

July 8, 2013  
Ms. Elizabeth M. Murphy  
Secretary  
Securities and Exchange Commission  
100 F Street, N.E.  
Washington, DC 20549-1090

Re: File No. S7-01-13: Securities and Exchange Commission; Regulation Systems Compliance and Integrity

Dear Ms. Murphy:

Thank you for the chance to comment on the Securities and Exchange Commission's ("SEC") proposed Regulation Systems Compliance and Integrity ("Reg SCI"). It is heartening to see the SEC address technology and its discontents in today's markets. It is also heartening to see the SEC build on the relative success of its Automation Review Policy program ("ARP"), broaden its reach, and give it the force of law. The industry needs structured and enforceable rules for technology management and risk control. Reg SCI is a welcome step, not only because it makes at least some institutions accountable for technology controls, but also because it requires prompt disclosure of technology problems to the SEC and public disclosure of any problems that affect investors.

My comments are about extending Reg SCI's coverage beyond the proposed SCI entities to include all non-ATS broker dealers with direct market access. Most important, because of their extraordinary footprint in the markets, all direct access proprietary trading market participants, and especially high frequency market participants, should be governed by Reg SCI. Recall that it was Knight Capital's failings on August 1, 2012 that prompted then SEC Chairman Mary Schapiro to issue a statement on August 3, 2012 announcing that she had directed SEC staff to draft Reg SCI. In that light, it would be peculiar if Reg SCI at adoption didn't apply to at least some segments of the high frequency trading industry; more peculiar still because by at least one measure Knight's problems had a worse effect on confidence and investment than the May 6, 2010 Flash Crash.

#### **A Fact of Life**

Not so long ago disruptive or deviant behavior in the markets was disciplined not just by regulators but also by trading crowds. The crowds understood their industry's behavioral norms and understood when and how to enforce them, even if only informally. Behavioral norms were established by exchange rulebooks but also by institutional experience and knowledge. Informal sanctions were quick and sometimes nasty. They ranged from vulgar looks and gestures to loud complaints, to trading around delinquents, to fist fights, and even to death threats. Trading crowds also had elders in the very sense in which villages or tribes have elders. They were people with strong ties to the community who, because of their judgment, experience, economic power, and in some cases kinship ties, mediated disputes, enforced business norms, and ruled on disruptive acts. All this is no reason to romanticize them, of course. Trading crowds were also expensive, easily corrupted, opaque, exclusive, insular, and by today's standards very slow.

Beginning in the 1970s, trading crowds were supplemented with order delivery and quoting systems as technology entered the markets. Crowds started to be replaced altogether by technology as early as the 1980s, a trend that accelerated in the 1990s and was largely completed by 2008. Market reformers and the SEC encouraged that trend because of its obvious benefits on costs, transparency, access, speed, and certainty.

As markets automated they inevitably reimagined market microstructure and made tradeoffs. Two decisions in

particular soon fostered new behavioral norms in the industry. Anonymity and fully automated price/time matching were originally implemented to ward off collusion, to let investors compete with market insiders, and to let investors defend against predatory trading. Unfortunately, they also made it impossible for the trading crowd to attribute and sanction disruptive behavior, and behavior that was once considered inherently disruptive soon became normal. New market participants even described that behavior as a sign of a healthy market. "Flickering quotes," in the past a symptom of backing away, spoofing, or even of chronic drug use, became the means by which market participants with new technologies claimed they improved liquidity and narrowed spreads, even if quotes flickered a thousand times a second, up and down in sawtooth or staircase patterns of prices and sizes with little justification to anyone who looked.

And who was looking? Academics with undisclosed financial ties to an emerging industry of technology-driven trading firms validated the industry's claims that spreads were shrinking and the industry was the reason why. Academics also claimed flickering sawtooth quotes were just high-speed price discovery. It took years before other academics pointed out flickering quotes were often inaccessible, and that a one-lot trade against a supposedly healthy 20-lot quote made the whole 20-lot disappear in microseconds. Spreads and liquidity are still measured the old-fashioned way, as if they represent something real and actionable, as if participants are at any serious risk of sanction from peers or regulators if they back away. They aren't. Because of universal pre-trade anonymity, investors never know if they are about to route to a phantom quote, and because of price/time they have no choice but to try.

