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Securities and Exchange Commission
100 F St. NW
Washington, DC 20549-9303
Rule-comments@sec.gov

File No. S7-01-13

Re: Proposed Regulation SCI

Dear Securities and Exchange Commission:

Here are my comments on the proposed Regulation SCI:

In summary:

- The proposing release ignores how other jurisdictions deal with technology issues. NASA's Aviation Safety Reporting System provides a good model for disclosure of technology safety issues.
- The safe harbor should shelter all self-reported problems.
- This looks like Sarbanes-Oxley for exchanges – seemingly innocuous but with lots of hidden costs.

[1] I am also on the boards of directors of the EDGA and EDGX stock exchanges. My comments are strictly my own and don't necessarily represent those of Georgetown University, the University of Pennsylvania, EDGX, EDGA, or anyone else for that matter.

- The SEC should first designate itself as an SCI-entity, establish the policies and procedures called for in the proposal, have its compliance audited, and report on this compliance.
- Market participants have the right economic incentives to protect themselves from catastrophic events, but not necessarily to protect the market as a whole.
- Policies and procedures are useless without serious market-wide testing during trading hours.
- The entire market should be run entirely from backup sites at least once per year.
- Multiple competing exchanges are *de facto* backups for each other.
- Improved shock absorbers (a/k/a circuit breakers) are essential.
- The SEC should set a good example of useful disclosures by improving the clarity and readability of rule filings. In particular, useless duplication and redundancy should be avoided.
- The economic analysis reads like a lawyerly afterthought rather than part of a sound economic analysis leading to the rule.

**Introduction**

Proposed Regulation SCI (Systems Compliance and Integrity) is designed to deal with technology risk in the securities markets. It extends the SEC's formerly voluntary Automation Review Policy (ARP) and makes it mandatory for national securities exchanges and various other Self-Regulatory Organizations (SROs) such as FINRA and MSRB. It would also apply for the first time to certain Automated Trading Systems (ATSs). The covered entities are known as "SCI-entities." SCI-entities would effectively be required to follow various computer industry standards, among other things. This proposal follows the traditional SEC approach of requiring policies and procedures and lots of documentation to ensure that the technology systems don't break and have reliable backups. Technology glitches and breakdowns ("SCI-events") would have to be reported to the SEC. It would also permit SROs to require members to participate in testing.

The SEC has adopted its traditional policies and procedures approach to the problem. In short, regulated entities have to develop paperwork that says their systems must not fail, and they must produce additional paperwork to document compliance with the paperwork. Thus, the SEC will be able to monitor compliance by sending in relatively low-cost but not necessarily technically skilled bureaucrats to do "check-the-box" inspections. And the SEC will be able to tell Congress and the public that it has Done Something to address market technology issues. And when the systems do fail (as all human built systems will eventually), it will be *prima facie* evidence that the policies and procedures were not followed, invalidating the alleged safe harbor provisions in the proposal, so that enforcement actions can be taken against the offending entity.

Unless the SEC (and Congress) devote sufficient resources to hiring enough really skilled technical people (and they are not cheap!), this will devolve into a paperwork exercise with little added benefit to the markets. The entities will develop policies and procedures that protect themselves from bureaucracy risk, but such policies and procedures will not protect the market from the complex interactions between firms that will be the locus of the next big mess.

**The SEC is not the only jurisdiction that deals with technology risk.**

The proposing release, despite its massive size and repetitive verbiage, does not really analyze how other government regulatory agencies in the US and elsewhere deal with similar technology risks. Technology risk is a very real life-and-death problem that affects aviation, nuclear power plants, the electricity grid, the telecommunications sector, medical devices, and banking. Indeed, the proposing release shows little evidence that the agency has seriously tried to find out and examine how other agencies deal with critical technology risks.[2]

The proposal does reference various computer industry, NIST, and FFIEC standards, along with SEC releases such as the 2003 Interagency White Paper.[3] However, referencing a few purported industry standards is not the same as analyzing what other agencies and jurisdictions are actually doing with respect to fostering the creation and adoption of best technology practices. The SEC should have examined the policies and procedures used by other regulatory jurisdictions to foster technology that does not fail.

The SEC is not the first entity to be faced with this problem, and it could learn a lot from other agencies about best practices in this field. **In general, I believe that the SEC's cost-benefit analysis will have a better chance of withstanding judicial scrutiny if the SEC regularly demonstrates that it has carefully considered – and documented in its rule proposals - possible solutions to a problem that other jurisdictions have tried. I recommend that the SEC do this in all major rulemakings.** Such an analysis should be in the main body of the text, rather than in some perfunctory section in the back. This will increase the public's confidence that the SEC has truly considered these other possibilities rather than just assign some inexperienced junior person to write something so that it appears that the SEC has properly considered costs and benefits.

**NASA's Aviation Safety Reporting System provides a good model for disclosure.**

Market crashes don't kill people, but airplane crashes do. The FAA and NASA have long dealt with such life-and-death technology issues, and today commercial aviation has an excellent safety record. The SEC should examine NASA's Aviation Safety Reporting System as a model for how to treat SCI issues and incidents.[4] It is a non-punitive system for reporting problems that encourages self-reporting of aviation safety issues. Individuals are encouraged to report safety issues, and the FAA promises to waive

[2] At the October 12, 2012 Roundtable, Technology and Trading: Promoting Stability in Today's Markets, the Commission had exactly one (!) non-industry panelist, Dr. M. Lynne Markus, a computer software expert from Bentley University. http://www.sec.gov/news/otherwebcasts/2012/ttr100212-bios.htm There were no panelists from the FAA, NRC, FERC or other agencies that face similar technology risks.

