

UNITED STATES OF AMERICA  
Before the  
SECURITIES AND EXCHANGE COMMISSION

Securities Exchange Act Of 1934

Admin. Proc. File No. 3-19798

In the Matter of

SERGEY PUSTELNIK a/k/a  
SERGE PUSTELNIK,

Respondent.

MR. PUSTELNIK'S ANSWER TO THE ALLEGATIONS OF ORDER

Dear Secretary Countryman,

The below is an answer to the order from Administrative Proceeding File No. 3-19798. I am currently representing myself *pro-se*.

**1. Undisclosed Control Person**

The Division of Enforcement (“Enforcement”) alleges that from at least October 2010 through September 2016, I was an undisclosed control person of Avalon FA Ltd. (“Avalon”), a trading firm based in Kiev, Ukraine.

I deny that I was an undisclosed or an otherwise control person of Avalon FA Ltd. The term “control” is defined in Rule 405 under the Act as “the possession, direct or indirect, of the power to direct or cause the direction of the management and policies of a person, whether through the ownership of voting securities, by contract, or otherwise.”

Enforcement has not alleged that there has been ownership through voting securities or by contract. The “*otherwise*” provision of the definition has not been clearly established in the Commission’s rules, or case law and is factually based. See, e.g., First Gen’l Resources Co., SEC No-Action Letter, [1988-89 Transfer Binder] Fed. Sec. L. Rep. (CCH) ¶ 78,251 at 78,253 (Aug. 23, 1988) (“[t]he Division [of Corporation Finance] has historically declined to express any view on the affiliation of any person to an issuer of securities on the ground that the question is a matter of fact best determined by the parties and their advisors.”)

However, I do concede that a jury has found in favor of all allegations made by Enforcement.

## **2. Registered Representative**

I confirm that from March 2011 through January 2015 I was a FINRA registered representative associated with Lek Securities Corporation (“Lek”), a broker-dealer registered with the Commission. I was first registered with a regulated broker dealer in 2001. In the fourteen years of being in the industry I did not receive a single customer complaint and my record has been completely unblemished. On January 21, 2015 I voluntarily withdrew from FINRA, an organization that has improperly obtained private photographs and demanded I share my

personal spousal communications in my private email account. FINRA has taken the position that as a private, non-government entity, it does not recognize or respect spousal privilege, which is protected by the U.S. Supreme Court. To protect the privacy of myself and my spouse I chose not to be associated with FINRA.

During the time when I was registered at Lek, I did not have any supervisory responsibilities or roles within the broker dealer and relied solely on compliance staff of Lek, including Samuel F. Lek who was its Chief Operating Officer, Chief Compliance Officer, and who has acted as a FINRA administrative judge and legal counsel and opinions offered by Norton Rose, Lek's primary legal counsel during the time. See e.g. Exhibit 7 - Copy of letter from Sam Lek to FINRA that was prepared by Norton Rose. Prior to sending the letter, Sam Lek showed the letter assured me and Avalon that the trading was perfectly legal. There were multiple occasions on which Sam Lek has made such assurances to me and to Avalon. I then did not have any knowledge or expertise to determine whether the trading conducted by Avalon in the open market is manipulative. Nor did I ever have any authority at either Lek or at Avalon to stop any trading conducted by Avalon Traders.

From the period of 2015 and 2016, I was enrolled as a first-year and subsequently second-year law student at Harvard Law School. During the summer of 2015, I volunteered full-time at a D.C. based think tank that focuses on economic regulation to help developing nations. This time frame is important, because according to Enforcement and documents submitted in the civil case,

the majority of profits from the two strategies have occurred in 2015 and 2016, the time frame when I was no longer affiliated with Lek. FINRA has further alerted Lek and Samuel F. Lek, about manipulative layering. Most serious admonishments by FINRA to lek have also happened in the time period when I was no longer registered. “In April 2015, FINRA again alerted LEK and Sam Lek that Avalon might be engaged in manipulative trading through LEK, and that LEK and Sam Lek's conduct may have aided the manipulative trading. From at least March 2016 through September 2016, FINRA advised LEK on a monthly basis that it continued to see substantial layering activity through LEK.” I was not made aware of these communications.

During the entire period, Lek Securities, and Sam Lek have always maintained that trading conducted by Avalon is not manipulative and disagreed with the regulators. Thus, my registration as a registered representative was not a necessary condition for Avalon’s trading.

### **3. Civil Injunction**

I agree with the allegation that this injunction has been entered against me and that a jury has found for the Commission on all counts. This decision however, is currently being appealed to the Second Circuit and is pending resolution. The Commission has recently filed a motion to remand a certain issue back to the District Court. Considering that this matter is not fully adjudicated, the current Administrative Proceeding should be adjournment until final resolution of the underlying matter.

Among other appealable issues, a Higher Court should determine whether open market orders can constitute securities fraud based solely on intent (“sole intent approach”) as opposed to requiring traditional elements of “artificial information.” Circuits are currently split on this issue. See e.g. “Spoofing and Layering” Mark, Gideon. *Journal of Corporation Law*; Iowa City Vol. 45, Iss. 2, (2020): 399-469.

In determining the remedial actions I request that the Commission considers that there is disagreement among experts about what “layering” and “cross-market manipulation is”, that all trades have been made in the open market, and that the only witnesses or victims of potential harm were highly sophisticated high-frequency trading firms employing trading algorithms, and not the general public. These firms were Hudson River Trading and Citadel Securities. Both these firms complained about losing money in their HFT trading algorithms. Both of these firms are named in a landmark lawsuit by the City of Providence, Rhode Island et al. v Bats Global Markets, Inc., No. 14-cv-2811 (S.D.N.Y.). Citadel has been fined for trading ahead of its clients, See FINRA letter of acceptance, waiver, and consent No. 2014041859401, July 16, 2020.

#### **4. Considerations of Remedial Actions**

In deciding what remedial actions to take, in addition to the above, and the request to postpone the decision until the underlying matter is fully adjudicated to avoid unnecessary litigation burdens on both sides I would request the attention to the following:

- a) I have not been associated with any regulated broker-dealer since January 21, 2015.
- b) All alleged trading was conducted by Avalon traders and overseen by supervisors and compliance personnel at Lek Securities, not me.
- c) All alleged trading was done in the open market, using real orders that faced risk of execution.
- d) There was no allegation of traditionally manipulative orders such as pre-arranged wash-sales or “marking the close.”
- e) There are no allegations of traditional fraud, such as defrauding investors and clients. There is no allegation of any fiduciary duty to unknown and anonymous (by market structure design) other market participants.
- f) There are no allegations that I, Avalon, Lek, or the traders made any public statements about any security.
- g) All conduct was in the open market using electronic means that went through pre-trade and post-trade compliance checks and reports at a Broker-Dealer that had an obligation to prevent manipulative activity and who had the power and authority to terminate it at any time.
- h) All trading was never concealed and was conducted in the open market and Lek Securities has gone through multiple audits by FINRA and other regulators. While the regulators expressed concerns over trading, there was no order to stop or prohibit trading in the period

of almost six years. Compliance and legal counsel for Lek Securities (Norton Rose) has assured me that while the regulators do not “like” the trading at issue - it is perfectly legal and “good trading.” During this time, I had no authority to stop such trading at either Avalon or Lek.

