commission and the work  
5 that's been done with the Technology Advisory  
6 Committee over these last seven years.

7 We appreciate the importance of ensuring  
8 that risk management and regulatory frameworks  
9 keep pace, keep pace with the rapid technological  
10 advancements that have characterized the evolution  
11 of our markets in recent years. We've developed a  
12 wide array of capabilities to manage risk and  
13 volatility and to mitigate market disruptions.  
14 And these are applied at all levels of market  
15 participants, all levels of market participants.

16 These protocols include Globex credit  
17 control, price banding, maximum order quantities,  
18 messaging controls, stop logic, functionality such  
19 as circuit breakers, price protection points, and  
20 kill switches. Now each of these is outlined in  
21 some form or fashion underscore guidance and  
22 principles that have been the good work of this

1 group over these years. And to drill into these a  
2 little bit more deeply, just so we have an  
3 appreciation of how far this industry has come,  
4 when we speak of Globex credit controls, these are  
5 pre-execution risk controls that are provided.  
6 And they enable our clearing firms to set credit  
7 limits for every executing firm.

8 It's a requirement that our clearing  
9 firms utilize these controls. It's not an option.  
10 Our credit controls, which every clearing firm  
11 utilizes, includes mechanisms such as order  
12 blocking, order cancellations, automated email  
13 notifications, and these can be set at various  
14 levels and thresholds.

15 We also employ a tool called Cancel On  
16 Disconnect that will cancel all resting orders in  
17 a book for a market participant that happens to  
18 get disconnected from our system. Price banding,  
19 this applies to all of our products. All orders  
20 are subject to price verification levels. Bids at  
21 prices well above and offers well below the market  
22 fall outside the contract's band and they're

1 automatically rejected by our system.

2 Maximum order quantities, every product  
3 has predefined maximum quantity per order. This  
4 step ensures that the order is not exceeding this  
5 limit. If the maximum quantity is exceeded, the  
6 order is rejected by the system.

7 Messaging controls, these controls limit  
8 the rate at which firms may submit mass quotes and  
9 can block orders from entering the system if the  
10 volume thresholds or the order quantities are  
11 exceeded.

12 Stop logic functionality, stop logic can  
13 automatically halt the market for a predetermined  
14 period of time in order to help prevent extreme  
15 market volatility and price deviations. When it  
16 was triggered on May 6th of 2010, that infamous  
17 day, stop logic was the mechanism that reversed  
18 the course of the Flash Crash by halting the  
19 market for enough time for liquidity to be  
20 replenished.

21 Circuit breakers, in our equity indexes  
22 and energy products circuit breakers halt trading

1 for a period of time when a specified level is  
2 reached. In addition, the utilization of daily  
3 price limits prevents trading at prices higher  
4 than or lower than limits that are pre-set by our  
5 company.

6 Price protection points, protection  
7 points act as a control against excessive price  
8 swings in an illiquid market. These points  
9 prevent market and stop orders from being filled  
10 at significantly aberrant prices because of the  
11 absence of sufficient liquidity in that market.

12 Kill switches designed to allow clearing  
13 firms a one-stop shutdown of our CME Globex  
14 activity at the most granular level of a market  
15 participant. Additionally, more recently, we've  
16 just introduced inline credit controls that allow  
17 for account-based limits that can be set at a  
18 highly granular product level.

19 Taking a look at more recent activity, I  
20 just wanted to end by referencing how these  
21 markets are continuing to grow and evolve and  
22 having capabilities such as what we've outlined.



1 Capabilities that have been the predicate of the  
2 good work of this committee has enabled these  
3 markets to be global leaders.

4 CME Group's markets this past week as  
5 investors turned to these markets to manage and to  
6 hedge the largest cash market drop since 2011. In  
7 all instances, our market worked as designed.  
8 These protocols that I outlined worked as  
9 designed. Our risk mitigation tools and processes  
10 were utilized extensively throughout the week.  
11 They worked as designed.

12 Our systems performed well with large  
13 volumes and open interest. Total open interest  
14 records were achieved last week of 129.5 million  
15 contracts on February 6th. New daily volume  
16 records for options of 9.2 million contracts on  
17 February 6th. The last record in that regard was  
18 the US presidential election.

19 Equity futures and options reached  
20 several records during the week of February 6th at  
21 10.7 million contracts. The innovation, the  
22 advancement, the engagement of this Commission and

1 the Technology Advisory Committee has played a  
2 very formidable role in the leadership of our US  
3 futures markets, and having the protocols in  
4 place, and the system safeguards in place to keep  
5 pace with the innovation of technology and  
6 automated trading.

7 And so I feel very strongly about where  
8 we are today and the opportunities associated with  
9 how this committee can continue to help us evolve  
10 and keep pace with that change. Thank you.

11 MS. YADAV: So my sincere thank you to  
12 Vanderbilt's own Chairman Giancarlo, of course.  
13 To Chairman Quintenz, to Chairman Behnam,  
14 Commissioner Behnam, and of course, to Director  
15 Gorfine, for the incredible privilege of having  
16 the chance to serve on this committee, it really  
17 is a tremendous honor to be here and to have this  
18 time amongst such terrific colleagues.

19 In addition, I'd, of course, like to  
20 thank the incredible staff here at the CFTC for  
21 all their hard work and tremendous thoughtfulness  
22 in putting this wonderful program together. It

1 really is a fabulously cohesive and  
2 thought-provoking program that I think will give  
3 us an incredible volume of work to get on with in  
4 the time going forward.

5           So given the incredible activity that  
6 we've had over these past few weeks in the  
7 marketplace, it is actually a good time to step  
8 back, to stop looking at the tickertape every  
9 single minute, and to stop doing our breathing  
10 exercises, and to have a chance to actually go  
11 back in time. And I thought I might take you guys  
12 back to what seems like prehistory now which is  
13 August the 1st, 2012.

14           And that was another weird and  
15 problematic day on Wall Street as many of you will  
16 remember. And that was a day in which Knight  
17 Capital, an HFT market trading firm, experienced  
18 what can only be described as a bad technical  
19 glitch. Instead of sending out 212 orders, test  
20 orders, into the New York Stock Exchange, a  
21 failure of Knight Capital to update the software  
22 system on its router caused the system to unleash

1       several million orders into the marketplace  
2       resulting in Knight Capital accumulating losses of  
3       around \$450 million in just 45 minutes time for a  
4       firm that only had around \$360 million in cash and  
5       other assets.

6                 And these weird, anomalous, costly, and  
7       disruptive events seem to be growing in frequency  
8       in our marketplace. We can't forget, obviously,  
9       as Brian mentioned the infamy of the Flash Crash  
10      when a trader sitting in London in his parents'  
11      basement managed to contribute to events that  
12      eventually led to the crashing of the US stock  
13      market for a period of time.

14                In addition, and perhaps more mundanely,  
15      we have seen flash crashes in the trading of  
16      individual stocks, individual securities in the  
17      future markets, sudden disappearances of liquidity  
18      that are unexplained, costly, and they create a  
19      sense of anxiety amongst market participants as to  
20      how market robustness is supposed to look like in  
21      our leading markets.