[3] See Table A, page 100 of the proposing release. http://www.sec.gov/rules/proposed/2013/34-69077.pdf The White Paper is at http://www.sec.gov/news/studies/34-47638.htm.

[4] See http://asrs.arc.nasa.gov/

penalties in such cases.[5] This creates a safe environment in which critical information can be shared without worrying about potential consequences of sharing the information.

For example, suppose that a pilot reports "I pushed the wrong button by accident and almost crashed as a result." Clearly, that is pilot error, but human nature would be for the pilot to stay silent if he or she thought that no one would find out about the error. However, this near miss might indicate that the human engineering of the button location could be improved by changing the shape or location of the button, or by adding a fail-safe system to prevent the accidental pushing of the button. For this reason, it is in the public interest to create a system that does not punish the pilot for the mistake, but instead motivates the pilot to report the mistake so that future mistakes by others can be prevented.

The SEC should follow this example.

**The safe harbor should shelter all self-reported problems.**

The proposal contains a "safe harbor" provision protecting SCI entities from enforcement activities in the event of an SCI-event as long as they have taken certain steps. As proposed, the safe harbor only applies if the SCI entity "Has reasonably discharged the duties and obligations incumbent upon the SCI entity by such policies and procedures." However, as the required policies and procedures are designed to prevent SCI-events, the mere existence of such an event is *prima facie* evidence that the SCI-entity has messed up somewhere and the putative safe harbor would not apply. Catch 22.

There is a natural tendency for humans to cover up their mistakes and not report them to the authorities. Nobody wants to look bad. There is also the fear that reporting mistakes to an enforcement-focused agency like the SEC will generate expensive enforcement actions and fines. Even though entities and individuals will have a duty to report SCI-events, they may still be reluctant to self-report important relevant information that would reveal serious weaknesses for fear of adverse actions. In order to improve the quality of the information, the SEC should grant immunity from enforcement penalties for all problems that are self-reported by entities as well as individuals. This will improve the willingness of entities to report valuable information to the SEC and to the rest of the industry. As mentioned before, publicly disclosing SCI-events will alert other SCI-entities to vulnerabilities and help all entities prevent SCI-events.

It should also be noted that the proposed safe harbor for individuals in the Regulation SCO proposal only applies to their actions of aiding "any other person." It does not apply to any actions of the reporting individual. This safe harbor should be clearly extended to actions by the reporting individual for the reasons given above.

[5] To be precise, the ASRS web site states: "The FAA offers ASRS reporters further guarantees and incentives to report. It has committed itself not to use ASRS information against reporters in enforcement actions. It has also chosen to waive fines and penalties, subject to certain limitations, for unintentional violations of federal aviation statutes and regulations which are reported to ASRS. The FAA's initiation, and continued support of the ASRS program and its willingness to waive penalties in qualifying cases is a measure of the value it places on the safety information gathered, and the products made possible, through incident reporting to the ASRS." http://asrs.arc.nasa.gov/overview/confidentiality.html

**Forced disclosure of SCI-events will alert other entities about potential problems.**

One of the major benefits of this proposal could be better sharing of information about technology problems. Instead of keeping information about hardware failures, system intrusions, and software glitches private, sharing the information will alert others in the industry about such problems and help to reduce system wide costs of diagnosing problems, as well as result in improved responses to technology problems. These will serve as warnings to the other SCI-entities to stay vigilant to prevent similar problems from occurring on their platforms. This extremely important benefit does not come clearly through in the proposal amongst all of the other repetitive verbiage.

**Market participants already have the right incentives to do everything possible to prevent catastrophic firm-killing mistakes.**

Technology breaks. We need to design our technologies to minimize failures and to contain the damage when (not if) they fail. Technology failures in our financial markets can lead to catastrophic financial losses, as demonstrated by the losses associated with the Flash Crash, Facebook IPO, and the Knight Capital Group incident.

The prospect of such an instant-death event is sufficient motivation for firms to take every appropriate precaution against such catastrophic failures. It is unlikely that additional paperwork from the SEC will provide any additional protection against such failures at the individual firm level.

One could argue that the limitations to liability for incidental and/or consequential damages commonly found in contracts between SROs and their customers as well as in SRO rules limits these incentives. However, as the Facebook IPO glitch has demonstrated, commercial considerations and litigation exposure severely reduce any protections from liability imposed by such rules. Despite the seeming cap on liability found in its rules, NasdaqOMX has offered to pay much higher amounts.[6] Nevertheless, the possibility of an instant catastrophic loss is still a far more potent incentive than any amount of SEC-mandated policies and procedures.

**Market participants do NOT have the right incentives to deal with complex interactions between firms.**

However, our financial market today is a complex network that connects many different firms. Firms may operate in such a way that prevents each firm from suffering a catastrophic financial meltdown, but the interactions between firms may result in a catastrophic event.

The Flash Crash is a prime example of how such interactions between firms can result in a financial

[6] See my comment August 23, 2012 comment letter to the SEC on this topic, http://www.sec.gov/comments/sr-nasdaq-2012-090/nasdaq2012090-10.pdf.

catastrophe. The market on May 6, 2010 had already suffered severe losses as a result of market concerns over events in Europe and was experiencing high volatility. Firms that normally provide liquidity in the S&P 500 E-mini futures contract consequently reduced the amount of liquidity they provided in an uncertain situation. When large sell orders arrived at the CME, there was insufficient liquidity to absorb the sell orders and the price of the E-mini plummeted. Normal arbitrage activity between the derivatives and cash markets contributed massively to an already high level of message traffic on trading systems.