- i) There are multiple definitions of *layering* from various authorities including one from the Commission Concept Release on Equity Market Structure:

*Passive market making primarily involves the submission of non-marketable resting orders (bids and offers) that provide liquidity to the marketplace at specified prices. While the proprietary firm engaging in passive market making may sometimes take liquidity if necessary to liquidate a position rapidly, the primary sources of profits are from earning the spread by buying at the bid and selling at the offer and capturing any liquidity rebates offered by trading centers to liquidity-supplying orders. If the proprietary firm is **layering** the book with multiple bids and offers at different prices and sizes, this strategy can generate an enormous volume of orders and high cancellation rates of 90% or more. The orders also may have an extremely short duration before they are cancelled if not executed, often of a second or less.*

See .17 CFR PART 242 [Release No. 34-61358; File No. S7-02-10] RIN 3235-AK47 at 48-49.

- j) Evidence from denied experts that underscores that other industry and academic experts also determine that such trading is not violative and that trading in question was thus conducted under the color of legality.
  - i) Exhibit 1 Expert Report for Avalon - Equities Trading Final
  - ii) Exhibit 2 Expert Report for Avalon - Cross-Market Final
  - iii) Exhibit 3 Expert Report of Ronald Filler -- May 11 2018
  - iv) Exhibit 4 Begelman Expert Report 3.16.2018
  - v) Exhibit 5 Rebuttal Expert Report of Alan G. Grigoletto 5-11-18
  - vi) Exhibit 6 Rebuttal Report of David J. Ross (Layering) 5-11-18
  
- k) It has not been alleged nor have I ever acted or have been associated with an investor advisor and alleged conduct is irrelevant to being an investor advisor.
- l) It has not been alleged nor have I ever been or have been associated with a municipal securities dealer and alleged conduct is irrelevant to municipal securities.
- m) It has not been alleged nor have I ever been or have been associated with a municipal advisor, transfer agent, or nationally recognized statistical rating organization and alleged conduct is irrelevant to being a municipal advisor, transfer agent, or being associated nationally recognized statistical rating organization.
- n) It has not been alleged nor have I ever participated in any securities offerings and alleged conduct is irrelevant to participating in any securities offering.

- o) It has not been alleged nor have I ever ever participated in any offering of penny stock, including as a promoter, finder, agent or other person who engages in activities with a broker, dealer or issuer for the purposes of issuance trading in any penny stock, including the purchase or sale of any penny stock and alleged conduct is irrelevant to penny stock activities.
- p) Samuel F. Lek, the Chief Executive Officer and Chief Compliance Officer has been barred with the right to reapply for 10 years. (See Release No. 8726).
- q) Other administrative remedial actions taken by the Commission in layering related cases (duration of bars) for cases that have settled and were not fully adjudicated.
  - i) SEC v. Hold Brothers, September 2012
    - 1) Steve Hold, owner of broker and foreign trading firm - 2 years
    - 2) William Tobias - associated person of brokerage, manager of foreign trading firm - 3 years
    - 3) Robert Vallone - chief compliance officer of broker - 3 years
  - ii) SEC v. Biremis, December 2012
    - 1) Beremis, broker - License Revoked
    - 2) Peter Beck, owner of broker, controlled foreign traders - right to reapply
    - 3) Charles Kim, owner of broker, controlled foreign traders - right to reapply
  - iii) SEC v. Visionary Trading, April 2014
    - 1) Andrew Actman , broker, CEO - right to reapply
    - 2) Joseph Dondero, wonder of trading firm - permanent

- 3) Eugene Giaquinto, owner of trading firm - 2 years
  - 4) Lee Heiss, owner of trading firm - 2 years
  - 5) Jason Medvin, owner of trading firm - 2 years
- iv) SEC v Wedbush
- 1) Jeffrey Bell, associated person of broker - no nar
  - 2) Christina Fillhart, associated person of broker - no bar
- v) Citadel Securities, LLC (2017)- violated “Section 17(a)(2) of the Securities Act prohibits ‘any person in the offer or sale of any securities . . . [from] directly or indirectly . . . obtain[ing] money or property by means of any untrue statement of a material fact or any omission to state a material fact necessary in order to make the statements made, in light of the circumstances under which they were made, not misleading[.]’ Scierter is not needed to prove a violation of Section 17(a)(2); a showing of negligence is sufficient. Aaron v. SEC, 446 U.S. 680, 697 (1980). 42. As a result of the conduct described above, Citadel Securities willfully violated Section 17(a)(2) of the Securities Act.” Citadel was censured and required to pay \$5,200,000 disgorgement, prejudgment interest of \$1,465,268 and a civil penalty of \$16,000,000. No person was barred. (File 3-17772).
- vi) Citadel Securities, LLC (2018) violated “Section 17(a)(1) of the Exchange Act requires, among other things, that broker dealers make and keep for prescribed periods such records, furnish such copies thereof, and make and disseminate such reports as the Commission, by rule, prescribes as necessary or appropriate in the public interest, for

the protection of investors, or otherwise in furtherance of the securities laws. Exchange Act Rule 17a-4(j), promulgated thereunder, requires, in part, broker-dealers such as Citadel to furnish promptly legible, true, complete, and current copies of those records of the member, broker or dealer that are required to be preserved under Exchange Act Rule 17a-4 and any other records of the member, broker or dealer subject to examination under Section 17(b) of the Exchange Act that are requested by a representative of the Commission. Likewise, Exchange Act Rule 17a-25 requires that broker-dealers such as Citadel shall, upon request, electronically submit to the Commission the securities transaction information as required in the rule. As described above, Citadel failed to furnish complete records to the Commission staff that were requested by the Commission in its EBS requests. Therefore, Citadel willfully violated the recordkeeping and reporting requirements of Section 17(a)(1) of the Exchange Act and Rule 17a-4(j) thereunder by failing to furnish promptly true and complete trading information as requested by Commission staff over a period of approximately four years. In addition, Citadel willfully violated Exchange Act Rule 17a-25 by failing to submit electronically certain securities transaction information to the Commission through the EBS system in response to requests made by the Commission.” Citadel was censured and ordered to pay a civil penalty of \$3.5 million. No person was barred. (File 3-18915).

- r) Other administrative remedial actions taken by the Commission, such as but not limited to

- i) John J. Marvin - submitted false zip codes that “created misleading impression that Meslie’s orders were bona-fide retail orders” - 12 months (File 3-19885).
- ii) Hodgins & Kitay - \$900 million dollar accounting fraud - 5 year bar (File No. 3-17582).
- iii) Robert Russel Tweed - “The Commission’s complaint alleged that, in connection with the management of the Athenian Fund, a pooled investment vehicle, Tweed failed to timely disclose the loss of investors’ capital, failed to provide audited financial statements to investors, and otherwise engaged in conduct that misled investors”. - 5 year bar (File No. 3-19881).
- iv) Paul, J. Konigsberg - “On June 24, 2014, Konigsberg pled guilty to three federal felony charges relating to his falsification of investor account records of Bernard L. Madoff Investment Services, LLC. Judgment in that matter was entered against him on July 16, 2015. U.S. v. Konigsberg, 10-CR-228 (S.D.N.Y.)” - no securities bar, only attorney bar. (File No. 3-19879).
- v) Benjamin Alderson - “The Commission’s complaint alleged that Alderson failed to inform clients and prospective clients of conflicts of interest in the form of commissions he stood to—and did—receive. The complaint alleged that in doing so Alderson violated the fiduciary duty that every investment adviser has to its clients and prospective clients: to put the client’s best interests first, employ utmost honesty, and fully disclose all material information, including actual and potential conflicts of interest.” - 2 year bar with right to reapply (File No. 3-19869).