22                And really I thought that it would be

1 interesting for our committee and for market  
2 participants, regulators, and policy makers to  
3 think deeply about how we might lever our legal  
4 system in ways that can encourage and deter bad  
5 and disruptive behavior from taking place in the  
6 first place. As well as for the legal system to  
7 be utilized in ways that can create mechanisms,  
8 that can help make participants whole, to  
9 compensate participants in the event that these  
10 disruptions end up happening.

11 Now one concern that has been  
12 highlighted in the research that I have been doing  
13 is that the legal system is increasingly unfit and  
14 poorly adapted to dealing with the risk created by  
15 high-speed, highly automated trading in a very  
16 interconnected market. Now as many of you know,  
17 if you're lawyers, or if you watch "The Good Wife"  
18 and/or "Law & Order" that the legal system is  
19 basically underpinned by three very fundamental  
20 standards of liability that underpin much of the  
21 rulemaking that happened within these venerable  
22 walls, as well as, of course, across regulatory

1 agencies across DC.

2           When we think about strict liability,  
3 strict liability makes you liable irrespective of  
4 fault. You are liable for all the losses that  
5 arise as a result of your bad and disruptive  
6 conduct, right? And this kind of liability is  
7 designed to deter and punish extremely dangerous,  
8 disruptive kinds of activities that can create  
9 large costs and large disruptions in society.

10           Then we have the workhorse of the legal  
11 system, and that is negligence-based liability.  
12 Negligence-based liability punishes unreasonable  
13 behavior and makes you liable for the foreseeable  
14 consequence of that behavior, and when we're  
15 dealing with negligence, that is really one of the  
16 linchpins of our regulatory system. The  
17 reasonable standard, the reasonableness standard  
18 undergirds much of rulemaking today across  
19 regulation in the securities marketplace.

20           And then, of course, we have our most  
21 serious standard of liability which is intent.  
22 Intent or highly, grossly negligent conduct that

1 is manifested in cases of fraud, of manipulation,  
2 that is really regarded as being the most  
3 expressively bad kind of conduct that we can  
4 perform, and that is punished by an intent-based  
5 standard of liability. And all of these core  
6 fundamental guiding standards of liability are  
7 increasingly poorly adapted to the marketplace in  
8 which we live in which is governed by high-speed,  
9 highly automated algos in a market which is deeply  
10 interconnected, where the seriousness of the harm  
11 can seem to be far in excess of the actual nature  
12 of the act itself.

13           So when we look at algos, in order to be  
14 able to transact in milliseconds and microseconds,  
15 we need to make sure that algorithms are  
16 preprogrammed in advance of trading, right?  
17 Because as Charles mentioned earlier today, we're  
18 too distracted, we're too dumb to be able to  
19 follow along in real time. And as a result, of  
20 course, we need to make sure that our algorithms  
21 are preprogrammed in advance of trading to be able  
22 to deal with the permutations, the different

1 events, the different dynamic that will happen in  
2 an ever-evolving marketplace with changing prices.

3           And therefore, the fact that we have to  
4 preprogram algorithms, the fact that we have a  
5 predictive dynamic that underlies much of trading  
6 today, where algos essentially have to transact  
7 independently in real time in accordance with  
8 their programming means that systematic random  
9 error is almost endemic to trading today. That  
10 algorithms can easily misfire. Algorithms can  
11 easily fail to react to information in a way that  
12 we might expect them to. Algorithms may fail to  
13 perform as programmed in circumstances that are  
14 unusual because, essentially, they're constrained  
15 by their programming, and we cannot possibly  
16 expect traders to take into account every single  
17 eventuality that may possibly arise in that  
18 program ex ante.

19           So we have preprogrammed algorithms that  
20 create a dynamic, whereby systematic error is  
21 endemic to their operation. In addition, as we  
22 all know, as we all know, today's markets are



1       incredibly interconnected. As Larry mentioned in  
2       his presentation, we have venues both in the  
3       equities as well as derivatives space which are  
4       able to synchronize very rapidly to new  
5       information that comes in.

6                So as finance scholars have repeatedly  
7       shown, markets today are incredibly efficient at  
8       reflecting new information at the prices at which  
9       securities are trading. In addition, of course,  
10      that means that errors, misfires, and disruption  
11      can also potentially amplify and cascade as they  
12      move through the system of venues such that an  
13      original bad act, an original harmful event can  
14      seem far, far more serious as it's amplified  
15      rapidly across the marketplace in the prices and  
16      in the dynamics that exchanges and other venues  
17      have to deal with when they're dealing with  
18      cascading events in the market.

19               And these two dynamics make it very hard  
20      for the legal systems core standards of liability  
21      to work as intended. If we think about strict  
22      liability, for example, strict liability where

1       you're liable irrespective of fault is very  
2       difficult to apply in a market in which systematic  
3       random error is endemic, right? We cannot  
4       possibly expect, we cannot possibly imagine that  
5       traders will be able to build systems capable of  
6       safeguarding against every possible eventuality or  
7       circumstance in an evolving market environment.

8                 In addition, the negligence standard,  
9       too, our very core of the regulatory framework is  
10       straining. When we think about actions like  
11       Knight Capital or even the Flash Crash, actions  
12       that seem remarkably innocuous, remarkably  
13       expected in certain senses, can cause incredibly  
14       costly harm to the marketplace as a whole. And as  
15       we've sort of thought about the discussions  
16       throughout the day today, the increasing  
17       electronification of our marketplace, the  
18       increasing automation of our marketplace means  
19       that we might see an increase in these kinds of  
20       glitches and events happening such that it gives  
21       us some room to think about how we should  
22       recalibrate, rethink, reimagine, reconfigure the

1       reasonableness standard to deal with the kinds of  
2       harms that we are facing in today's marketplace.

3                 If we think about our own lives,  
4       control, alt, delete are my favorite keys on the  
5       keyboard. You know, these kinds of glitches  
6       happen all too often. So how do we reconfigure,  
7       rethink, deal once again with a reasonable  
8       standard -- a reasonableness standard when we are  
9       in an environment of a highly automated, highly  
10      electronic, and a marketplace in which  
11      preprogrammed high-speed algorithms are becoming  
12      the norm?

13                Now finally, and perhaps most  
14      interestingly from a philosophical perspective,  
15      particularly given Tim's earlier presentation,  
16      very insightful presentation earlier, how do we  
17      think about intent in this market? Right, when we  
18      look at automated trading, we look at machine  
19      learning algorithms that are effectively designed  
20      to reprogram themselves in response to new,  
21      incoming information. What do we do about intent?

22                Behavior that to us would seem bad,

1       undesirable, intentionally malicious may, to  
2       certain algorithms, be considered as being  
3       profit-generating, as being effective, as being a  
4       useful arsenal in their trading technology. And  
5       when algos are trading with other algos, how do we  
6       capture our vision, our understanding of harm,  
7       intentional, and bad behavior within the  
8       programming of highly automated machine learning  
9       algorithms?

10               Now one big gap, given these gaps that  
11       are left in the law, the cost of these gaps are  
12       going to be left to be borne by market  
13       participants, exchanges that have redouble their  
14       monitoring efforts are those who have to pick up  
15       the costs when firms do not have the resources,  
16       when their actions are too serious and too costly  
17       relative to their conduct to make whole those who  
18       are in the marketplace. And so someone has to  
19       pick up the tab. And that tab is either other  
20       market participants and/or it is investors who  
21       have to discount the capital they put into the  
22       market to reflect the risk of having to protect

1 themselves.