The high level of message traffic led to numerous well-documented system delays in various trading and reporting systems.[7] Prices reported on a variety of trading platforms became disconnected from one another. Concerns about "data integrity" induced even more liquidity providers to stop providing liquidity in a very uncertain situation. This lack of liquidity from firms that normally stabilize markets led to a chaotic situation in which the overall market mechanism failed. The stock of Accenture, which shortly before had been trading at over $40 per share, traded at a penny.

Over 20,000 trades were later cancelled as a result. ETFs were particularly hard hit. The stock of the Vanguard Total Stock Market ETF (VTI) – which represents the entire U.S. stock market -- traded as low as $.15. ETF pricing and liquidity are based on electronic arbitrage activity between the ETFs and the cash markets for the underlying constituents. This arbitrage activity depends upon reliable data feeds and reliable execution certainty in order to allow the arbitrageurs to operate. This arbitrage activity is a very thin margin business in which the liquidity providers cannot afford to take major risks. When there is evidence of a system malfunction somewhere in the market network, the rational thing for anyone to do is to immediately stop trading until the source of the malfunction is identified.

The Flash Crash is a classic example of how individually rational and appropriate behavior – pulling out of the market when the data appear inaccurate – can sometimes lead to a catastrophic result. The technical glitches that exacerbated the situation were seemingly minor delays in message traffic and inconsistencies between different data feeds, but they were enough to accelerate a chain of failures. The liquidity providers did the proper thing, shutting down when there was evidence of a problem somewhere.

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[7] See the SEC and CFTC joint report, "Findings Regarding the Market Events of May 6, ,2010." http://www.sec.gov/news/studies/2010/marketevents-report.pdf., page 36:

> *Whenever data integrity was questioned for any reason, firms temporarily paused trading in either the offending security, or in a group of securities. As a firm paused its trading, any liquidity the firm may have been providing to the market became unavailable, and other firms that were still providing liquidity to the markets had to absorb continued order flow. To the extent that this led to more concentrated price pressure, additional rapid price moves would in turn trigger yet more price-driven integrity pauses.*
>
> *Some firms experienced their own internal system capacity issues due to the significant increase in orders and executions they were initiating that afternoon, and were not able to properly monitor and verify their trading in a timely fashion.*

See also Chapter 20, Panic Ticks, in *Dark Pools* by Scott Patterson for more on the data integrity issues during the Flash Crash.

Yet this pullback by the liquidity providers (who are often vilified as "high frequency traders") occurred when other traders kept on trading, leading to a chaotic partial failure of the market network.[8]

Fortunately, the market quickly recovered. This self-healing feature is one of the great properties of free markets. When prices are out of line there is a huge profit opportunity for traders to make money by buying low and selling high. However, not all of the bad trades were busted. Some investors who had placed stop loss orders found those stop orders executed at low prices, but not low enough for the trades to be busted.

**Such externalities are a legitimate reason for regulation.**

The lesson here is that technology glitches –even seemingly minor ones – can have enormous impacts far beyond the firm involved. In economics terminology, technology risk imposes externalities on other market participants. In other words, technology risk is a lot like pollution in that it imposes costs on other people that are not born by the person creating it. This means that the private market will not necessarily create the proper incentives for each firm to provide the socially optimal level of technology risk prevention, and that government regulation may improve the outcome. For example, an exchange may not be concerned about preventing a lag of a few seconds in a data feed at a time of unusually high volume. It would not be cost-effective from the exchange's perspective to maintain expensive capacity that is needed but a few seconds each year and that would not generate any additional revenue. However, such lags were a contributing factor in the data integrity concerns that exacerbated the damage the Flash Crash caused to the equity market.[9] Likewise, a firm may logically believe *its* systems are robust and well tested, and refrain from participating in market-wide tests that could identify unstable complex interactions between firms.

There is a role for regulation here. The question is how to do it in the most cost effective manner.

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[8] On August 1, 2012, the opposite occurred, and an important liquidity provider did not stop trading quickly enough. Knight Capital Group, an important Designated Market Maker on the NYSE and a major NASDAQ market maker, had installed new software on the first day of the NYSE's RLP program, and the software malfunctioned. It took some time for Knight to pull the plug on the errant software, leading to enormous losses at the firm.

[9] The SEC has taken action against exchanges for disparities with data transmissions during the Flash Crash and at other times. See http://www.sec.gov/litigation/admin/2012/34-67857.pdf. The SEC noted "Although the data delays came to light during the inquiry regarding the Flash Crash, the delays occurred after the start of the Flash Crash and did not cause the extreme volatility that day." These particular delays may not have *started* the Flash Crash, but they are a symptom of the data integrity issues that led some market participants to pull out *during* the event. This withdrawal of liquidity clearly exacerbated the volatility even if it did not start the chain of events in the first place. Note that most of the busted trades in the equity market occurred AFTER the data delays commenced. The Flash Crash report noted on page 77: "Between 2:44:45 p.m. and 2:46:29 p.m. on May 6, NYSE quotes in the 1665 Symbols had average delays to the CQS of over 10 seconds." The first trade in Accenture that was busted occurred at 2:47:51, more than two minutes after the E-Mini contract had begun its rebound and by which time the E-Mini had regained the majority of ground lost in the Flash Crash.

**This could turn out to be Sarbanes-Oxley for exchanges.**

The SEC is in grave danger of repeating the botched implementation of the internal control provision of Sarbanes-Oxley §404. Following the Enron and WorldCom scandals, Congress passed Sarbanes-Oxley and included the seemingly innocuous provision that public companies should provide a report about the quality of their financial controls. Sounds reasonable. Who could object to the idea that public companies should have good financial controls? Congress, as it usually does, left the details up to the SEC and the then brand new PCAOB. The attitude of then-high level officials at the SEC was "We didn't think it was a big deal." This led to the *de facto* adoption of the Committee on Sponsoring Organizations (COSO) standards, as interpreted by the accounting profession. The SEC woefully underestimated the cost of compliance, and auditing and compliance costs of public companies jumped substantially.