- vi) Raph, C. Greaves, Esq - “The Commission’s complaint alleged, among other things, David Sims and Mario Procopio, and their respective entities, Sims Equities, Inc., ALC Holdings, LLC and El Cether-Elyown, engaged in a “prime bank” scheme from at least April 2014 through at least May 2017, through which they raised at least \$1,410,000 from at least 13 investors. They told the investors that their money would be invested with other large investments in a prime bank “trade platform” that would generate 1,200% to 40,000% in returns. No such trade platform existed. Sims and Procopio used nearly all of the investor funds to support their lifestyles and make at least one Ponzi-like payment. From at least 2015 through 2017, Greaves aided and abetted the scheme by, among other things, accepting investor deposits into his client trust account and by making misleading statements about Sims’ and Procopio’s past performance.” - no industry bar, but “Greaves is suspended from appearing or practicing before the Commission as an attorney.” ( File 3-19889).
- vii) Michelle Dipp - “In light of the information that Dipp was informed of and had access to, she knew or should have known the statements described above in filings with the Commission, press releases, earnings calls, and other communications with investors about the commercial progress, prospects and availability of AUGMENT and OvaPrime, were materially false or misleading. 44. Accordingly, Dipp violated Sections 17(a)(2) and (3) of the Securities Act which make it unlawful to obtain money or property through materially false or misleading statements and proscribe any

transaction, practice, or course of business that operates or would operate as a fraud or deceit upon a purchaser of securities.” - no bar. ( File 3-19843).

- viii) Christopher D. Larson - “The Commission’s complaint alleged, among other things, that from no later than December 2011 through at least December 2012, Larson engaged in a scheme to manipulate the market for Crown stock. As part of the scheme, Larson obtained control of Crown, transferred shares to nominees, paid \$400,000 for a “call center” to promote Crown, placed manipulative trades in his own account to create the appearance of market interest, and acted as the undisclosed CFO of the company. As Crown’s stock price became inflated as a result of these efforts, Larson’s nominees sold Crown shares and wired the sale proceeds — at least \$865,000 — to him.” - No industry bar, and “respondent is suspended from appearing or practicing before the Commission as an accountant.” (File 3-19821).
- ix) Floyd Mayweather Jr. - “Mayweather violated Section 17(b) of the Securities Act by touting three ICOs that involved the offer and sale of securities on his social media accounts without disclosing that he received compensation from an issuer for doing so, or the amount of the consideration.” - 3 years to “, forgo receiving or agreeing to receive any form of compensation or consideration, directly or indirectly, from any issuer, underwriter, or dealer, for directly or indirectly publishing, giving publicity to, or circulating any notice, circular, advertisement, newspaper, article, letter, investment service, or communication which, though not purporting to offer a security, digital or otherwise, for sale, describes such security.” (File 3-18906).

- x) Crypto Asset Management, LP and Timothy Enneking , “willfully violated Section 206(4) of the Advisers Act and Rule 206(4)-8 thereunder, which make it unlawful for any investment adviser to a pooled investment vehicle to make any untrue statement of a material fact or to omit to state a material fact necessary to make the statements made, in the light of the circumstances under which they were made, not misleading, to any investor or prospective investor in the pooled investment vehicle.” - No bar. (File 3-18740).
- xi) Moody’s Investors Service, Inc (1), “Moody’s rated approximately 26 Combo Notes with a total notional value of approximately \$2 billion... As a result of the conduct described above, Moody’s violated Rules 17g8(b)(2) and (3) of the Exchange Act which require NRSROs to establish, maintain, enforce and document policies and procedures reasonably designed to achieve transparency and consistency over the assignment of credit ratings.” Moodies was required to pay a civil penalty in the amount of \$1,250,000. No person was barred. (File 3-18689).
- xii) Moody’s Investors Service, Inc (2), “ MIS violated Section 15E(c)(3)(A) of the Exchange Act, which requires NRSROs to “establish, maintain, enforce, and document an effective internal control structure governing the implementation of and adherence to policies, procedures, and methodologies for determining credit ratings...e, MIS violated Section 17(a)(1) of the Exchange Act and Rule 17g-2(a)(2) thereunder, which prescribe certain record-keeping responsibilities for NRSROs with regard to the credit rating

process.” Moodies was required to pay a civil penalty of \$15,000,000.00. No person was barred. (File 3-18688).

s) Primarily egregious cases have warranted permanent collateral bars, such as

- i) William Andrew Hightower, who “on October 16, 2019, Hightower pleaded guilty to two counts of wire fraud in violation of 18 U.S.C. §§ 1343 and 2 in United States v. William A. Hightower, Case No. :18-CR00600 (S.D. Tex.). As part of Hightower’s plea agreement, he agreed to entry of an Order Imposing Money Judgment in the amount of \$9.5 million, which was signed by the court on October 9, 2019.<sup>3</sup> One wire fraud count to which Hightower pleaded guilty alleged, among other things, that on or about January 14, 2015, he transferred \$900,000 from a victim’s account to HCG and used those funds to pay back other investors and for personal spending, rather than for the intended investment purpose. Hightower also pleaded guilty to a second count alleging that on March 14, 2016, he transferred \$800,000 of another investor’s money into his account and used the money to pay back other investors and to fund his personal lifestyle.” Permanent collateral bar. (File 3-1981).
- ii) Bernard L. Madoff - “The Commission’s complaint alleged the following facts: Madoff and BMIS conducted a \$50 billion fraudulent scheme through the firm’s investment advisory business. In or around early December 2008, Madoff had told senior employees at BMIS that there had been approximately \$7 billion in advisory client redemption requests and he was struggling to obtain the liquidity necessary to meet

those obligations. When the employees pressed Madoff for more information, Madoff said that his advisory business was a fraud, “just one big lie [and] basically, a giant Ponzi scheme” that had been paying returns to certain investors out of principal received from other investors. Madoff said that he intended to surrender to authorities after he paid out remaining money to selected employees, friends and family members.” Barred with the right to reapply. (File 3-13520).

From 2015, I have enrolled and graduated from a leading law school primarily in order to better understand laws and regulations so that my future conduct is fully compliant. I have not been in the financial industry for over five years and I have not yet applied to any bar of any state or jurisdiction.

I also should not be punished by an excessive bar for exercising my rights to a due process in determining whether “layering” and “cross-market” - two novel definitions of open market manipulation, are indeed manipulative, contrary to the opinions of my supervisors, Chief Compliance Officer and former FINRA administrative law judge Sam Lek, and legal opinions rendered by leading firm, Norton Rose.

Thank you for your consideration.