2 More broadly, obviously, seen from the  
3 perspective of this agency that has done so much  
4 to lead international rulemaking in financial  
5 regulation, this is an area which remains  
6 underexplored, under thought, and in which  
7 guidance from us, guidance from our markets can  
8 really inform and lead the global dialogue both  
9 publicly as well as privately in thinking about  
10 and configuring and calibrating new ways in which  
11 to bring the law up to speed with the pace of  
12 technology that is currently underpinning trading  
13 and securities markets today. Thank you very  
14 much.

15 MR. GORFINE: Okay. I want to thank our  
16 panel, and with that we will open it up to  
17 questions, thoughts, or reactions to what you  
18 heard from the panel. And again, I'd like to keep  
19 in mind the idea of potential work streams that  
20 this group might consider. Let's begin with  
21 Chuck.

22 MR. OCHERET: I wanted to thank the

1 Commission and also the panel for this whole  
2 event. But these really resonated with me  
3 although I'm not really working in this space  
4 right now, most of my career was spent doing  
5 high-frequency trading at big banks and hedge  
6 funds.

7           And it's fantastic to see the effort  
8 that CME Group has put into automated tools and  
9 kill switches and things like that. And I would  
10 just like to say I have always been appalled at  
11 most of the larger organizations I've been at how  
12 few controls there were, or how much -- how little  
13 transparency there was even within the  
14 organization in the face of different kinds of  
15 failure scenarios.

16           So I mean, this is not unique to  
17 trading. I mean, this is a general technology  
18 problem, and this is true in any kind of system  
19 with massive concurrency and distributed elements,  
20 and, you know, the same thing applies some of the  
21 blockchain things we were discussing earlier. And  
22 at one of the major organizations I was at, when

1 something were to fail, you know, it could be a  
2 hardware failure. It could be a software failure.  
3 It would take hours or days to resolve the  
4 situation and figure out what had gone wrong.

5           Until we eventually completely automated  
6 things so that if, you know, a switch failed in  
7 the data center, the head trader would get a  
8 dialogue on his desk saying these are the options  
9 you should trade to our connection to the New York  
10 Stock Exchange being down, or something like that.

11           The other point I wanted to make was,  
12 and this was actually what was a question I was  
13 going to ask in the AI session, having built a lot  
14 of artificially intelligent or pattern  
15 recognition-based algos, one of the things that a  
16 lot of the newer technologies, especially the  
17 deep-learning neural network technologies lack  
18 that were present in a lot of earlier technology,  
19 or some of the earlier technologies, was this  
20 notion of explainability. When something goes  
21 wrong because the algorithm is adapting or because  
22 a new situation occurs, there's no explainability.

1       There's no way to understand why did it make that  
2       decision, and sometimes -- because at a certain  
3       point, it's just numbers. It's all these linear  
4       equations and you're trying to figure out, well,  
5       we trained it, and here's some coefficients.

6                 You know, they don't explain themselves.  
7       They're just doing dot products at very high  
8       speed. But I think it's something that we should  
9       hold people to a higher standard to.

10                MR. GORFINE: Okay, Mr. Curley.

11                MR. CURLEY: Thank you. I wanted to ask  
12       a question of Larry Tabb if he's still available  
13       on the phone. In particular, his slide 6 where he  
14       references that execution algos are typically  
15       slower than proprietary algos, and then has the  
16       added feature of it being kind of hardwired into  
17       the system. And is the emphasis really, is that  
18       different in futures markets where there's more a  
19       single queue than a multi-queue dynamic. And then  
20       second, does that really result in a form of  
21       structural disadvantage for parties using  
22       execution algos, maybe disproportionately



1 customers, in the sense of the -- a small  
2 difference making a big difference in terms of  
3 actual realized results in trading. Because that  
4 would, even in a system where you kind of  
5 prioritize fair process over fair result and kind  
6 of the way MiFID is challenging now, but that  
7 would suggest there's even a fair process concern  
8 if those types of differences exist in terms of  
9 tracking between execution and the proprietary  
10 algos.

11 MR. GORFINE: Larry, if you're there and  
12 you were able to hear the question, please, go  
13 ahead and jump in.

14 MR. TABB: Hello, hello, hello?

15 MR. GORFINE: We can hear you well.

16 MR. TABB: Okay, good. In terms of  
17 futures customer orders versus equities customer  
18 orders, that problem isn't as big a deal but  
19 depending upon where the execution algorithm is  
20 and how the data is structured and read, it could,  
21 you know, it could be impactful, but not generally  
22 as impactful as on the equity side where there's

1       so many routing decisions to be made.

2                       Now the question is, is this a good  
3       thing or a bad thing? Or does this, you know,  
4       create, a, poor outcomes for customer orders?  
5       That's harder to say because it's really  
6       difficult. We had a business for a while before  
7       it spun off that was really measuring equity  
8       execution. And just getting the normalized  
9       information, even down to one millisecond was very  
10      difficult, and actually, to really get an accurate  
11      representation, you really needed to get into the  
12      microseconds, and maybe ten microseconds, or  
13      sometimes, even single-second, or single-digit  
14      microseconds. And none of the brokers really had  
15      the ability or I'm not sure they even had the  
16      ability to measure or, you know, monitor at that  
17      level.

18                      On the other hand, the customer orders  
19      have another advantage that the market makers do  
20      not have, and it's that they know the full size.  
21      And so and to a certain extent, knowing exactly  
22      what you're trying to accomplish that this is

1 really only 200 shares of a half a million share  
2 order, actually the buy-side has tremendously more  
3 information than the market makers do. So as well  
4 as this is a symbiotic relationship in that the  
5 market maker's providing liquidity. If they do  
6 not get fair outcomes then they widen their  
7 quotes. So it really is kind of a cat and mouse  
8 game.

9           And that said, what I believe and what I  
10 said in my presentation that's really important is  
11 just a much better mechanism to measure and  
12 benchmark execution speeds. Because then you'll  
13 have a better understanding of whether you're  
14 being treated fairly or if there's a problem that  
15 we should be worried about. And so unfortunately,  
16 it's really difficult to answer that last  
17 question, but I believe that both sides have  
18 advantages in different ways and it is a symbiotic  
19 relationship between the liquidity provider and  
20 the taker.

21           And if the takers have an advantage, the  
22 market makers would go out of business. And if

1 the market makers had a super advantage, then the  
2 investors would clearly see harm in terms of  
3 getting executed. With that said, I believe  
4 better, more fine grained time stamping and better  
5 computer sync would help that.

6 Now I would like to provide or ask --  
7 provide a comment myself on the last presentation  
8 from the professor from Yale. I think we've come  
9 a long way, you know, and I don't think we should  
10 always be worried about errant or aberrant algos  
11 and their impact, but I think the exchanges and  
12 the regulatory agencies have done a really good  
13 job in terms of implementing kill switches, and,  
14 you know, limits, and circuit breakers, and things  
15 like that, to stop the market from poor reaction.