Speed quickly became very valuable. Speed put high frequency firms at the top of price queues when they wanted to be there, and let them cancel out when they didn't. Speed let firms collect rebates, collect spreads, interposition between investors, and press hard or flee when markets turned. As the industry grew and competition boiled, firms relying on speed premiums soon needed shortcuts to maintain or increase the premium. Co-location shortcut transport times. Proprietary data feeds shortcut consolidated tapes. Unstructured and informal software development methods shortcut time-to-market. And, inevitably, loose or nonexistent controls shortcut algorithm latency. Firms trimmed instruction paths and coded operations in single-precision or integer math to save valuable cycles; fast but less accurate computation engines replaced slower, more exact ones. At the same time technology sunset many business norms and sunset markets' abilities to enforce norms, it exaggerated even the smallest firm's power and rewarded even its most risky shortcuts, just as those shortcuts introduced complex and often unknown risks to modern markets.

To a point, speed creates certainty. Speed can also amplify complexity and fragility. Examples much in the news are large and small flash crashes. There was the May 6, 2010 Flash Crash itself, the thousands of mini flash crashes before and since, the DAX flash crash this past April, and the Dow Jones Utilities Index flash crash in May. Flash crashes were rare in older market models, and when they happened they were widely seen as disruptive aberrations. Now they're ordinary, a fact of life. Speed was also a factor in technology failures involving the Facebook and BATS IPOs, and incidents involving Direct Edge, Infinium, Knight and others.

### **Broken Market**

At SIFMA's technology conference in June, Gregg Berman, an earnest SEC official, explained that the few cases of mini flash crashes he had explored to date were generally caused by human error. Moreover, "It seems that over the past few years a popular meme has emerged: that collectively these sudden price spikes are symptomatic of a 'broken' market; that they demonstrate the fragility of our current market structure, that they must be caused by nefarious players; and that they are precursors to another market-wide flash crash, the same way that ground tremors may occur before a large earthquake. Now that sounds like a terrific story, but is it actually true?" He didn't think so, and he told the audience why. But his explanation is reassuring only if we submit to its unfortunate reductionism.

Frequently a mini flash crash is caused by an aggressively priced and oversized order storming into a liquidity

crisis as it runs through an exchange order book. We can call it human error, as Berman does. But in domestic markets that order runs through the book only because the order is marked ISO, and it's marked ISO only because the order sender promised to take the top of book at other exchanges. Taking just the top of book at away markets then blessed that order to ignore all other prices and sizes at the away exchanges. At current speeds, the order runs through the book in a few microseconds, with nothing to stop it. Nothing stops it because, at least for a time, the SEC forcibly removed the speed bumps some exchanges installed to slow trading in a liquidity crisis. Most exchanges never had them in the first place. As often as not that order is on a regional exchange in a highly fragmented market, with order books offering what former Senator Ted Kaufman once called just a "thin crust of liquidity." Order books are thin in lit markets in part because market makers can quote 100 shares far from the touch and still get juicy regulatory privileges. They're also thin because 40 percent of trading is off-exchange. In hundreds of names 50 percent or more of trading is off-exchange, undermining investors trading in the lit markets. Retail – all those patient, dumb orders – almost never makes it to an exchange. Institutions avoid the exchanges when they can because of leakage, and exchanges peddle leakage like it's ice cream at the beach.

It's fair to call this mess a "broken market," and to attribute flash crashes to more than simple human error at order entry. Unpacking regulatory and technological complexity – and speed - shows why markets are so vulnerable today to commonplace events. Regulatory and technological complexity will only increase over time, and there's every reason to believe speed premiums will increase. We're left praying we can hold off catastrophe by cutting the error rate.