Sincerely,

**Respondent**  
Sergey Pustelnik

July 27, 2020

/s/ Sergey Pustelnik  
Sergey Pustelnik  
[serge.pustelnik@gmail.com](mailto:serge.pustelnik@gmail.com)  
45 River Drive South  
Jersey City, NJ 07310

**EXPERT REPORT OF HAIM BODEK  
"LAYERING" ALLEGATIONS**

UNITED STATES DISTRICT COURT  
SOUTHERN DISTRICT OF NEW YORK

SECURITIES AND EXCHANGE COMMISSION V. LEK SECURITIES CORPORATION, SAMUEL LEK, VALI  
MANAGEMENT PARTNERS dba AVALON FA LTD, NATHAN FAYYER, and SERGEY PUSTELNIK a/k/a  
SERGE PUSTELNIK

Civil Action No. 17-1789

May 11, 2018

## **I. Introduction**

1. My name is Haim Bodek. I am currently the Managing Principal of Decimus Capital Markets, LLC, a consultancy that advises on U.S. securities market structure and provides expert witness services. I was formerly a founder and Chief Executive Officer of Trading Machines LLC, an independent high frequency options trading firm. Prior to my tenure at Trading Machines, I was a Managing Director and Joint Global Head of Electronic Volatility Trading at UBS, a global securities firm. My curriculum vitae is attached as Exhibit A. Exhibit B to this Report and the citations in the footnotes below contain a listing of the various documents and information that I considered in this matter. If needed, I may prepare graphic or illustrative exhibits to use at trial based on the opinions expressed herein, and I may also use facts, documents or exhibits submitted by other experts for Defendants or other parties in this action.
2. In addition to my expert witness experience, I have actively provided the U.S. Securities and Exchange Commission information to assist in several investigations that resulted in substantial monetary fines and significant changes in practices of certain trading venues, including but not limited to admissions of inaccurate disclosures in exchange rule filings.
3. I have been retained to analyze transactions in connection with the claims asserted in civil proceedings docketed at No. 17-cv-1789 and to respond to the expert reports produced in connection with these proceedings by Terrence Hendershott and Neil Pearson. I produced this report in my capacity as an expert engaged on behalf of defendant Vali Management Partners dba Avalon FA Ltd (“defendant” or “Avalon”).
4. I am qualified to provide expert testimony in this litigation because of my extensive background as an electronic trading executive and algorithmic trading strategist, with roughly twenty years of experience in the automated trading space. I have been engaged as a testifying or consulting expert in several lawsuits to provide both quantitative and qualitative analysis while leveraging my in-depth knowledge of industry practices and the architecture of the electronic trading process.

## **II. Assignment**

5. I have been engaged by Avalon to prepare an expert report for the benefit of its legal counsel assessing the claims of the U.S. Securities and Exchange Commission (“SEC”) that Avalon and traders trading in Avalon’s brokerage account participated in manipulative schemes
6. To accomplish this, I reviewed, among other things, the Complaint by the SEC dated March 10, 2017, the materials provided by Terrence Hendershott, the expert engaged by the SEC, depositions and deposition excerpts from other witnesses in this matter, and the tick data provided by Thesys Technologies, LLC, a leading market data provider.

7. I have been asked to offer my opinions concerning the so-called “layering loops” described by the SEC and Professor Hendershott.
8. For this Report and the commensurate work I am doing regarding the so-called “cross-market strategy” allegations in the same proceedings, I am being compensated at \$750/hour, with additional predetermined fixed payments totaling to \$50,000 paid at different stages of this engagement.
9. My work in this matter is ongoing, and I reserve the right to supplement my current analysis as additional information becomes available and the source material is further analyzed, including the reports and testimony of other expert witnesses in this matter..

### **III. Background**

#### **Electronic Market Making / Quasi-Market Making**

10. Modern electronic exchanges are typically characterized by electronic limit order books that provide displayed prices to the marketplace in the form of bids and offers (i.e., “buy” and “sell” orders for specific quantities of shares), although some types of exchange orders may be “hidden” (i.e., undisplayed) in whole or in part.
11. Market makers are a special class of market participant that stand ready to buy and sell a security and to profit from the differential between the buy and sell price, which is typically referred to as “capturing the spread.”
12. Markets makers may function as a broker-dealer with an exchange-approved market maker designation and market maker clearing account. Market makers can also be “quasi” or “de facto” market makers that operate liquidity providing strategies as a mere exchange member or as a customer of a broker-dealer. Many firms that engage in high frequency trading (“HFT”) could be classified as quasi-market makers, although some HFT firms serve as registered market makers.
13. When market makers post orders in the market that are not immediately tradable / executable against other existing orders, these “resting” orders / quotes of market makers are considered to be “posting liquidity” or “providing liquidity.” When a market maker decides to trade against a resting order in the market, that behavior is considered to be “taking liquidity.”
14. Note, however, that the maker-taker pricing model employed by most lit exchanges<sup>1</sup> in conjunction with advanced order types may incentivize market participants to execute in a manner that blurs the line between a liquidity provider and liquidity taker, especially in circumstances when the market “rolls” (e.g., moves a tick) and aggressive orders (i.e., those orders that improve over the National Best Bid and Offer (“NBBO”) or

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<sup>1</sup> The maker-taker pricing model treats differently in terms of fees and rebates passive and aggressive orders, i.e., those placed by providers of liquidity and takers of liquidity, respectively. In the most common form of this model, providers of liquidity get a per share rebate, while takers of liquidity get charged a per share fee.

take liquidity) that may appear marketable as sent to the market in fact result in posted liquidity at new prices.

15. Some market makers and HFT firms consider liquidity taking strategies to be a form of market making<sup>2</sup> and choose to define market making as the activity of short-term (i.e., intraday) spread capture (i.e., buying at an effective bid and selling at a higher effective offer), irrespective of the manner in which prices are executed.
16. Many institutional customers also post liquidity to build long-term positions in a manner that is comparable to market maker posting strategies but in practice serves the purpose of accessing market liquidity.
17. Not unlike HFTs that do not possess the status of registered market makers, manual day traders often also act as informal or quasi-market makers on the intraday basis or even longer time horizons, especially those manual traders who are engaged in scalping strategies. Accordingly, their trading strategies are often similar to and compete with HFTs' strategies.

### **Manipulative Trading, Spoofing, Layering, and Disruptive Trading**

18. Avalon is charged with violations of several provisions of the federal securities statutes, namely Sections 17(a)(1) and 17(a)(3) of the Securities Act of 1933, Section 10(b) of the Securities Exchange Act of 1934 and the corresponding Rule 10b-5, and Section 9(a)(2) of the Securities Exchange Act of 1934. Essentially, the SEC complaint is based on allegations of “spoofing” / “layering” and “cross-market manipulation,” and the complaint repeatedly alleges the existence of artificial pricing. For instance, the SEC maintained that “layering enabled Avalon to manipulate the market so that it could reap profits by buying low and selling high at artificial prices.”<sup>3</sup> It is my understanding that challenged orders in this case had been entered by independent contractors trading through Avalon’s account at Lek Securities. Moreover, it is my understanding that neither Avalon’s principals nor any other employees of Avalon entered any of the challenged orders.
19. Note, however, that trading activity invariably impacts the market itself in the sense that any transaction, let alone a trading strategy based on a series of transactions, has some marginal impact on the market price. Critically, price impact of a given strategy is not necessarily “artificial” even when such impact could be reasonably anticipated by the trader in question. Moreover, legitimate trading activity may be misinterpreted as having a manipulative design, particularly in a scenario of executing larger trades that *inherently* move the market. This bias may be compounded when all transactions for a

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<sup>2</sup> See, e.g., Cameron Smith, *Who You Callin’ HFT? Five Misconceptions Surrounding “HFT”*, Markets Media (July 15, 2016), <https://www.marketsmedia.com/callin-hft-misconceptions-surrounding-hft-by-cameron-smith-quantlab/> (arguing that “‘taking liquidity’ . . . is really providing liquidity to a resting limit order placed by an investor that chose not to incur the costs associated with crossing the spread (which can be meaningful, especially in stocks with wide tick sizes)”).