16 Now does that impact the legal system?  
17 No, but I think it limits some of the damage that  
18 occurs.

19 MR. GORFINE: Okay, thank you. We'll  
20 take two more questions or comments, Mr. Heymeyer  
21 and then Mr. Chattaway.

22 MR. HEYMEYER: I'd like to start by also

1 chiming in and thank you all for providing the  
2 forum and for all of the work that went into the  
3 decision, of course, of cancelling and then  
4 rescheduling. So thank you all very much. The  
5 presentations today have been terrific, and this  
6 is a subject that I find challenging and tricky  
7 because of my days when I was Chairman of the  
8 Board at NFA when the first ATS drafts came out.

9           It gets very tricky in trying to figure  
10 out where to draw the lines and where the net gets  
11 cast as to what is an automated trading system and  
12 what isn't. There are retail traders that use a  
13 lot of the independent software vendor-type  
14 systems that employ pretty simple automated tools  
15 that quickly fall into the category of automated  
16 trading system depending on how the wording of the  
17 rules is written.

18           And so it gets very tricky and very  
19 challenging to try to legislate the particulars of  
20 rules like this. We do a lot of low-latency  
21 automated trading, and we spend copious amounts of  
22 time going over our software-release protocols,

1       our risk tools. As Larry said, there have been a  
2       lot of advancements. It still makes me worry  
3       about it all the time that some kernel of an  
4       operating system goes down and there's something  
5       that we've missed.

6                I agree with Larry that the exchanges  
7       have made huge strides and if you ask the prop  
8       trading, the principle trading firms, I think they  
9       are unanimous that the best situation is the  
10      better and better the exchange tools get. Not in  
11      any way to put the responsibility on the  
12      exchanges, it's the trading companies who use the  
13      tools. It's their responsibility to manage their  
14      risk.

15               But as those tools become more and more  
16      granular down to the tag 50 at the CME level, and  
17      the CME's made great strides in being able to  
18      calculate what in the futures business, over in  
19      the equities business is buying power with their  
20      GCC limits, or per product risk limits, and those  
21      tools continue to get better and better. It's  
22      very competitive, as we've talked about today, the

1 technologies, and the speed of these things is  
2 breathtaking. But it's provided tremendous value  
3 in liquidity to the US Treasury market to try to  
4 finance all of that debt. The liquidity is deep,  
5 and so those tools have become better and better.

6           And the best setup, I think for  
7 everybody, is if the exchanges continue to do  
8 that. That's the ideal situation, because  
9 legislating, while there's a real temptation to do  
10 that, because it scares all of us, it gets very  
11 tricky in exactly how to do that. And so it's a  
12 tough balance, and it's a challenge, and it's  
13 tricky, and it's a very good public policy debate.  
14 But I do tend to think that these technologies, as  
15 the exchanges have gotten better and better, in  
16 the futures markets, I'm not as sure about all of  
17 those venues that Larry was talking about in the  
18 equity markets that make it so complex. But  
19 because you've got central limit order books, the  
20 technologies have come a long way.

21           MR. GORFINE: Thank you. Last comment,  
22 Mr. Chattaway?

1                   MR. CHATTAWAY: Thank you. Yeah, I  
2 completely agree with the comments from Larry and  
3 Mr. Heymeyer over here. I just wanted to  
4 emphasize that the standard shouldn't be to build  
5 perfect systems. Software and hardware will fail  
6 and always fail. I think the standard should be  
7 to ensure that market participants have a  
8 framework around controlling and mitigating those  
9 problems so that they don't have external impact.

10                   MR. GORFINE: Okay, thank you very much.  
11 So I think based on the panel and the discussion  
12 and the range of, potentially, worthy items for  
13 this group to explore, I would move that the TAC  
14 recommend to the Commission that it consider  
15 creating a subcommittee on automated trading. Is  
16 there a second?

17                   MS. VEDBRAT: Second.

18                   MR. GORFINE: Okay. Any questions or  
19 comments? All right. I will now call for the  
20 vote on the motion. All those in favor of  
21 recommending to the Commission that the Commission  
22 consider creating a subcommittee on automated



1 trading, please say aye.

2 COMMITTEE: Aye.

3 MR. GORFINE: All those opposed, please  
4 say nay. Are there any abstentions? Okay. The  
5 motion carries. I'm getting better at this  
6 procedure here.

7 So before we take a break, I believe the  
8 Chairman has a few remarks he'd like to make?

9 CHAIRMAN GIANCARLO: Just briefly. I'm  
10 not going to be able to stay for the final  
11 session, so I just wanted to just give a closing  
12 remark now if I could. And actually I wanted to  
13 give sort of a correction, an observation, and a  
14 reflection. And the correction is that the  
15 professor is from Vanderbilt not Yale, Larry Tabb.  
16 We've got an upgrade there so just wanted to make  
17 that point.

18 MR. TABB: I'm sorry about that.

19 CHAIRMAN GIANCARLO: There was an  
20 observation I heard before that regulators were  
21 referred to as vampires in the house. I've heard  
22 regulators called a lot of things, and I've

1 probably called them a few things myself, but a  
2 vampire is one that's new to me. So I have to  
3 reflect on that.

4 MR. KNIGHT: Point of order, I said we  
5 don't want regulators to be like vampires in that  
6 you let them into the house and then you can't  
7 stop them. No, no. I'm not accusing regulators  
8 of being vampires, let the record reflect.

9 CHAIRMAN GIANCARLO: Thank you. And I'm  
10 glad I gave you a chance to clarify that so rumors  
11 don't spread. So that's great. So we get that  
12 sorted out. The one sort of reflection I just  
13 wanted to make is I think it was Tim Estes  
14 referred to, he said technology has not yet turned  
15 back, and I think he was referring to bad behavior  
16 in the marketplace, and I think he say yet.

17 I thought the yet was quite remarkable.  
18 I must say there's a lot about technology I think  
19 is absolutely remarkable and transformational and  
20 can bring a lot of good. But I'm not sure ending  
21 bad behavior is something it can do. I think as  
22 long as there are human beings anywhere in the

1 market, our role as regulators is to try to find  
2 them, punish them, take them out of the  
3 marketplace, but the strange thing is they come  
4 back -- they or their friends come back some other  
5 time. So I think that the ongoing battle that  
6 regulators and self-regulatory organizations and  
7 good players in the market, we all have together,  
8 is to find those bad actors and take them out.

9           Unfortunately, they will always be  
10 there. If technology limits the number of them,  
11 that's great, but I think that's probably not one  
12 that at least I personally have on my hope list.  
13 I think that the process of getting rid of bad  
14 actors just still falls on us as humans to find  
15 them and take them out of the marketplace. And I  
16 think as long as there are markets they will  
17 attract. There's the old story about the bank  
18 robber. When they asked him why he robs banks, he  
19 says well, that's where the money is.

20           Why are there bad actors in markets?  
21 Well, maybe that's why because that's where the  
22 money is, and I think our job, as the good actors,

1 is to take them out of the marketplace. Anyway,  
2 with that, I want to thank you all. This has been  
3 a great, great day today. It's another great  
4 advisory committee meeting this year by the new  
5 Commission. So I tip my hat to Commissioner  
6 Quintenz who put a lot of time into this, and it  
7 falls on the heels of a great MRAC meeting just a  
8 week before. So thank you all for very much.  
9 Have a good break and we'll see you all soon.  
10 Thanks.