### **Blinking**

At least one natural experiment readily contrasts the relative resilience of older slow, monopoly markets with the fragility of today's speedy, fragmented markets. On September 1, 2004, shortly after the opening, a trader submitted a basket to the NYSE floor to buy \$10.8 billion worth of stock all at once when he intended to buy only \$10.8 million. \$10.8 billion was just about one-third of what NYSE usually traded during a full day at the time, a huge amount relative to the market, the mother of all aggressively priced and oversized orders. What's remarkable about this error is the systemwide chaos it caused on U.S. and global markets – none at all. Though the trading crowd was confused, as they worked the orders intermediaries called for more liquidity and tried to confirm the basket wasn't an error, the basket was cancelled soon after. Books didn't instantly empty, prices didn't ricochet to \$100,000 a share in a microsecond, market makers didn't play "hot potato," and major indexes weren't suddenly shocked. The incident barely made the news.

Six years later, after the market became dominated by electronic exchanges, we all know what happened during a few violent minutes on May 6, 2010 when a trader quite intentionally parceled out just half of a \$4 billion E-Mini order, well under two percent of the E-Mini's total value traded that day, an order size the trader had successfully executed in the past. When Berman said at SIFMA that "I don't think market participants really care how long it takes the average person to blink, so I'm not sure why everyone keeps comparing the speed of the market to this benchmark," the difference between 2004 and 2010 might help explain it.

Berman rightly condemned poor controls that allow mistakes to flow through to the markets, "What we are seeing is the result of sloppiness combined with a lack of checks and balances." As the 2004 NYSE incident showed, trading crowds had checks and balances built into their behavioral norms. When technology replaced trading crowds, those norms vanished with in practice little or nothing to replace them. Technology and risk controls reimagine at least some of those checks and balances for electronic markets. Berman said, "in this day and age, there should be no excuse for these types of mistakes, especially considering the negative impact these events have on investor confidence," and he's absolutely right. Right enough for a strict liability standard for errors – that's what "no excuse" means to the lawyers - though the Commission has been plain it won't allow it in Reg SCI.

Improving checks and balances enough to reduce human error is a worthwhile goal. It will be achieved only by expanding Reg SCI to apply to every market center and to every market participant with direct access to a market

center, including proprietary firms, sponsoring firms, and ordinary broker dealers. Even more so than at least some of the exchanges, high frequency firms should take the spotlight here because of their dominance and because their business models keep them active in the markets from open to close.

### **Maturity**

Investors and the National Market System have a great deal more at stake if Getco or Virtu has a serious technology problem than if BYX or NSX has a serious problem, and yet as it stands BYX and NSX will be subject to Reg SCI but proprietary trading firms like Getco and Virtu will not. Consider that with the Knight Capital and Getco merger the combined firm is a designated market maker for as much as a third of NYSE flow and is a substantial presence on other markets. Daniel Coleman, CEO of the newly merged outfit, said the firm has "unmatched scale and depth across asset classes, product types and geographies." Individually, neither firm's record is spotless. Getco's trading arm was censured and fined \$450,000 early last year because, as FINRA wrote, "During the review period [about 18 months], the firm failed to establish and maintain a reasonable supervisory system, including but not limited to its written supervisory procedures and supervisory and operational risk control systems related to the oversight and operation of high frequency trading and algorithmic trading." And last August, Knight notoriously collapsed from an errant 45 minute trading spree that landed it in Getco's arms. Yet with just 0.4 percent of the tape, NSX will host OCIE examiners enforcing Reg SCI but the merged Knight-Getco apparently will not.

In its proposing release, the SEC notes that Reg SCI will not apply to most market participants, including non-ATS broker-dealers. It will not apply to the high frequency trading industry, not even to high frequency market makers. It's true that any firm with direct market access is already covered by Rule 15c3-5 ("Market Access Rule"), which requires that participants with direct access to a marketplace have suitable "risk management controls and supervisory procedures reasonably designed to manage the financial, regulatory, and other risks of this business activity." The text of the rule and subsequent practice make it plain the Market Access Rule's focus is on credit and access controls, regulatory matters like correctly marking short sales, and certain other compliance issues, with at best indirect application to some of the intimate technology risk control and disclosure matters addressed by Reg SCI. The SEC acknowledged that, writing "that it is appropriate to consider whether some types or categories of broker-dealers other than SCI ATSS should also be subject to some or all of the additional system safeguard rules that are proposed for SCI entities."