<sup>3</sup> Complaint para. 41, at 14, SEC v. Lek Sec. Corp., No. 1:17-cv-01789-DLC (S.D.N.Y. Mar. 10, 2017), <https://www.sec.gov/litigation/complaints/2017/comp-pr2017-63.pdf>.

given strategy are not assessed holistically. Furthermore, the economic purpose and intent of transactions must not only be assessed on an individual basis, but also in the context of the full transaction sequence associated with the strategy in question.

20. In equities markets, the Financial Industry Regulatory Authority, Inc. (“FINRA”) provided the following general descriptions of “spoofing” and “layering”:

Generally, spoofing is a form of market manipulation which involves placing certain non-*bona fide* order(s), usually inside the existing National Best Bid or Offer (NBBO), with the intention of triggering another market participant(s) to join or improve the NBBO, followed by canceling the non-*bona fide* order, and entering an order on the opposite side of the market. Layering involves the placement of multiple, non-*bona fide*, limit orders on one side of the market at various price levels at or away from the NBBO to create the appearance of a change in the levels of supply and demand, thereby artificially moving the price of the security. An order is then executed on the opposite side of the market at the artificially created price, and the non-*bona fide* orders are immediately canceled.<sup>4</sup>

21. In its own enforcement action against the same firm, the SEC provided a slightly different definition that combined the terms “spoofing” and “layering.”<sup>5</sup>
22. In contrast, consider the case where a trader “chases” the market by placing multiple buy orders (i.e., stacking) at successively more aggressive prices that remain unfilled due to absence of contra liquidity despite a reasonable resting / exposure time period. Such activity does not create artificial price movement although the price might rise significantly over the period of posting and might actually mean-revert to original levels at a later time. Regardless of the final equilibrium point, such orders demonstrate the lack of willing counterparties to sell against the trader’s aggressive buy orders, which otherwise would be expected to execute except for that there are no interested counterparties to trade against the posted buy prices. The trader’s activity in this scenario does not cause the absence of sellers, but merely exposes the absence of sellers. If the price rises as a result of other buyers’ actions, it is not because these buyers were deceived with artificial prices, but because the buyers were responding to the lack of sellers which the original trader’s buy orders exposed to the marketplace as a whole.
23. Furthermore, if such a trader determines through such activity that further price appreciation is unlikely, it may choose to enter into a short position at the higher price. In such a scenario, it may choose to leave its buy orders in the market to realize a profit

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<sup>4</sup> Press Release, Fin. Indus. Regulatory Auth., Inc., FINRA Joins Exchanges and the SEC in Fining Hold Brothers More Than \$5.9 Million for Manipulative Trading, Anti-Money Laundering, and Other Violations (Sept. 25, 2012), <http://www.finra.org/newsroom/2012/finra-joins-exchanges-and-sec-fining-hold-brothers-more-59-million-manipulative>.

<sup>5</sup> Hold Bros. On-Line Inv. Servs., LLC, Exchange Act Release No. 67,924, Investment Company Release No. 30,213, at 2, 5 (Sept. 25, 2012) (settled proceeding), <https://www.sec.gov/litigation/admin/2012/34-67924.pdf>.

on the newly established short position. Alternatively, the trader may choose to cancel its buy orders that would mitigate the potential for adverse price impact against its newly established short position or otherwise contradict its expectation of future price movement below its posted bids. Such decisions are both legitimate and based on a change in the trader's expectations and economic interest resulting from the newly established short position.

## Price Discovery

24. A market maker that trades against orders resting in the market it perceives to be mispriced by taking liquidity in accordance with its assessment of supply and demand is enhancing the process of price discovery by correcting the mispricing in question.
25. Most market makers' strategies contain numerous quantitative adjustments to "lean" their markets in a manner consistent with their assessment of mispricing, hoping to execute against such mispricings favorably as a maker (i.e., by posting liquidity).
26. The process of price discovery, in which the price of an asset is determined by trading activities of market participants and the resulting buying and selling pressures, typically produces legitimate (and at times extreme) price movements until an equilibrium price is achieved. Note, however, that in practice the equilibrium is often a temporary phenomenon directly related to the activity of market makers and other market participants trading the asset. New market participants may choose to enter or exit positions; market makers may adjust their prices due to changing market conditions; and customers holding a position may choose to realize gains or losses.
27. For example, a market maker that has incurred losses trading against a large market participant would often "widen" its bid-ask spread and / or shift its notion of the fair value of the asset until that large market participant is no longer willing to pay the spread to trade with the market maker or until the market maker is willing to bear the risk of repeated trades given its assessment that there is a sufficient spread to be captured.
28. The notion of an equilibrium (i.e., a stable price of an asset) in the short-term is more indicative of a situation in which market participants do not find sufficient economic gain in challenging the prevailing price of an asset by deploying capital to trade against resting bids or offers, as opposed to a notion of the market finding an intrinsic value to asset in the "efficient market hypothesis."
29. Market participants use a wide variety of trading strategies in order to achieve excess risk-adjusted return, which is known as "alpha." Inevitably, a search for alpha, as well as its persistence, may be jeopardized by errors and random occurrences. Certain strategies become more or less successful as the market evolves, and, moreover, different types of strategies may have unusual and/or unexpected interactions with one another, whether they compete with each other or not.
30. In addition to the quasi-market making strategies noted above, specialized trading strategies relevant to this inquiry are exploratory trading strategies and market impact strategies.