The SEC is in grave danger of making the same mistake here, of adopting a seemingly innocuous rule with the best of intentions that adopts without much thinking various standards without comprehending the real costs and benefits of the rule.

At first it seems reasonable to state that firms should comply with various industry "standards." Who could object? The effect of the proposal is to anoint the standards in Table A. One of the individual standards is 457 pages.[10] Many of the proposed standards cover similar or overlapping areas. When the "standards" differ in their approach, which one prevails? If an SCI-entity complies with one but not the other, does the safe harbor still apply?

The actual text of the proposed rule does not specify particular standards. Will the safe harbor apply to any industry standard that passes the definition? If so, I could see the creation of the Race-to-the-Bottom Standards Organization to come out with lax standards. What is more likely is that the SEC will attempt to run around the safeguards in the Administrative Procedures Act by creating unwritten rules in which certain standards are *de facto* adopted without a thorough and public analysis. Any entity that does not adhere to the *de facto* (but not officially adopted) standards will face regulatory consequences severe enough to get them to toe the line.

**The SEC itself should first comply with Reg SCI to learn the true costs.**

The SEC is the primary overseer of the national market system in the United States. As the performance of the U.S. national market system is affected by the interactions between numerous regulated and unregulated entities, the SEC has a legislative duty to ensure the fair and orderly operation of the national market system. This includes the technical stability of the system as a whole. Even if individual entities within the national market system adhere to industry standard technical standards of data security, disaster

[10] http://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-53r4.pdf

recovery, and so forth, the market as a whole may still exhibit technical instability due to the highly nonlinear interactions between entities in the system.

Therefore, the SEC should first deem itself an SCI-entity and make sure that it has policies and procedures in place to ensure the fair and orderly operation of the national market system, that it document those procedures, and that it regularly report its compliance with those policies and procedures to senior management (e.g. the Commission). The annual compliance review should be performed by an outside entity such as the Government Accountability Office (GAO) or an outside consulting firm.

The SEC's experience in complying with its own rules will provide it with valuable experience in estimating the true costs of compliance. This will help to make its final cost-benefit analysis more believable.

**The referenced technical standards deal mostly with firm-level risks, not market-wide instability.**

Table A of the proposed regulation anoints a list of various off-the-shelf industry and government standards as evidence of compliance with Reg SCI. These off-the-shelf standards, as well meaning as they are, deal mostly with technology risks at the level of the individual entity, and do not take into effect the technological and economic stability of the U.S. market network as a whole. If the SEC is serious about dealing with technology risks, it must look beyond mandating that individual firms have good technology and understand that the SEC itself is the real operator of the U.S. market network as a whole.

**Policies and procedures are nothing without serious market-wide testing.**

As I mentioned before, each entity already has the proper incentives to protect itself from catastrophic failures, but not the right incentives to protect the market as a whole from the complex interactions among different entities in a complex partial failure of the market network. **The focus, then, should be on dealing with these complex interactions.** This requires 1) serious market wide testing under various partial failure scenarios, and 2) improved shock absorbers (a/k/a/ circuit breakers) to deal with the inevitable future glitches that will occur.

**Required member participation in testing is essential.**

I have personally witnessed market-wide testing performed by the exchanges. Although the exchanges themselves engage in thorough testing, their members do not always participate, and the testing cannot possibly simulate every possible thing which can go wrong. The Facebook IPO is a classic example of this. Despite all of the widely reported testing that NASDAQ and the industry did, it still blew up.

It is vital that as many firms as possible participate in testing with conditions as realistic as possible.

The ability of SROs to require their members to participate in testing is an important step forward in making sure that testing is as realistic as possible. **I think that this is one of the most valuable parts of Regulation SCI and will do the most to ensure improved market network reliability.** Indeed, I think this is the only part that will seriously reduce the risk of the headline-grabbing meltdowns that reduce investor confidence.

Some SROs might be reluctant to force participation of major customers in testing for fear of alienating those customers. For that reason, Regulation SCI should require participation in industry testing by any entity that normally generates more than a certain threshold of trading volume.

**Important participant connections to backup facilities are essential.**

Most of the most important participants in the market are co-located in stock exchange data centers. In the event that the market has to operate from backup facilities, it is essential that these important players be able to operate as well. If important liquidity providers and arbitrageurs do not participate in the market, excessive fluctuations in prices may occur, as we witnessed during the Flash Crash. For this reason, SROs should be permitted to require certain members to not only participate in backup testing, but to actually connect to the backup data centers as well.

**Each entity should conduct periodic tests of backup plans during actual trading.**

No matter how much testing is done, no test environment can possibly test every possible combination of message traffic, order types, and other situations. For this reason, each entity should be required to run entirely under its backup plan at least once each year for a full trading day. BATS set a good example by operating from its backup site on March 14, 2013.[11] Every SCI-entity should be required to do this at least once a year.

**The entire market should be run from backup sites at least once a year.**

Likewise, after each market has tested its backup capacities with live testing during market hours, the entire market should run off of the backup sites at least once per year. September 11 is a natural day to do this as a memorial to those who lost their lives in that event and the brave activities of the rescue workers.