11 MR. GORFINE: Okay. Thank you very  
12 much, Mr. Chairman. So with that we're going to  
13 take a ten-minute break. I want to try to stick  
14 to this schedule since it is Valentine's Day and  
15 folks will want to head out after the last panel.  
16 Let's return back at 3:25 if we can for our last  
17 panel.

18 (Recess)

19 MR. GORFINE: Okay. I would like to  
20 call the TAC meeting back to order and begin our  
21 final panel on emerging trends and best practices  
22 with respect to cybersecurity. Our panelists are

1 Naeem Musa of the CFTC and Phyllis Schneck of IBM,  
2 of Promontory IBM.

3 Let us begin with Naeem.

4 MR. MUSA: Good afternoon. Thank you  
5 for the opportunity to address the Technology  
6 Advisory Committee. As Commissioner Behnam  
7 mentioned in his opening remarks, cybersecurity is  
8 an all hands on deck exercise. As a regulator of  
9 financial markets, we are laser-focused on  
10 protecting our data from cyberattacks.

11 Cyberattacks continue to rise and  
12 tactics are getting more sophisticated, utilizing  
13 the combination of hacking, malware, and social  
14 engineering. In my role as the Chief Information  
15 Security Officer for the Commission, I meet  
16 monthly with our Chairman to review all recent  
17 cyber incidents and agency responses as well as  
18 review all recent cyber incidents and agency  
19 responses.

20 In addition to that, I meet on a regular  
21 basis with the Commissioners to discuss our  
22 progress and our cybersecurity program and review

1 with them all new trends in cyber threats. We  
2 have heard multiple panel participants comment on  
3 cybersecurity risk of data transmission, storage,  
4 hackable trading platforms, and virtual currency  
5 wallets.

6           While we believe that technology-driven  
7 innovation is and will continue to enhance  
8 markets, we also recognize the paramount  
9 importance of cyber security and data security  
10 practices that can help to safeguard the system  
11 underpinning innovation -- the system underpinning  
12 such innovation. According to the Verizon 2017  
13 breach, or data breach report, private sector  
14 financial service organizations were the most  
15 targeted victims.

16           Representatively, quarter of all  
17 confirmed breaches, while other sectors reported  
18 more incidents, over 40 percent of incidents  
19 impacting financial services organizations  
20 resulted in breaches more than any other sector.  
21 Cybersecurity remains one of top compliance risks  
22 for financial firms. According to the same

1 report, 88 percent of industry compliance officers  
2 surveyed view cybersecurity compliance and  
3 identity theft as the most challenging compliance  
4 topic.

5 To echo the words of our Chairman,  
6 cybersecurity is undoubtedly the most important  
7 single issue facing our markets today in terms  
8 market integrity and financial stability. We are  
9 all in this together and it's critical that we  
10 work together in a private-public partnership to  
11 combat cyber threats. CFTC seeks to leverage  
12 every resource available to us across Federal  
13 government and private industry.

14 CFTC is constantly reviewing and  
15 updating our cybersecurity protections to guard  
16 against the growing threat of breaches. We can't  
17 get comfortable or rest on our laurels with our  
18 past successes of preventing or avoiding breaches.  
19 CFTC takes nothing for granted.

20 The cyber threat is persistent and  
21 ever-changing. It has rightly been said and it's  
22 not a question of if, it's a matter of when, when

1 a breach will take place. In addition to  
2 collaborating with other financial regulatory  
3 agencies, CFTC also works closely with the  
4 Department of Homeland Security and the National  
5 Institute of Standards and Technologies to bring  
6 in leading technologies and frameworks for  
7 combatting cyber threats. We are committed to  
8 seeking opportunities to utilize artificial  
9 intelligence, machine learning, and automation to  
10 strengthen our ability to combat the constant  
11 morphing nature of cyber risk. CFTC has adopted  
12 the NIST cybersecurity framework as a model for  
13 how we deliver cybersecurity services and how we  
14 mature our protection of information assets.

15           When adoption began in the late 2016,  
16 our leadership team recognized the ability of the  
17 cybersecurity framework to provide standards for  
18 managing and reducing cybersecurity risks,  
19 organizing capabilities around five functional  
20 areas of identifying risk, protecting against it,  
21 detecting it, responding to it, and then  
22 recovering from a potential breach.



1                   Just as in the case of public and  
2 private organizations, CFTC needed a comprehensive  
3 structure for making informed decisions about  
4 risk, as well as informing budget and strategic  
5 planning to ensure we are prepared for the road  
6 ahead. In addition, my team has established a  
7 dedicated security metrics program to better  
8 inform stakeholders across our organization to  
9 promote awareness and structure from making  
10 informed risk-based decisions and managing  
11 cybersecurity risks.

12                   These metrics provide additional  
13 visibility that go above and beyond the federal  
14 reporting guidelines under FISMA. As a result,  
15 our organization has achieved a green score card  
16 for all five functional areas under the security  
17 cybersecurity framework. CFTC has taken steps to  
18 ensure that the organizations responsible for  
19 delivering cybersecurity services within the  
20 Office of Data and Technology is functionally  
21 aligned with the cybersecurity framework. We are  
22 constantly assessing our current state of maturity

1 and the pathway for the desired state of maturity  
2 for each service including planned projects,  
3 acquisition of technology, additional personnel,  
4 and the corresponding budget required to achieve  
5 each road map.

6 In September 2016, the CFTC unanimously  
7 adopted system safeguards and cyber resilience  
8 standards for clearing houses, contract markets,  
9 swap execution facilities, and swap data  
10 repositories. At a minimum, all organizations  
11 should focus on governance, risk assessment,  
12 access rights and controls, data loss prevention,  
13 vendor management, training, and incident  
14 response.

15 As our CFTC Chief of Staff Michael Gill  
16 has previously stated, we recognize the great  
17 expertise in cybersecurity within the firms that  
18 we regulate. And proactively seek ways to support  
19 their frontline defense in cybersecurity and cyber  
20 resilience. In addition, our Chairman has  
21 recently agreed to chair a new board-level  
22 taskforce on cybersecurity for the International

1 Organization of Securities Commissions, IOSCO.

2 It is critical that cybersecurity be a  
3 priority for all regulators, and we believe IOSCO  
4 can play an important role in helping market  
5 regulators around the world improve their cyber  
6 resilience practices. In conclusion, I am  
7 interested in hearing from the committee on how we  
8 can better share information and improve how we  
9 better collaborate around this indiscriminate  
10 challenge that we all face.

11 When I hear the words all hands on deck,  
12 with regard to cybersecurity threats, I interpret  
13 that as the need for all of us to proactively  
14 collaborate on work together. Thank you.

15 MR. GORFINE: Thank you, Naeem.  
16 Phyllis?

17 MS. SCHNECK: So good afternoon. I'm  
18 Phyllis Schneck. I'm noting my nametag here. I  
19 thank you for adding my middle name. My whole  
20 life anyone that uses my middle name is because  
21 they're mad at me. So it's a privilege to be  
22 here. I very much appreciate the opportunity to

1 address this committee.