## Exploratory Trading Strategies

31. Exploratory trading is the practice of placing bona fide orders that are intended to be executed in order to elicit information from the market about the strength of buy and sell interest in the marketplace at different price levels.
32. Before entering into a large position, a trader requires knowledge on what price levels are feasible for entering into that position, as well as what price levels are favorable, taking into account the total liquidity available in the marketplace.
33. A trader may, for example, place small aggressively-priced orders that improve the bid to conduct exploratory trading activity. If that order executes quickly, it might indicate sufficient sell interest in the market that would encourage the trader to delay further executions until he is able to buy shares at a lower, more favorable price. However, if the order does not execute and the market retreats (i.e., market offers at those prices are withdrawn), it might indicate that the trader should be more aggressive about buying the security due to the competition from other buyers or simply to insufficient liquidity resulting from a lack of sellers.
34. A trader may also conduct exploratory trading to determine whether the current price of a given security is supported at a reasonable price level by challenging the available liquidity. In this scenario, the trader would execute at the current price level to test the buy / sell interest by trading in the opposite direction from the position that he would eventually accumulate. It is important to note that the trader in this scenario has not yet committed himself to accumulating such a position, but he is utilizing this exploratory trading strategy as a factor in deciding whether or not he would build that position in the first place and at what price. For example, if a trader is hypothesizing that a security is cheap relative to his view on the fair value of that security, but the market is trending down or appears to have little buy interest, he may test the liquidity available on the bid by selling shares to establish a short position. If the market remains firm at the level sold, he might determine that this level is reasonably priced and then close out his short position for a minor loss and begin to accumulate a long position. If, on the other hand, the market starts or continues to trend down after his short position has been established, he would conclude that the lack of buyers in the market implies that a more favorable price can be established by waiting and permitting the market to go lower. In such scenarios, exploratory trading has provided critical information to the trader for determining the buy / sell interest in the market and where the liquidity is supporting the price.
35. By definition, exploratory trading requires deliberate market impact to extract information from the market. Often, such exploratory trading activity results in “scalping yourself” or realizing a loss by buying at a higher price than one ultimately sells at. At other times, the behavior may appear indistinguishable from a market making spread capture activity which results in a profit. Exploratory trading by definition does not produce artificial price movement, as the trader in question, while engaging in price discovery, stands firm to trade with real buyers and sellers who in fact receive competitive and timely fills they would not otherwise receive, albeit, at times perhaps at the expense of information leakage.

36. Given that all trades provide some level of information on liquidity available in the marketplace, market making strategies typically benefit from the concept indirectly, and some algorithmic traders explicitly incorporate the concept directly to target positions and react to the changing market supply and demand. Such use of exploratory trading in liquidity providing / scalping strategies can result in the exploratory trades capturing a spread and can often look as naive profit-taking for executed orders that are in the opposite direction from a market maker's position taking direction.
37. A notable empirical study assessing the strategies of major HFT firms based on proprietary data on E-mini S&P 500 futures from the Chicago Mercantile Exchange concluded that such firms engage in exploratory trading and on average lose money on their exploratory trading activities. This study conceptualized exploratory trading as "a device for obtaining knowledge from market-makers about the probability that orders in the near future will be followed by a permanent price change."<sup>6</sup> Furthermore, the study made the following important observation:

Exploratory trading could be considered a form of costly information acquisition (albeit an unusual one) which raises at least the possibility that HFTs uniquely contribute to the process of efficient price discovery. However, unlike traditional costly information acquisition, exploratory trading does not generate information that relates directly to the traded asset's fundamental value, but that pertains rather to unobservable aspects of market conditions that could eventually become public, ex-post, through ordinary market interactions. Furthermore, because exploratory trading operates through the market mechanism itself, exploration exerts direct effects on the market, distinct from the subsequent effects of the information that it generates.<sup>7</sup>

### **Market Impact Strategies**

38. Market impact is the effect that a market participant has on market prices when he buys or sells an asset. Market impact costs constitute an additional cost a trader must pay to enter into a position, as the process of consummating the transaction itself may change the market price in an adverse direction.
39. While market impact has been traditionally seen as representative of the cost of liquidity with regard to the reference price prior to attempting execution, the price movement itself can also be a confirmation of a trader's belief that a given security is mispriced relative to its fair value and that the lack of liquidity that opposes that trader's position is a confirmation of a perceived mispricing.
40. All large traders have the potential for significant impact on the market and must manage that impact or otherwise be exposed to excessive slippage. The primary way a

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<sup>6</sup> Adam D. Clark-Joseph, Exploratory Trading 7 (Dec. 31, 2014), <https://www.aeaweb.org/aea/2015conference/program/retrieve.php?pdfid=1133>.

<sup>7</sup> *Id.* at 48-49.

large trader can manage that impact is to control the execution size and the aggressiveness of his prices.

41. For example, it is a standard industry practice to execute large orders by slicing an order into smaller “child” orders so as not to reveal to the market the presence of large buy and sell orders. One pervasive phenomenon is a general decrease of average trade size across trading venues. As recently noted by the SEC’s Division of Trading and Markets, “In contrast to trading volume, average trade size fell substantially for both NASDAQ and NYSE stocks [from 2005 to 2014] . . . [A]verage trade size fell by 53% for NASDAQ stocks (from 434 to 204 shares) and by 75% for NYSE stocks (from 777 shares to 195 shares).”<sup>8</sup> It is important to note that this phenomenon is not explained by smaller positions or trading interests being preferred by investors, but rather by changing industry practices that utilize more efficient or appropriate execution strategies to execute larger orders using multiple child orders.
42. It is common for market participants to routinely mask trading intentions, which essentially amounts to concealing information from the marketplace, in order to improve the execution quality and access to liquidity. Hidden orders, which aid traders in masking their intention, may play a significant role in determining supply and demand in order books. For instance, in response to a question regarding the use of hidden order, a Quantlab executive provided the following response: “Profit taking that we have is of a size that's what our current position is, and that would reveal that to the market. And we don't really want that conveyed to the market. We don't want the market to react to that liquidity.”<sup>9</sup>
43. While aggressively trading with large orders is usually considered poor management of market impact that leads to information leakage and market impact costs, price impact can also benefit certain types of traders. For example, a trader who engages in a “momentum trading” strategy may take liquidity in a speculative manner, anticipating that depleted liquidity on one side of the market would permit him to exit his position because liquidity seekers would demand liquidity at a price favorable to that trader. This activity is a legitimate form of speculation that assists in price discovery and in no way is guaranteed to produce a successful result. Quite frequently, retail day traders engage in this form of speculation unsuccessfully and incur losses in part due to transaction costs associated with momentum trading and the tendency for such traders to buy at inflated prices and to sell at depressed prices without the materialization of additional liquidity seekers willing to trade at profitable exit points for such speculators.
44. This type of trading is a form of price discovery and correction that offsets the ambiguity put into the market by other market participants concealing their target positions. When the price is impacted, this outcome encourages other participants with undiscovered buy and sell interest to engage in the market until buy and sell interest arrives at a new equilibrium price range. In fact, aggressive trading can improve markets

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<sup>8</sup> Memorandum on Rule 611 of Regulation NMS from the SEC Division of Trading and Markets to the SEC Market Structure Advisory Committee 12 (Apr. 30, 2015), <https://www.sec.gov/spotlight/emsac/memo-rule-611-regulation-nms.pdf>.

<sup>9</sup> *Id.* at 303.

by correcting imbalances of buy and sell interest that have remained as a result of efforts of market participants to conceal the depth of such interest. In other words, such trading strategies are in fact the opposite of market manipulation, as they push the market price closer to the “true” price rather than create artificial deviations from that true price.