**Improved shock absorbers (a/k/a/ circuit breakers) are essential.**

After the Flash Crash, the markets have instituted single stock circuit breakers and are currently testing improved "limit-up limit-down" procedures. Market-wide trading halts have also been revamped. There is a natural tendency at this point to say "mission accomplished" and go on to other concerns. This

[11] See http://www.tradersmagazine.com/news/bats-exchange-operates-from-backup-facility-111003-1.html.

would be a big mistake. The new procedures are not yet battle tested, and I have serious concerns about how they will work when the next big tsunami of market activity overwhelms the market mechanism. I am particularly concerned that the large number of computations needed to implement limit-up limit-down will be problematic during periods of unusual market stress and high trading volume. Furthermore, I do not believe that there is a good understanding of how the single stock and market wide circuit breakers will interact with the derivatives market mechanisms during a period of severe system stress.

No matter how good the policies and procedures are, sooner or later there will be a chain of freak events that overwhelm the market. Occasional tsunamis of trading activity have overwhelmed our markets long before computer systems. There will be additional tsunamis in the future We need to do our best to anticipate these events and prepare contingency plans for when – not if – they occur. We need to make sure that the entire complex market network, and not just individual firms, operates in a "fail-safe" condition when this occurs.

**Complex networks fail in hard-to-predict ways, so we need some human judgment.**

Our market as a whole is a highly complex network that is evolving daily. Sooner or later this network will be hit with some kind of Big Shock that will stress its technology systems to the max. In such a situation, networks can fail in hard-to-predict ways that could lead to a cascading failure as we saw in the Flash Crash. It is inevitable that eventually such a Big Shock will hit, either from external events, technology failures, or intentional attacks.

Since the actual mode of failure is hard to predict, the correct response for every case is impossible to specify in advance. There needs to be some flexibility in the market-wide circuit breakers to allow human judgment to decide when and how to re-open the market. For example, if another Flash Crash type event leads to a market shutdown that would close the market for the rest of the day, it might be appropriate to re-open the market for a special 30 minute trading session that would allow the market to determine appropriate end-of-day prices to use for mutual fund pricing and marking to market of positions. Or it might not. We need to have procedures in place to figure out which humans should make that judgment. Ideally, the SROs would consult with each other and the SEC, but such emergency plans need to be worked out in advance and rehearsed or chaos will result when the next big shock hits.

**Market re-opening procedures after trading halts should be like the usual morning open with pre-market trading permitted.**

I am also concerned that the re-opening procedure will not be robust enough to produce accurate prices with a smooth re-opening process that will reassure investor confidence in a time of trouble. With the market totally closed, there is no price discovery at all because there is no trading. Although opening auctions sound nice in theory, imagine the problems that market participants will have participating in 4,000 auctions simultaneously during a time of high market turmoil when participants are lacking the information about prices normally supplied by pre-open trading . It will be impossible for the humans involved to keep up, and a messy re-opening is the likely result followed by violent swings in the prices of individual stocks.

I propose instead that we use the well-oiled system that we use daily to open the markets. The exchanges turn on their computers in the early hours for pre-open trading that is open primarily to sophisticated investors. Their trading provides battle-tested information about the appropriate market price, and this information informs the opening auction. In the meantime, retail and other orders accumulate for an opening auction that usually produces a fair opening price.

**Whatever system is used to re-open after market wide trading halts, it needs to be rehearsed regularly with realistic testing and mandatory participation from all major industry participants.** Failure to do such industry-wide fire drills will result in enormous headaches when a serious problem triggers market-wide trading halts.

**Testing should be coordinated with the derivatives markets**

The Flash Crash emphasized the close linkages of the equity and derivative markets. It is a sad fact of life that our fragmented regulatory system impedes a comprehensive approach to many issues affecting the industry, including technology stability. The SEC should work with the CFTC to adopt a coordinated approach to dealing with SCI issues across the financial markets. This would include having the derivatives exchanges participate in the same rounds of testing as the equity markets.

Coordination with other agencies is also important for reducing the overall costs of compliance. Large firms are regulated by a number of different regulatory agencies, many of which have or will have their own regulations on technology integrity. Duplicative, overlapping, or worse yet conflicting regulations will increase the complexity of the system and the costs of compliance with no benefit for ultimate technology integrity.

**Multiple exchanges are *de facto* backups for each other.**

Our market network is a very competitive market structure in which no one exchange dominates the market. If one exchange goes down, the other exchanges have more than enough capacity to handle the trading volume. This has strong implications for the amount of backup required in the system. Reg SCI does not recognize this cost-saving reality.

One important economic question is "How much backup is enough?" One of the beautiful things about our competitive (some would use the pejorative term "fragmented") market structure is that no one entity or data center handles more than about 1/4$^{th}$ of U.S. equity volume. There is plenty of excess capacity in the system to handle normal trading volumes should one or more exchanges go off line. It is not therefore necessary that *each* exchange have totally redundant backup facilities as long as the market network as a whole has sufficient capacity.

The proposal adopts off-the shelf industry standards without taking into consideration the fact that already existing idle capacity in the industry provides a *de facto* backup.

Note what happened in the options market on April 25, 2013, the day that the CBOE experienced a major technology outage that delayed its opening by several hours. [12] The other exchanges eagerly picked up the slack and the total number of option contracts traded on April 25 was comparable to other days.

[12] See "CBOE Preaches to the Choir as 'Glitch' Crashes Exchange" by Nikolaj Gammeltoft, April 26, 2013, http://www.bloomberg.com/news/2013-04-26/cboe-preaches-to-vegas-choir-as-glitch-crashes-exchange.html.