2 I've been a nerd my whole life, studied  
3 high-performance computing early on for tornado  
4 modeling, how you use compute power and that's  
5 grown. We went into cryptography. Here I am in  
6 cyber. I showed my father how to hack a few  
7 machines. He said please use that gift well and  
8 don't do any more bad things. We had a talk on  
9 ethics about 20 years ago and here we are. All  
10 of our world is connected. I can tell you back  
11 in my first world in the private sector as a chief  
12 technology officer for global government work for  
13 a major cyber provider, everything is connected  
14 including government to government. Your electric  
15 grid is talking to your refrigerator, to your  
16 hairdryer, to your car.

17 Moving into running my most recent  
18 former role, running the operational defensive  
19 cyber mission for the US government as a deputy  
20 undersecretary at Homeland Security over cyber and  
21 comms, you can see the day to day, minute to  
22 minute incident response at any moment. It's not

1 just if and when, it's happening. And I'll keep  
2 this part brief because I'm sitting between you  
3 and Valentine's Day, but the idea is as computers  
4 are connected, computers are not smart. They're  
5 just fast.

6           They fetch instructions off what we all  
7 call memory, and they just execute it. They don't  
8 stop and think should I do this. Somebody else is  
9 supposed to have thought that through, and we  
10 haven't. We haven't built security into that. So  
11 now we face -- it's not about cybersecurity. I  
12 tell people in ten years I don't want to have a  
13 field of cybersecurity. It's about everything  
14 else. It's about the financial world that you  
15 drive every day, the electric world that our power  
16 companies drive, and daily life.

17           And we're using this great new  
18 technology, and we should enjoy it, but we need to  
19 protect it by design. And as you have everything  
20 being a computer, you all drove here in one today.  
21 Everything is executing instructions without  
22 thinking about what it's doing next. So at some

1 point, whether it's how those instructions get to  
2 the machine, how they're put into it, how they're  
3 crafted, or at the time of execution, somebody  
4 needs to put some logic into that, and/or, and I  
5 give you and, look at as they are being executed,  
6 what does this mean?

7           You won't stop everything. You won't  
8 see everything, but you should start to detect  
9 things. And that's where we get into two areas,  
10 our current threat landscape, and what we can do  
11 about that. In my current role, leading the  
12 global cybersecurity practice for Promontory  
13 Financial Group, an IBM company, that's a longer  
14 mouthful than my full name, what we do is we look  
15 at how do you not only take the role of  
16 compliance, but make that security.

17           They're not the same. You can check a  
18 bunch of boxes, and they're very important boxes.  
19 I give you that. They're very important, but the  
20 bad guy knows what those boxes are. We have to go  
21 above and beyond that to get to resilience. So  
22 what we look at is when, as an industry, when you

1 are investing in regulating, or on the other side,  
2 in being compliant, look at that from an area of  
3 how does this make me more resilient.

4           Anyone that tells you you're going to  
5 prevent a cyberattack or they can prevent one for  
6 you, run away. It should be about how am I going  
7 to detect it, and how am I going to be resilient?  
8 I believe very much in communicating with  
9 regulators early and often. I come from a world,  
10 in the nerd community, where in the cyber  
11 operations center we all speak Klingon. I  
12 actually know a few words, and as events develop,  
13 we're looking as an industry as when do those get  
14 reported up to executives? It used to be that  
15 you're trained not to go upstairs with that until  
16 you have your full story. Now it should be, now  
17 that we have new technology to put data together  
18 faster, you have a better idea of when something's  
19 happening.

20           And I urge our customers and everyone I  
21 talk to, bring it up there faster. Learn to speak  
22 English and translate what you're seeing in cyber

1 ops into English that someone can say this might  
2 be an event that not only I'm seeing, but all of  
3 my colleagues are seeing. And this work in  
4 public-private partnership that Naeem mentioned  
5 and others have mentioned, that transcends  
6 competition. The financial sector is phenomenal  
7 at sharing information that protects the entire  
8 sector.

9           When you look at what people like to  
10 call the internet of things, everything is  
11 connected. That thermostat in your house, Alexa,  
12 they're listening to you. Not in a good or bad  
13 way, that's up to you. But it's all about what is  
14 the data that's being transported. Do you have  
15 any idea of how it's being transported, and we  
16 bring these devices into our workplaces. Do we  
17 understand what data could get on them? Do we  
18 understand what they're connected to? Is there a  
19 router in a wire closet for the guest wireless  
20 that somebody operates to help somebody out that  
21 nobody knows about that's now connected up to  
22 something that runs something operational in a



1 building.

2                   These are all issues we've looked at,  
3 and in my prior life we looked at control systems  
4 inside federal buildings, and we said, what are  
5 dangers in a random router, for example, being  
6 somewhere that talks to the elevators? So not to  
7 put a Hollywood movie on this, but understanding  
8 that in every sector, financial especially,  
9 everything is connected.

10                   You look at high-performance computing,  
11 the world is going toward fast compute power. So  
12 Dan -- I promised Dan I would mention a couple of  
13 the emerging technologies, especially your  
14 favorite one, and I'll get there in a moment, but  
15 when you -- we heard algorithms mentioned in the  
16 previous panel. I would push back and say, yes,  
17 the algorithms are getting better and better, but  
18 sometimes you can't undo them. Sometimes they're  
19 mathematical transforms.

20                   I have sat in that seat where somebody  
21 said how did you get to that number and you can't.  
22 And what the industry is able to do is put

1 together billions of data points of threats that  
2 we see all over the world. Threats that come off  
3 that box that sits at the edge of your network  
4 that blocks the bad guy from getting in, that box  
5 is able to tell your ops center and the ops center  
6 of the company that built the box, and those  
7 companies use the speed of computing to put that  
8 together just like a weather forecast. In my old,  
9 old life forecasting tornados, what this is coming  
10 together to look like. The only difference  
11 between cyber and weather is the chaos.

12           So the bad guy controls the cyber and  
13 everything else controls the weather. But the  
14 cyber is actually harder because someone else can  
15 dictate it, believe it not. So as all these  
16 things come together it's going to be about the  
17 power of computing, the power that powers that  
18 high-speed trading, making sure it's accurate, not  
19 only with the length of the wire and the kind of  
20 fiber, but who is able to adjust it at a pace  
21 faster than you can detect them, and what are you  
22 going to do about it. And the last part is the

1 most important, what's the resilience?

2                   How does the sector bounce back from  
3 that and self-correct? On the algorithm side some  
4 of that math can get torn apart and some of it  
5 cannot. And I think that's -- you sparked my  
6 interest today. That's a huge area that I think  
7 the nerd community can look at for you in a better  
8 way. So at what point are we liable for the  
9 decisions that are being made, and what point are  
10 we not? Some of it can be taken apart, some of it  
11 can't.