45. Quantlab’s strategy, while signal-based, shares many common traits with market impact strategies. Strategies that attempt to join aggressive trading with aggressive orders on the same side of the market are in part relying on the market impact of their trades to create price impact and realize a profit. As observed by a Quantlab executive, “We detect that there's imbalance between supply and demand. There's net buying pressure than we tend to buy.”<sup>10</sup>
46. Although they may share some common characteristics, market impact strategies as a form of execution must be distinguished from the concept of “momentum ignition.” The SEC has illustrated momentum ignition as follows: “With this strategy, the proprietary firm may initiate a series of orders and trades (along with perhaps spreading false rumors in the marketplace) in an attempt to ignite a rapid price move either up or down. For example, the trader may intend that the rapid submission and cancellation of many orders, along with the execution of some trades, will ‘spoo’ the algorithms of other traders into action and cause them to buy (sell) more aggressively.”<sup>11</sup> On the other hand, a market impact strategy is conducted with bona fide orders that intend to aggressively trade by improving the NBBO or sending marketable orders and, unlike market ignition, does not incorporate or employ fraudulent means, such as spreading false news or spoofing. Quantlab’s strategy incorporates an implicit market impact strategy property, which an outside observer could confuse with market ignition: “That's not how that works. And we buy and we have to be quick when we buy because we're buying - competing with other people like us.”<sup>12</sup> This may be seen as an illustration of an algorithmic interaction on the pressure side.
47. Moreover, in response to the question “is it fair to say that the spread-crossing strategy that Quantlab employs is designed to sort of get ahead of momentum that it [sees] signaled in the marketplace?,” its executive answered in the affirmative.<sup>13</sup>
48. In fact, Quantlab’s “spread taking” strategy is not that different in character from Avalon’s pressure strategy, given that both operate aggressively and increase book pressure, except Quantlab’s market impact component is primary taking and requires the existence of other market participants having price impact in the market, which Quantlab appears to join forces with.
49. Furthermore, the use of quiet side orders by Quantlab to exit positions indicates a desire not to contradict the market impact of its aggressive orders and Quantlab admits that its orders do have price impact. As noted above in connection with an HFT strategy

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<sup>10</sup> *Id.* at 318.

<sup>11</sup> Concept Release on Equity Market Structure, Exchange Act Release No. 61,358, 75 Fed. Reg. 3594, 3609 (Jan. 14, 2010), <https://www.gpo.gov/fdsys/pkg/FR-2010-01-21/pdf/2010-1045.pdf>.

<sup>12</sup> Deposition of John Huth, at 237 (Jan. 23, 2018).

<sup>13</sup> *Id.* at 236-37.

competing with other market participants, Quantlab's strategy itself can act as triggering strategy as it trades at the same time as other algorithms, and algorithmic trading firms that trade against Quantlab's contra-side hidden order side can be said to have been influenced by Quantlab's market impact and would be "deceived" by Quantlab's passive side no differently from Avalon's passive side. Overall, both firms use equally legitimate strategies.

50. To condense, aggressive trading by improving the market price or executing liquidity-taking orders does not in itself constitute market manipulation, and its features, which include a discovery of a lack of opposing contra-side interest and / or the diminishment of contra-side interest through consummated transactions, result in a likely correction of the prevailing market price rather than an artificial price impact and point in the direction that this trading strategy is unlikely to be manipulative. More generally, as recognized by some courts, a trading strategy with an expected market impact is not in itself illegal. For instance, one court applied the standard that, "[w]hen the transaction is effected for an investment purpose . . . there is no manipulation, even if an increase or diminution in price was a foreseeable consequence of the investment."<sup>14</sup>
51. Market makers, including non-registered market makers and HFT firms, often quote bid and offer sizes that obfuscate the direction they intend to trade the bulk of their respective positions. Withholding information about an intended buy or sell interest is not a deceptive practice, but an intrinsic behavior of traders who may have significant market impact depending on the liquidity profile of the security in question.

## IV. Observations

### General Observations About Avalon's Trading Strategies

52. Avalon's trading activity is manual in nature and is predominantly active on electronic stock exchanges.
53. Avalon's trading is primarily conducted through Lek securities and is organized into sub-accounts allocated to different traders.
54. While consistent in many respects with techniques also employed in HFT scalping strategies, as discussed by Bodek and Shaw<sup>15</sup>, Avalon's trading is primarily an intraday quasi-market making strategy with significant exploratory trading and market impact strategy components.
55. Avalon's quasi-market making strategy effectively captures a liquidity-providing spread over time (multiple ticks) over a legitimate and sensible trading range. Avalon's traders used multiple orders over many trading venues at different price points. In other words, these strategies provided liquidity over time and across markets.

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<sup>14</sup> United States v. Mulheren, 938 F.2d 364, 368 (2d Cir. 1991).

<sup>15</sup> Haim Bodek, *The Problem of HFT: Collected Writings on High Frequency Trading & Stock Market Structure Reform 18-28* (2013).

56. Avalon's traders' strategy also makes use of an order book pressure component to challenge market prices over a trading range. This order book pressure component is similar in function to analytical approaches used by HFT market makers that employ an order book pressure model, such as Citadel<sup>16</sup> and Quantlab,<sup>17</sup> with executives of both of these firms testifying in this case.
57. There is inherently a dual purpose for orders associated with Avalon's book pressure strategy. Such orders are intended to challenge the market prices through aggressive tightening of the NBBO, but also function as spread capturing orders in a quasi-market making strategy.
58. Avalon's "quiet" orders are placed primarily to exit inventory while minimizing market impact at the ends of Avalon's trading range. Avalon typically used reserve or hidden orders to mask the lower and upper ranges of its trading range.
59. Irrespective of criticisms of its market impact and pressure strategy component, Avalon's intent is inherently two-sided in the bids and offers it posted, and the strategy is resilient in that Avalon is positioned to capture an economic spread on both its pressure side and its masked "quiet" side.

#### **Avalon's Trading – Exploratory Trading Strategy**

60. The order placement and executions of Avalon's trading strategies are similar for its exploratory trading and market impact trading activities, as both seek to challenge market prices by posting aggressive orders.
61. Avalon's exploratory trading is by design intended to risk economic loss in order to determine levels of resistance in price movements when either buyers or sellers are attracted to the markets by its aggressive exploratory trading.
62. For Avalon's non-marketable orders that improved over the best prices in the lit market, the response from liquidity takers in the market who executed against Avalon's orders provides valuable information to Avalon on the presence of buy and sell interest. It should be emphasized that Avalon's counterparties benefitted from Avalon's aggressive prices that typically improved over the NBBO, providing executions that otherwise might not have been available to them.
63. Avalon's unexecuted orders provided critical information on the lack of buy and selling interest in the market and represent the edges of the trading range, as they were properly exposed to the market and were meant to be executed under certain market conditions.
64. The reactions of other traders, including HFTs, to orders exposed by Avalon, whether executed or not executed, generated valuable information on the market's valuation of securities and available liquidity for Avalon's use. Having access to such information is not manipulative because the underlying orders were placed in conditions likely to result in execution, and, if not executed, such orders would constitute evidence of a lack of contra-side interest at those price points. Furthermore, contra-side liquidity may have

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<sup>16</sup> See, e.g., *CFTC v. Oystacher*, No. 15-CV-9196, 2016 U.S. Dist. LEXIS 89934, at \*24 (July 12, 2016).

<sup>17</sup> See, e.g., Deposition of John Huth, at 322 (Jan. 23, 2018).

been taken by HFTs, such as Quantlab, which would further reduce the liquidity available to Avalon.