Here are the daily volumes for the U.S. options industry during that week:

| US Options | 4/26/13 | 4/25/13 | 4/24/13 | 4/23/13 | 4/22/13 |
|---|---|---|---|---|---|
| Equity | 14,133 | 16,508 | 15,570 | 16,091 | 12,840 |
| Index & Other | 1,048 | 1,049 | 1,197 | 1,562 | 932 |
| **Total** | **15,181** | **17,558** | **16,767** | **17,652** | **13,771** |

Source: Barclays' Daily Volume Snapshot for April 29, 2013

However, even though overall option market volume was roughly unaffected, the CBOE did suffer a major loss in market share on April 25. Its market share in equity options declined from 17.7% to 3.2% on that day.

Here are the daily market shares for that week:

**US Equity Options Market Share Overview**

| Equity Options | 4/26/13 | 4/25/13 | 4/24/13 | 4/23/13 | 4/22/13 |
|---|---|---|---|---|---|
| NYSE Amex | 15.5% | 17.6% | 15.7% | 13.7% | 14.3% |
| NYSE Arca | 14.2% | 14.5% | 11.4% | 13.4% | 12.6% |
| **NYSE Group** | **29.8%** | **32.0%** | **27.2%** | **27.1%** | **26.9%** |
| Nasdaq Options Market | 9.7% | 9.5% | 8.8% | 9.5% | 9.5% |
| Nasdaq PHLX | 16.0% | 20.7% | 22.3% | 19.4% | 14.8% |
| NOBO | 1.0% | 1.4% | 0.9% | 1.1% | 1.1% |
| **Nasdaq OMX Group** | **26.6%** | **31.6%** | **32.0%** | **30.0%** | **25.5%** |
| **BOX** | **2.2%** | **3.0%** | **2.3%** | **2.4%** | **2.8%** |
| **BATS** | **4.7%** | **4.7%** | **4.2%** | **4.7%** | **4.8%** |
| CBOE | 16.8% | 3.2% | 17.7% | 16.9% | 19.5% |
| C2 | 2.3% | 2.9% | 2.0% | 3.0% | 2.2% |
| **CBOE combined** | **19.1%** | **6.0%** | **19.8%** | **19.9%** | **21.7%** |
| **ISE** | **17.1%** | **22.0%** | **14.2%** | **15.6%** | **17.8%** |
| **Index Options** | **4/26/13** | **4/25/13** | **4/24/13** | **4/23/13** | **4/22/13** |
| CBOE | 96.0% | 90.6% | 97.2% | 96.7% | 94.0% |
| C2 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **CBOE combined** | **96.0%** | **90.6%** | **97.2%** | **96.7%** | **94.0%** |

Source: Barclays' Daily Volume Snapshot for April 29, 2013

The proposal does no cost-benefit analysis that takes into consideration the already existing industry excess capacity as backup. It is essential that the Commission explicitly examine this in meeting its obligation to appropriately consider the costs and benefits of this proposal.

**The Economic Analysis still looks like a perfunctory afterthought.**

The SEC has paid lip service to the idea of improving the economic analysis of its rulemakings, and of incorporating economic analysis early in the rulemaking process rather than as an after-the-decision formality to justify a decision. However, if this is truly the case, it does not show in this written rule proposal. The Economic Analysis that starts on page 271 is stuck in the back, not in the beginning. This placement itself makes it look like an afterthought. The section begins with excessive repetition of previously stated items. Such repetition could easily be misinterpreted as a lawyerly trick to add bulk to the section to make it seem more thorough. It takes several pages of eye-glazing repetition before there is a brief but useful discussion of incentives and the limits of competition beginning ten pages later on page 281.

The analysis leads off with the argument that SCI entities may be reluctant to fess up publicly to their glitches and that market forces would do a better job of choosing counterparties with better disclosure. This is one of the weakest arguments in favor of adopting this proposal. Market participants interact repeatedly with each other on a real-time basis and are acutely aware of glitches when they occur. Reputations for technical quality and lack thereof quickly get around, even if there are no official announcements on each glitch. Indeed, promptly reporting system problems is one way for markets to develop a reputation for openness, transparency, and reliability.

It isn't until page 290 that the analysis gets to the largest and most important issue: the quality of market data, and the possibility of severe economic disruption as a result of a major glitch. Burying this item 19 pages into the Economic Analysis after such a weak opening discussion of disclosure gives the impression that the Commission (or at least the writer of this part of the release) really does not have a good grasp on the economics of the problem. This does not bode well for judicial acceptance of the cost-benefit analysis or for reassuring the public that the SEC knows what it is doing. And even this section does little to emphasize the importance of good quality market data and the "analysis" quickly degenerates into a repetitive and granular discussion (with lots of wordy repetition of the proposal) of changes to IT systems. Page 298 is another one of those pure repetition pages. Page 309-311 are also almost pure repetition of what the proposed rules would do with little additional content. The Economic Analysis section then peters off without any clear conclusion.

It could be worse, however. In other SEC releases, such as the proxy access proposal, the economic analyses were literature reviews of scholarly articles with limited direct relevance to the issue at hand.[13]

**Failure to identify and assess alternatives violates Executive Order EO12866.**

[13] http://www.sec.gov/rules/final/2010/33-9136.pdf.

Neither the Economic Analysis section nor any other section contains a serious discussion or analysis of how other jurisdictions have dealt with similar technology risks. Instead, the whole proposal basically says "We will take our formerly 'voluntary' (ahem) ARP program and make it a formal rule and apply it to more entities without seriously thinking about how other jurisdictions deal with such risks."

The SEC stands a much better chance of having its analysis withstand judicial and public scrutiny if it conducts and documents an analysis of how other jurisdictions address similar problems. This isn't just a good idea, it's the law. Executive Order EO12866 §1(b)(3) and §1(b)(8)clearly requires the identification and assessment of available alternatives. Likewise, §1(b)(8) requires agencies to "base its decisions on the best reasonably obtainable scientific, technical, economic, and other information concerning the need for, and consequences of, the intended regulation." How can the agency assert that it is using the best reasonably obtainable scientific and technical information if it hasn't documented that it has looked at what other agencies are doing with similar problems?