For industry advice on a philosophy to address that point, one idea is found in Getco's response to an EU Commission public consultation about MiFID, where it wrote "Authorised firms engaging in automated trading should have in place robust risk controls." Robust controls at a large automated trading firm should probably include, as Reg SCI specifies, "written policies and procedures reasonably designed to ensure that its SCI systems [that is, relevant systems] and, for purposes of security standards, SCI security systems, have levels of capacity, integrity, resiliency, availability, and security, adequate to maintain the SCI entity's operational capability and promote the maintenance of fair and orderly markets." Robust controls for a large automated trading firm should also probably require that firms, as Reg SCI specifies, "Establish, maintain, and enforce written policies and procedures reasonably designed to ensure that its SCI systems operate in the manner intended, including in a manner that complies with the federal securities laws and rules and regulations thereunder and the entity's rules and governing documents, as applicable."

Does the industry live up to those standards? It's worth noting that some time after Getco wrote "Authorised firms engaging in automated trading should have in place robust risk controls," its trading arm Octeg was censured and fined for inadequate controls. As for Knight, after its August 2012 debacle Reuters quoted Tom Joyce, former CEO of Knight Capital, as saying "It is clear that at the pace we all operate, I was mistaken, regulatory risk was not our biggest issue, operational risk was and we unfortunately proved it." After a group of investors rescued Knight but before it decided to merge with Getco, Bloomberg asked Joyce if there was anything his new investors would change at Knight Capital in light of its disaster. He replied "None." Bloomberg followed up, asking "After all that happened they're not looking to change anything in the firm?" Joyce answered, "No. Why?"

Set these aside for now because the high-frequency firm IMC gives us something more recent. IMC is headquartered in Amsterdam, and in an article about Dutch high frequency firms the Economist wrote in its April 20, 2013 edition, "Optiver's Mr Elzinga acknowledges the danger [of flash crashes] but emphasises his firm's internal risk-management standards and the fact that the partners' own capital is at risk, which encourages discipline. From his perch in IMC's Amsterdam office, Mr Defares makes the same point in a different way: 'You have 12 storeys above your head right now and you don't sit here worrying about them crashing down on you. You trust the architect and the builders.'"

Keep that in mind because within just days around publication of IMC's thoughts about trust, builders, and architects, three separate stock exchanges announced settlements with IMC's Chicago office - Nasdaq on April 5, BATS on April 23, and NYSE Arca on April 26. Each censured the firm and together the exchanges fined it a combined \$375,000 for poor controls, for, as one of the settlements said, failing "to establish and maintain adequate supervisory procedures, and a reasonable system of follow-up and review, related to the oversight of the firm's high frequency and algorithmic trading..."

At least some of what we hear from the high-frequency industry about risk and trust is reminiscent of the pieties the industry recited when it first commented on the SEC's Equity Market Structure Concept Release in early 2010. In a comment letter dated April 27, 2010, Getco wrote that the stock market is "resilient and robust even during times of stress and dislocation." A thick scrum of firms that included Allston, RGM Advisors, Hudson River, and Quantlabs wrote in a letter dated April 23, 2010, "the risk of automated professional trading firms creating instability in the markets is unlikely..." On April 21, 2010 DRW wrote "the particular aspects of professional trading that seem to be of concern to the Commission (for example, high frequency trading, colocation, and so on) are exactly what enable professional traders to provide liquidity to long-term investors during periods of market disruption." And then, within days, came the \$1 trillion Flash Crash on May 6. In his landmark paper on the Flash Crash some months later, former CFTC Chief Economist Andrei Kirilenko described a fratricidal "hot potato" trading frenzy among HFT firms as they took liquidity, dumped inventory into a shattered market, and ran for the hills. He concluded that "High Frequency Traders may compete for liquidity and amplify price volatility," a finding later confirmed by Menkveld.