12                   Compliance is turning to resilience.  
13 It's not only did you check the boxes, I'll say a  
14 few nice things about the NIST framework because  
15 its' birthday of five years I think was yesterday,  
16 believe it or not. And that was built with the  
17 private sector and government together. And a  
18 little bit of humor, the private sector sent the  
19 folks to make that framework, not the ones they  
20 would normally send to days and days of government  
21 meetings, which tend to be the people companies  
22 can just hemorrhage and they don't care. Very

1 candid for the end of your day, they sent really  
2 good, smart people to build that because it was  
3 the way that we could get public and private to  
4 work together, forgive me, without regulating  
5 because that was problematic in many, many sectors  
6 for a lot of reasons.

7           Putting together the best of technology  
8 with the best of what government needed and it  
9 provides a very good, it's not everything, but a  
10 very good baseline that people tend to truly  
11 appreciate, because it's understandable. The  
12 technology that Dan begged me to raise is our  
13 friend quantum computing, the big Q. People say  
14 that will outdo blockchain, it will outdo  
15 cryptography.

16           These are interesting claims, but there  
17 is a little bit of truth to the last one. So for  
18 those who want a little bit of nerdism at the end  
19 of your day, the whole idea is that you can be in  
20 multiple states at once. So if you have an atom  
21 or you have a state, and you have -- they actually  
22 call it a Qbit in the community. It doesn't know

1        what state it's in kind of ever. So if you think  
2        about the ability to run through every possibility  
3        instead of having to find one in several billion,  
4        at that point, there is at some point in the state  
5        of that atom that it will click, and you'll find  
6        the possibility. And that will literally enable  
7        you to "guess a key".

8                    I'm being very simple here. And if you  
9        can find a mathematical number, then you break  
10       cryptography. Now we are quite a ways from that,  
11       but not decades. I would say about one decade.  
12       Some of this is already being implemented. That  
13       doesn't mean you don't encrypt things from now  
14       until ten years from now and say I give up. It  
15       means please do encrypt things.

16                   When the bad guy gets in and takes cases  
17       and cases of your data home to another planet,  
18       you'll be able to be the one on the news that  
19       says, great, but it was encrypted, they got  
20       nothing because we were prepared and we were  
21       resilient. But going forward, we need to look and  
22       understand these new technologies.

1                   Blockchain cryptocurrency,  
2           cryptocurrency is just based on the ability to  
3           spin up lots of computers all over the world and  
4           have them use their power to create numbers that  
5           equate to currency because it's valuable. So it  
6           doesn't -- it's not a question of which currency,  
7           it's a question of how the technology's applied.  
8           My personal opinion is the best use of the  
9           ledgers, which is what they call blockchain, is in  
10          tracking.

11                   So anyone who's flown and uses one of  
12          the airlines that has the track my bags  
13          application, this is my favorite thing. I'm not  
14          as angry by the time the plane lands because I  
15          knew the bag didn't get on the plane, but at least  
16          it's getting tracked. They can do the same thing  
17          with vegetables now. So finding the E.coli in the  
18          spinach, that could have taken hours not weeks. A  
19          lot fewer people would have gotten sick.

20                   They do it with shipping, and expanding  
21          a lot of that work, it's all based on computing  
22          power and the ability to track the cryptocurrency.

1 They call it cryptocurrency because it's just  
2 spinning up a lot of computing power to do a lot  
3 of fancy math to enable you to claim not only the  
4 transaction, but the actual currency.

5 All of that is pretty much already here.  
6 So my message is threefold. One is let's continue  
7 working with you to take compliance to mean  
8 resilience. Use the investment that customers and  
9 financial institutions are making in compliance to  
10 actually be cyber resilient. And I would demand  
11 that of them as a regulator, and many already are,  
12 and it's nice to see that because you're helping.

13 I think the second part is look at the  
14 technology you're using. Almost everything you  
15 buy today is wicked connected. That's a favorite  
16 phrase, not technical, but if you look at it, it's  
17 got a USB somewhere. If you plug your cell phone  
18 in at an airport in one of those USB stands,  
19 please don't ever do that again. Those are  
20 actually little computers and they can transfer  
21 data right onto your phone. Just use the plug.

22 But think about every device you have

1 where it's connected, and the last part, think  
2 about where data flies all over. The ability to  
3 compute so quickly takes disparate datasets and  
4 puts them all together now, and creates newly  
5 available information from bits of data that were  
6 never available to be mined and analyzed before,  
7 and creates all new issues in privacy and  
8 compliance. All of a sudden new data, new  
9 information, new tracking is available that we  
10 never imagined.

11 So security and the thought leadership  
12 that you're putting in now needs to go into  
13 everything we do forward so that we are ahead of  
14 the game. And we're close now but we need to be  
15 ahead of the game with quantum and blockchain and  
16 there will be many, many things following. So  
17 thank you, again, very much for having me here  
18 today and the work that you do.

19 MR. GORFINE: Thank you so much, and  
20 thanks to both of our panelists. I'd like to open  
21 it up again to questions and discussion items.  
22 Hopefully, that's not me that's making that noise.



1       Phyllis, can you -- let's see if that helps it.  
2       It does. Okay. And I'm just going to tee up for  
3       consideration in picking up on this last thread,  
4       with all of these emerging area -- emerging  
5       technologies that we've talked about today, are  
6       there unique cybersecurity concerns and approaches  
7       that you all are thinking about?

8                     And on a related point, you know, are  
9       there emerging best practices that are either  
10      available, that could be kind of consolidated by a  
11      group like this, or could a group like this help  
12      to create best practices in some of these nascent  
13      areas? So I'll throw that out there and any other  
14      thoughts or questions as well. Chuck, we'll start  
15      with you.

16                    MR. OCHERET: I obviously talk too much.  
17      Thank you guys very much. Those were great  
18      presentations. This is an area that's near and  
19      dear to my heart, and actually, this is one of  
20      those cross-cutting concerns that basically brings  
21      together everything we've talked about so far  
22      today.

1                   One of the things I'm doing is building  
2           a whole machine learning as a service platform,  
3           and a lot of the data that we want to supply to  
4           that platform is all this data that's coming in  
5           from all these participants, you know, thousands  
6           of connections from participants all over the  
7           industry. And we need to really protect that  
8           data, but we also want to design predictive  
9           analytics and all kinds of other things. So how  
10          do you defend against leakage of that data or  
11          people seeing things that they shouldn't see? So  
12          it's -- we put an awful lot of thought into how we  
13          redact parts of the data, how we anonymize data,  
14          how we prevent, you know, people from anonymizing  
15          the data on two different days, and then being  
16          able to correlate things across anonymized  
17          datasets to do traffic analysis and say, well,  
18          this one is obviously that bank or -- so it's an  
19          enormous cross-cutting concern.

20                   One of the things that always jumps out  
21           is there, you know, any security measure that you  
22           take is great until you learn that it doesn't work

1       anymore, or that somebody's figured out how to get  
2       past that. So no one security measure works. You  
3       have to have multiple layers and multiple ways to  
4       audit, and as you said, it's not a matter of  
5       necessarily stopping it always, but detecting that  
6       it's happened and being able to then respond to  
7       that quickly. I guess that's mostly what I wanted  
8       to mention.

9                   MR. GORFINE: Okay, any other questions  
10       or comments from the members? Oh, I'm sorry, yes,  
11       Mr. Barry.