**Cost-benefit analysis**

The cost-benefit analysis section still appears to be a formulaic "check-the-box" exercise to provide the appearance of meeting various legal requirements. In particular, estimates of the costs and benefits of alternative approaches used by other jurisdictions are glaringly lacking. As stated above, the cost estimation will be much more believable if the SEC designates itself and SCI-entity and has itself examined periodically by an external party.

The benefits are summarized on pages 304-305. In short, they are 1) fewer disruptions affecting less than the whole market, 2) fewer headline grabbing events like the Flash Crash and the Facebook IPO, and 3) better information about system quality, and 4) fewer market-wide shutdowns as occurred during Hurricane Sandy, and 5) reduced monitoring costs for the SEC.

**Measuring benefits**

The benefits of reducing outages and major technical snafus are pretty straightforward:

Catastrophic failures in exchange systems are extremely costly, both in terms of direct losses to participants and in reduced investor confidence in markets. The outflows from the US equity market after the Flash Crash are a symptom of this, although it is difficult to separate concerns about the overall health of the economy and the market from concerns about the technological integrity of the U.S. market mechanism. Even a modest reduction in the overall risk of such a meltdown is quite cost effective to the economy as a whole.

As far as the cost of catastrophes, just look at the losses alleged during the Facebook IPO, along with the ongoing legal and administrative costs in cleaning up the mess. The SEC has received comment letters

on NasdaqOMX's reimbursement proposal which quantify some of the losses and can easily be used as a basis to estimate the total size of the losses. UBS alone alleges that it lost over $350 million.[14]

Similarly data from the Flash Crash can be used to illustrate potential losses from a serious technology glitch. The SEC-CFTC preliminary report indicates trades executed at losses total $14 billion.[15] This is admittedly a very crude measurement, but it certainly demonstrates the magnitude of the potential losses from a major event. And most of these losses were from trades that were NOT later busted.

As far as costs of system outages such as during Hurricane Sandy, one can look at total industry revenue on a daily basis to put a lower bound on the damages per day of outage. SIFMA indicates total FINRA-member equity commissions at approximately $47 billion per year in 2010.[16] That comes to approximately $187 million per trading day. As the industry cost structure is one of fixed cost in the short run, the lost revenue from the two days of approximately $374 million is indicative of losses suffered by the industry in terms of commissions alone. This does NOT include lost trading profits to investors, or loss of utility from being unable to hedge risk, monetize holdings, or otherwise trade.

**Other comments: Even electronic markets are made of people, not machines.**

There was some criticism of the shutdown of the U.S. equity market during Hurricane Sandy despite the test of the backup systems shortly before the hurricane. I must admit that I was at first disappointed at the closure because it would have been a good live test of our backup systems. **However, the closure during Hurricane Sandy was exactly the right thing to do.**

Even if all of the exchange backup systems worked perfectly and could have been run from afar with no human involvement whatsoever, there are still thousands of flesh-and-blood humans who work in the financial markets in the New York City area. This includes people who work on buy-side and sell-side desks, as well as those who work at firms that provide liquidity to the market place. Even though most liquidity is now delivered by machine, there are real people who are closely watching what those machines are doing.

If the equity markets had stayed open, these humans would have been under considerable pressure to show up for work under dangerous conditions. Even if they could have worked from home, they still

[14] For example, see the November 12, 2012 comment letter from Mark Shelton of UBS America http://www.sec.gov/comments/sr-nasdaq-2012-090/nasdaq2012090-22.pdf. UBS alleged that it lost more than $350 million and that total losses exceeded $500 million. The class action bar has also alleged numerous losses. For example, see http://www.zamansky.com/cases/facebook-nasdaq-negligence-class-action.html and http://www.zamansky.com/cms/wp-content/plugins/fresh-page/files_flutter/1339540284NASDAQFirstAmendedComplaint6-12-12FINAL.pdf.

[15] http://www.sec.gov/sec-cftc-prelimreport.pdf Table 8.

[16] http://www.sifma.org/uploadedFiles/Research/Statistics/StatisticsFiles/FI-US-Industry-Financial-Results-SIFMA.xls

would have been distracted from taking the steps then needed to take in order to protect themselves and their loved ones from harm. Human safety must take precedence over market operations.

As much as I love our financial market and love to extol how beneficial our markets are to society, I must admit that we can live without them for a day or two. After all, we do shut down in an orderly manner every night and also for weekends and holidays. We shut down for a day to mourn the death of a former president. The allocation of capital and efficient risk transfer do not seem to suffer much from such predictable and orderly closings. An occasional orderly closing when a hurricane or blizzard threatens New York is a prudent action that is consistent with the maintenance of fair and orderly markets for the protection of investors and the public good.

**Other comments: Rule proposals should be more clearly written with less repetition.**

The dominant philosophy of U.S. securities regulation is disclosure: Market participants are required to disclose important information about the products that they are selling to investors. As the primary regulator of this disclosure, the SEC should set a good example of good communication. Yet this rule sets a particularly bad example. It is filled with so much redundant prose that it is very easy for readers' eyes to glaze over and miss the important points that are buried in the repetitive and unnecessary redundancy. For example, the phrase "enforce written policies and procedures" appears 20 times in the proposal.[17] The phrase "as discussed above" appears 29 times, and the phrase "as noted above" 51 times. The phrase "policies and procedures" appears 266 times. Page 272, the beginning of the purported Economic Analysis, is a particularly redundant summary of the proposal which reads like it was written by a lawyer and not an economist. Similarly page 292 is another example of excessive and unnecessary redundancy.