One thought through all this is that while market practitioners may know some aspects of their businesses quite well, they can overestimate their industry's skills while they underestimate or misunderstand their industry's risks. Still, the industry acts as if it understands the risks and has them under control. The adults in the room have to insist that given its place in the National Market System, and given the unprecedented power of its technology and the industry's record, the industry must consistently perform to reasonable and enforceable standards of technological and institutional maturity. It's rarely fashionable these days to say it, but this is what regulation is for.

### **Incentives**

That is especially true because market incentives can drive the industry in the opposite direction, that is, short-term market incentives can drive the industry to minimize risk controls. That conclusion comes from a study the Federal Reserve Bank of Chicago published last year with results of in-depth risk management interviews it conducted inside the world of high speed trading, interviews which included nine different proprietary trading firms. The Fed's results detail the risk management practices at these firms.

The Fed found that "Depending on the trading firm, the life cycle for the development, testing, and deployment of a new trading strategy ranges from minutes to months to one year. At a few firms, new trading strategies are quickly implemented by tweaking code from existing strategies and placing new code into production in a matter of minutes." Tweaking code and putting it into production in a matter of minutes invites disaster, as Nasdaq discovered in its Facebook tragedy. Echoing the Fed's report, last year Traders Magazine wrote that technology executives told it "software development processes and procedures are often haphazard. Pressure to rush a new feature to market can override the need to get it right, they say." The Fed also found that firms deliberately skimp on

risk controls to boost speed, writing "Most firms apply fewer pre-trade risk checks to some strategies to reduce latency (delays)."

The result of all this sloppiness is predictable. One firm said that it "had two incidents of [an] out of control algorithm. To address the first incident, the firm added fat finger and credit checks to its pre trade risk controls. The second out of control algorithm was caused by a software bug that was introduced when fixing the error code that caused the first incident." The Fed noted that "Six of the nine firms interviewed had such occurrences or got caught up in other firms' out of control algorithms." Mysteriously, "Error in one firms' automated system impacted prices, but the firm declined to provide specific details related to what went wrong." And these incidents were just the ones the firms disclosed to the Fed.

As the market data and research firm Nanex documents at great length, runaway algorithms stampede markets every day. What good reason can there be for thousands of quote updates a second in a stock and just one trade? And in the simplest case, why should investors have to pay for National Market System infrastructure to process meaningless or erroneous quote stampedes at ever-increasing rates? The industry's externalities are strangling markets with fiber optic cable.

Rather than restrain them, market incentives seem to breed stampedes. It is far cheaper for firms to implement new trading strategies in "a matter of minutes" (as the Fed wrote) than it is for them to rigorously test a new strategy before deployment. It is also more profitable for firms to skimp on risk controls because controls take precious microseconds, and in rote price/time markets microseconds cost money. The public can't rely on market discipline to sanction bad behavior because trading is anonymous and because firms must trade with the first counterparty at the best price no matter who has it. In the pits, where trading was not anonymous and where participants had some control over their counterparties, the market could discipline disruptive behavior, but in price/time electronic markets the exchanges have to do it. The exchanges know, or should know, who misbehaves, but they're tangled in mixed incentives of their own, dependent on firms for the next quarter's profits and somehow expected to moderate their customers' unruly behavior. There isn't even agreement on what "misbehave" means, with behavioral norms having changed so radically in the last 10 years that what was once condemned as quote flickering or trading ahead or interpositioning is now standard practice across the industry. Notwithstanding the occasional exchange enforcement action against a firm, unless we want to revisit pretrade anonymity, price/time, the order protection rule, for profit exchanges, and other by now sacred cows, the only practical source of discipline left is the government.

Nevertheless, as another example of the industry's misplaced self-confidence and puffery, firms are happy with how they manage risk and prevent errors, and they want regulators to stay home. The Fed summarized what firms said about risk management by writing "Relying on existing industry best practice documents for risk management is desirable. Regulatory guidance on risk management is not needed because trading firms have a better understanding of risks than regulators." In other words, the industry wants to be left alone because the industry thinks it knows what it's doing, even when it demonstrably does not. What it's doing as it rushes software into production or as it increases speed by skimping on risk controls is maximizing profits as it minimizes costs, just as any business rightly must, but with the critical difference that this industry's shortcuts allow mistakes that affect public markets, with long-lasting effects on the country. It has become a risk management race to the bottom, a form of regulatory arbitrage played out in microseconds.