12                   MR. BARRY: I'm sorry, I just wanted to  
13       reiterate that, I appreciate that the nerd  
14       community is on our side here and trying to help  
15       out. But as we talk about kind of the move to  
16       distributed ledger technology, and a lot of the  
17       work that LabCFTC is doing is looking to bring  
18       some financial technology partners into the fray  
19       as well.

20                   And I think this is a whole lot of data  
21       that's going to be available to people, so I think  
22       we need to be mindful of the entitlement to that

1 data, how we access it, do we anonymize it. The  
2 enormous benefits across operational settlement  
3 and regulatory reporting are immense. So I think  
4 we have to go there, but we just need to be  
5 extremely mindful from the start about how we set  
6 these standards, and, you know, that's going to be  
7 a top one consideration, not something that we  
8 think about after the fact.

9 So I think definitely a subcommittee  
10 that is focused on this topic would be definitely  
11 recommended.

12 MR. GORFINE: Okay. Well, I will pick  
13 up on your recommendation there, and based on this  
14 discussion, I would move that the TAC recommend to  
15 the Commission that it consider creating a  
16 subcommittee on cybersecurity. Is there a second?

17 MR. OCHERET: Second.

18 MR. GORFINE: Okay. Are there any  
19 questions or comments? Okay. I now call for the  
20 vote on the motion. All of those in favor of  
21 recommending to the Commission that the Commission  
22 consider creating a subcommittee on cybersecurity,

1 please say aye?

2 COMMITTEE: Aye.

3 MR. GORFINE: All those opposed please  
4 say nay. Are there any abstentions? Okay, with  
5 that the motion carries. So I'd like to thank  
6 very much our panelists and, at this point, I'd  
7 like to turn this back to Commissioner Quintenz.

8 COMMISSIONER QUINTENZ: Thanks very  
9 much, Dan. First, congratulations of your  
10 proficiency with Robert's Rules of Order. You did  
11 a great job today. I guess I'd turn it over to  
12 Commissioner Behnam for any closing remarks.

13 COMMISSIONER BEHNAM: Thank you, first  
14 and foremost, thank you, Commissioner Quintenz,  
15 for your leadership, holding this meeting.  
16 Echoing the Chairman's comments, a really  
17 fantastic day where I think we all, at least  
18 speaking for myself, learned a lot and raised a  
19 lot of new questions which we have to address in  
20 the months and years ahead.

21 Thank you to Dan Gorfine, from my  
22 experience with MRAC and working with Alicia

1 Lewis, the DFO there, we know this is a lot or  
2 work so congratulations and well done. A couple  
3 of things that I just want to point out, and I'll  
4 keep this brief, a couple of analogies that were  
5 raised, first off, I love the baseball analogy.

6 But I think it's worth pointing out that  
7 one of the gentlemen who was used eventually got  
8 sort of at least suspected or was alleged to have  
9 performance-enhancing substances. So a fresh  
10 reminder that as we create these incubators, as we  
11 create these labs, as we create these sandboxes,  
12 it's important that we keep, you know, bad actors,  
13 manipulation, customer protections, fraud all on  
14 mind which I know we do. It's a priority for  
15 everyone at this table, but we have to beat that  
16 drum over and over again so that we support  
17 innovation, but also do it in a responsible way so  
18 that above all else integrity is maintained and  
19 kept for the markets.

20 The other analogy which I think Charlie  
21 mentioned was that the journey analogy which I  
22 think is great in the sense that we have to do

1       this together. Obviously, public-private  
2       partnerships were mentioned several times. One  
3       thing that I thought of, though, is as we do this  
4       together, which we should, and I think the  
5       Chairman has demonstrated his willingness to do  
6       this time and again for the past few months, I  
7       think it's important, at least from my standpoint,  
8       that you all coalesce around some core principles  
9       and some core ideas.

10                Because there clearly will be  
11       differences in terms of your business models and  
12       what your interests are. And I think it was  
13       mentioned earlier that none of us want to be  
14       picking winners and losers here. So for us to be  
15       good policymakers, and I think for the Hill as  
16       well, because eventually, you know, I think we all  
17       believe they're going to have to get involved in  
18       terms of statutory changes, it's going to be  
19       important to understand that there are some  
20       baseline principles that you all agree on, that  
21       may not be the optimal, but as a standard they're  
22       the best for the industry moving forward, and we

1 can build off of those.

2           So I think that's an important element  
3 to think about as a lot of ideas were thrown  
4 around today, productive ones, good ones, but  
5 things that I think we have to digest and sort of  
6 analyze before we make final decisions on how to  
7 move forward. So with that, thanks again to  
8 everyone on the panel. Look forward to 2018 and  
9 more important discussions, a lot of great  
10 subcommittees brought into order today so looking  
11 forward to discussions and the recommendations  
12 that come out of there. So thank you, again,  
13 Commissioner Quintenz, and Happy Valentine's Day.

14           COMMISSIONER QUINTENZ: Thank you,  
15 Commissioner Behnam. And I'd like to thank  
16 Chairman Giancarlo for spending such a good chunk  
17 of his day with us, and to Commissioner Behnam for  
18 spending the entire session with us. I'd like to  
19 echo the Chairman's comments that technology is a  
20 bipartisan issue, but the work of this committee,  
21 and I think the work of all the advisory  
22 committees, isn't owned by us. It's owned by you.



1                   And we look forward to all of the good  
2                   work, and it's going to be a lot of work, but all  
3                   of the good work that's going to be done over the  
4                   next 1, 2, 6, 12 months, possibly even longer,  
5                   around some great conversation that we had today.  
6                   And I'd like to bring up something that I think  
7                   Tim mentioned about hope versus reality. And I  
8                   think it's fun to talk about hope and the  
9                   possibility, and it gets us excited, but at the  
10                  end of the day it comes down to work. And  
11                  understanding what we need to do to realize, you  
12                  know, that vision, and I'm excited that I think,  
13                  at least in some ways, this is where that work is  
14                  going to get done. So thank you all for your  
15                  participation and for your future commitment to  
16                  getting into that work so, and, Dan, great job.  
17                  Thank you. So I'll turn it back over to you.

18                   MR. GORFINE: Thank you.

19                   COMMISSIONER QUINTENZ: And for those of  
20                  you that were too shy to eat your cupcakes on  
21                  camera, feel free to do that when the lights are  
22                  off. They're more in the back of the room. Don't

1 let them go to waste. Thank you.

2 MR. GORFINE: We were actually going to  
3 count to three now and all take a bite at the same  
4 time. All right, well, thank you all again for  
5 attending this TAC meeting. It's been incredibly  
6 interesting and productive. With that, I'd like  
7 to wish everybody a Happy Valentine's Day and this  
8 meeting is adjourned.

9 (Whereupon, at 3:58 p.m., the  
10 PROCEEDINGS were adjourned.)

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CERTIFICATE OF NOTARY PUBLIC

DISTRICT OF COLUMBIA

I, Carleton J. Anderson, III, notary public in and for the District of Columbia, do hereby certify that the forgoing PROCEEDING was duly recorded and thereafter reduced to print under my direction; that the witnesses were sworn to tell the truth under penalty of perjury; that said transcript is a true record of the testimony given by witnesses; that I am neither counsel for, related to, nor employed by any of the parties to the action in which this proceeding was called; and, furthermore, that I am not a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

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