As the Commission noted on page 338: "If there is excessive dissemination of insignificant events, truly important events may get hidden among others that do not have the same degree of significance or impact on the securities markets." This applies to Commission releases as well: Excessive repetition means that truly important items may get hidden among others.

While various requirements of the Administrative Procedures Act and the Paperwork Amplification Act have to be followed, this does not mean that rule proposals should be as repetitive and obtuse as they have become. If repetition is important to convince courts that items have been considered, it should be referenced in the footnotes rather than the body of the text.

Some of the text is just inane. On page 323, the text states: "In addition to the burden of establishing and maintaining such policies and procedures as set forth in the Paperwork Reduction Act Section above, the Commission preliminarily believes that SCI entities would incur costs in enforcing the substantive requirements that are the subject of the policies and procedures." Really, what a surprise! Could anyone not have figured out that this would be costly before page 323? The word cost is mentioned 319 times in this release, and well over 100 times before this useless statement on page 323.

I note and concur with the comment letter from the Center for Plain Language.[18]

[17] According to the search feature of Adobe Reader.

[18] http://www.sec.gov/comments/s7-01-13/s70113-18.pdf.

**The Commission should send badly written proposals back to the staff for editing.**

This is not the only SEC release that suffers from excessive and redundant obfuscatory verbiage. I beg the commissioners to send such badly written proposals back to the staff for clarifying editing before inflicting them on the commissioners or putting them out for public comment.

The Commission has already received numerous requests for extensions of the comment period on this proposal. One of the reasons for these requests for extensions is that the proposal is so obtuse that it requires substantial time and effort to read all 377 pages, let alone understand the implications of them. The dreadful writing quality of this release is one of the reasons for the numerous pleas for extensions that the Commission has received. If the proposed rule and the proposing release been written in a clearer manner, commenters would have been able to comprehend and comment on the rule much sooner.

A more readable release would make it much easier for everyone (including the commissioners!) to comprehend and speed up the analysis process.

**The access to facilities requirement in Rule 1000(f) is redundant.**

Proposed rule 1000(f) gives the SEC access to SCI facilities to monitor compliance. The SEC already has virtually unfettered access to its registrants' facilities, as documented in the citations in footnotes 285 and 286. Why clutter up the proposal and rules with such redundancy?

**The requirement to design systems to collect data is likewise redundant**

Proposed Rule 1000(b)(1)(i) F would require SCI-entities to have "Standards that result in such systems being designed, developed, tested, maintained, operated, and surveilled in a manner that facilitates the successful collection, processing, and dissemination of market data."[19]

This requirement sounds beneficial. Who could argue with the notion that SRO systems should be able to comply with their legal duties to collect and disseminate market data? However, this section is redundant. SROs and other market participants already have substantial reporting requirements for market data, as noted in footnote 191 of the proposing release. Furthermore, as the revenue from the sale of this data is an important revenue source for the SROs, they already have all of the right incentives to successfully collect, process, and disseminate market data. All this proposed section does is create paperwork to document compliance with this redundant requirement. More paperwork won't give SROs any incentive to do it any better than they already are.

Including such redundant verbiage in the rules just results in increasing complexity of the SEC rulebook and more compliance paperwork. This will increase costs for industry participants to document compliance, and it will increase costs for the SEC to monitor compliance with the documentation

[19] Incidentally, the phrase "successful collection, processing, and dissemination of market data" appears 33 times in the proposing release.

requirement, and it will do absolutely nothing to improve the technological stability or reliability of our market network.

Let me be more explicit. This redundant requirement has zero benefits because it will do nothing to improve the successful collection, processing, and dissemination of market data beyond what is contained elsewhere in this and other SEC regulations. It will have compliance costs. Therefore, on a cost-benefit basis it should be struck from the regulation because it imposes costs with no benefits.

This section is the kind of useless regulation that the Administrative Procedures Act, the Paperwork Reduction Act, and various executive orders were designed to eliminate. Rule writers may think that they are doing a good legal job by adding such redundant, duplicative, superfluous, unneeded, and unnecessary sections to remove any scintilla of the smallest possibility of the slightest bit of doubt. However, there are real and continuing costs to both the Commission and the industry from such excess overabundance of overkill.

**Other industry practices: T+1 will reduce costs and risks**

Question 74 asks "Are there other industry practices related to proposed Regulation SCI that should be considered further in light of the two-day closure of the U.S. securities markets during the storm?" Currently, one of the outstanding risks in our financial systems is the large number of unsettled trades that are always in process resulting from the T+3 settlement cycle. Continuing efforts to shrink the settlement cycle will reduce the risk that Something Really Bad happens between trade and settlement.[20] As the Group of 30 pointed out long ago,

TIME = RISK.

Facilitating industry efforts to shorten the settlement cycle on a cost-effective basis will reduce risk in the system.

By the way, I would like to commend DTCC for staying open and keeping clearance and settlement operating during Hurricane Sandy, despite the loss of access to 55 Water Street and the flooding of its vault.[21] I think they deserve praise for preparing and implementing disaster recovery plans that actually worked.

If you have any questions, feel free to email or call me. Seriously.

[20] See the DTCC/BCG study "Cost benefit analysis of shortening the settlement cycle" http://www.dtcc.com/downloads/leadership/whitepapers/BCG_2012.pdf. This is also a good example of how to do cost-benefit analysis.

[21] http://www.dtcc.com/downloads/legal/imp_notices/2012/dtcc/z0036.pdf

Respectfully submitted,

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