### **Confidence**

Knight Capital misjudged its risks, made mistakes, and suffered the consequences. The so-called Knightmare also hammered confidence and subverted capital formation. Domestic equity mutual fund and ETF flows in the three months before Knight Capital's August 1, 2012 disaster net to almost flat, but in the three months after the disaster they net to a combined \$50 billion outflow, nearly a perfect pivot around that date, and \$16 billion more than came out of the domestic equity markets in the first three months after the Flash Crash. The Knightmare also

added to a widening belief that our capital markets are, in fact, broken.

On the third anniversary of the Flash Crash this year, the Tabb Group published a survey on market structure confidence. Tabb reported that industry confidence in equity market structure, which had been eroding since the Flash Crash, had hit new lows. In May 2010 only 15 percent of Tabb survey respondents had weak or very weak confidence in the market. By August 2012 that number had increased to 34 percent, and by the time of the "hash crash" in April 39 percent of respondents had weak or very weak confidence in market structure. Tabb also noted that only four percent of respondents had very high confidence in market structure. That's better than the two percent of survey respondents Gallup recently found with very high confidence in car salesmen, but none of this is anything to be proud of, not when we crow we have the finest capital markets in the world, where market structure is strong, all the market centers are good looking, and all the high frequency traders are above average.

Despite record low interest rates and a riotous bull market since 2009, equity investors are giving up, stockpiling cash or moving into other asset classes. According to the Investment Company Institute ("ICI"), \$370 billion left domestic equity mutual funds from 2010 through 2012, an outflow that began with a surge of redemptions immediately after the Flash Crash. Some commentators say this outflow is more than offset by inflows into domestic equity exchange-traded products, evidence that confidence actually remains strong, but those experts appear to have confused "changes in assets under management" and "inflows," a regrettable but stubbornly common mistake – ask the Beardstown Ladies about that.<sup>1</sup>

Critics have long argued market structure problems contribute to this loss of confidence. Since mutual fund flows pivoted on May 6, 2010, from essentially flat in the three months before May 6, 2010 to a \$34 billion outflow in the three months after May 6 2010, that point seems clear. Critics likewise argue that technology problems cause confidence problems, and the SEC agrees, at least in part. But the technology problems aren't limited to what we see on the front pages of the Wall Street Journal, all those stories about the BATS or Facebook IPOs or about the Knightmare. The problems include the daily crack of trading algorithm misfires.

At a recent Sandler O'Neill conference, a panel of high frequency trading and exchange executives agreed that both retail investors and industry professionals had lost confidence in the market because of fiascos like the Flash Crash and Knight Capital. After a moment that could have turned into genuine introspection, some of the executives rallied to blame the news media for it, the Wall Street Journal in particular. Never mind that "Dark Pools," a book by the Wall Street Journal's Scott Patterson, quoted a prediction of an unstoppable large-scale computer trading disaster within six months of publication, and Knight Capital torched itself just six weeks later.

Technology disruptions have undermined confidence and investment. Knight Capital showed that the Market Access Rule doesn't safeguard markets from catastrophic technology errors and their material effects on capital formation. We will lower the risk of more episodes like it only when the government asserts reasonable oversight of at least the most active firms trading in the markets. To restore confidence the public must see the government take that meaningful step. We can't simply trust builders and architects. We have to regulate them.

Sincerely,

R. T. Leuchtkafer

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<sup>1</sup> According to ICI, domestic equity ETFs held \$386 billion at the beginning of 2010 and \$645 billion at the end of 2012. ETF assets in 2010 grew to \$540 billion by the end of 2012 simply because of the bull market, so to a first approximation that implies new ETF cash of \$105 billion in the period. With \$370 billion in mutual fund withdrawals, there's a net \$265 billion flowing out of domestic equity funds of all stripes from 2010 to 2012 during one of the strongest bull markets in history. In light of all this, certainly something is affecting confidence in the equity market.