65. Avalon's exploratory trading orders are significantly smaller in order size when compared to its quasi-market making order sizes, a property consistent with the practice of exploratory trading during the period when it is not maintaining a sizable net position.
66. It is through the interaction of Avalon's exploratory trading activity within the lit market, that Avalon is able to gain superior information on trading price range for a security, more easily identifying the absence of liquidity within certain ranges and buy and sell resistance levels. Had Avalon not conducted exploratory trading activity, its ability to assess liquidity and assign proper valuation to securities would have been impeded despite the legitimate nature of trying to gain such insights. Moreover, market interaction is oftentimes a necessary tool for manual traders who do not rely on formal models and automated algorithms.
67. In the absence of quantitative trading models and electronic trading systems, Avalon is only able to identify sensible levels to accumulate position and liquidity by staying active in the lit market and challenging market prices with exploratory trading activity. Avalon's presence in the lit market through his exploratory trading activity is thus an important information source contributing to his ability to effectively value the realistic trading ranges for a security, while assessing liquidity and constructing a reasonable estimate of a security's valuation.

#### **Avalon's Trading – Market Impact Strategy / Pressure Strategy**

68. Once Avalon has entered into a position, it often challenges markets prices with aggressive non-marketable orders, entering orders that improve the best bid or offer in the market while it ascertains an exit level where natural buy and sell interest indicate the resistance points for a subsequent price movement beneficial to its position.
69. In essence, Avalon's market impact strategies build upon the position it has already committed to. By challenging the market prices, Avalon gains vital information on the potential resistance points where natural buy and sell interest exist in the market selected by Avalon as suitable price points to exit his position. Furthermore, in the cases where Avalon's aggressive orders are not met by opposing buy or sell interest, its exposure of the absence of such interest serves to provide additional information to market participants who may be inclined to either remove the diminishing liquidity or replenish the liquidity based on their assessment of the security's valuation.
70. Avalon's pressure strategy orders are very likely to interact with HFT order anticipation strategies. HFTs using book pressure signals step ahead of Avalon's orders, presumably forecasting that liquidity takers will enter the market at even more aggressive prices than Avalon or the HFTs orders. In cases where HFTs collide with Avalon's contra-side orders without further price movement, HFTs are therefore mispricing the potential for further price movement, primarily because the HFT is not challenging Avalon's quasi-market making strategies with sufficient size.

71. The HFT strategies that are interacting with Avalon's traders' strategy appear to be overly sensitive to signals that imperfectly forecast market price improvement and the notion of such HFTs establishing and defending a trading range around a notion of fair value with significant liquidity is less evident in their strategies. Overall, HFTs that continually seek to step ahead of customer order flows without accurately identifying the trading horizon of such order flows, while paying more aggressive prices in anticipation of further price movement, are likely to be at a disadvantage when trading against Avalon's orders that are placed to capture a wider spread over the trading range. If such HFTs do not challenge Avalon's pricing and risk capacity, they will likely pay a market making spread to Avalon when additional order flows do not materialize confirming their expectation of continued price movement.
72. At the end of a trading sequence, Avalon tends to liquidate its position when it identifies opposing buy or sell interest in the lit market, given its assessment of diminished likelihood of any further favorable price movement. If the opposing buy or sell interest that has been exposed through his market impact strategy is substantial, Avalon may choose to reverse its position by utilizing a combination of exploratory trading and market impact strategies.
73. Throughout the market impact strategy phase of Avalon's trading activity, it aggressively trades in a manner that is wholly consistent with his assessment of its valuation of a stock, its trading range and the state of buy and sell interest in the market. Although its activity often serves to enhance the profitability of its position, it must be emphasized that such activity is legitimate speculative trading activity done through bona fide orders and consistent with common patterns of risk-increasing behavior conducted by speculative traders during period of momentum and price discovery in the marketplace.

#### **Avalon's Trading – Quasi-Market Making Strategy**

74. Avalon's larger orders tend to be posted at a more favorable price point for more shares than the orders that improve over the book. Such orders are often placed in what Hendershott refers to as the "quiet" side in the opposite direction of the Avalon's pressure strategy component.
75. Quiet side order tends to establish strong resistance (i.e., making a market) and appear to be placed roughly where Avalon expects the trading range to resist the market and/or where Avalon's is willing to build a contra-side position. Such quiet side order usage is hardly distinguishable from Quantlab's strategy, which "uses[s] hidden orders for profit taking."<sup>18</sup>
76. For both loud and quiet side, an order may be changed if it does not execute or if Avalon determines a more favorable price can be achieved.
77. Avalon's loud side and quiet side orders provide potentially significant liquidity to other market participants.

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<sup>18</sup> *Id.* at 303.

78. Avalon will act rationally based on which side it trades (loud vs. quiet side). For example, it will cancel its loud side orders if the quiet side trades and it has built position against side where continued use of the pressure strategy might impact the market in the direction adverse to its position.
79. Since there are many traders engaged in Avalon's traders' strategy, there is a diversity in the implementation of such a strategy that requires assessment on a case-by-case basis.

### **Summary Characteristics of Avalon's Trading Strategy**

80. Avalon engages in a pattern of *exploratory trading strategies* in the lit markets to challenge market prices, potentially attracting buyers / sellers to trade against prices he posts into the market or otherwise demonstrating the lack of buy / sell interest.
81. Avalon engages in a pattern of *market impact strategies* in the lit markets where Avalon's aggressively improves bids and offers in the market in a manner to validate the absence of buy / sell interest in the contra direction of his accumulated position and to validate Avalon's assessment of liquidity, valuation, and trading range. Such activity is primarily evident in the price region between the upper and lower bound of Avalon's trading range. We refer to this activity as Avalon's *pressure strategy*.
82. Avalon engages in a pattern of *quasi-market making strategies* where Avalon's places larger orders with hidden or reserve size that provide liquidity at the upper and lower bound of Avalon's trading range.
83. Avalon is manually implementing exploratory trading strategies, market impact strategies, and quasi-market making / scalping strategies *all of which* are frequently implemented in various forms within algorithmic trading strategies of high frequency traders and electronic market makers.
84. A pivotal observation is that Avalon's trading strategy has interactions with the algorithmic trading logic of HFTs where HFT market making strategies employing book sure models have stepped ahead of Avalon's pressure strategy and have collided with Avalon's quiet side orders, which are posted at the ends of Avalon's trading range. HFTs who rely on institutional orders being the primary generator of book pressure signals have disingenuously complained to exchanges, while asserting that their algorithms are not inherently flawed, but that such algorithms have been triggered by deceptive trading.<sup>19</sup>
85. HFTs are thus equating the failure of book pressure models to result in subsequent price movements with the view that quasi-market makers like Avalon do not have intent to trade on their two-sided markets. Such complaints do not afford quasi-market makers the right to trade a security over a longer-term trading range, while having an intent of two-sided market making. Implicitly in the complaints of such participants is the view that any challenge to one side of the market must come from a longer-term investor not making a two-sided spread, so as not to limit the opportunity for further price

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<sup>19</sup> See, e.g., Deposition of Adam Nunes, at 97-98 (Apr. 6, 2018) ("From my perspective, there are many ways to create an artificial or misleading balance between the buy side of the order book and the sell side of the order book..").

movement in the direction the HFT anticipates. Such views are more indicative of the long history of HFT accommodation on HFT-oriented exchanges and are inconsistent with legitimate market manipulation allegations.

86. The toxic interaction between Avalon's traders' strategy and HFT algorithms, as confirmed by deposition of HFT executives and their firms' interaction with the SEC, appears to be the central evidence that alleges market manipulation. Because HFTs lose money, they seem to believe that Avalon's two-sided strategy is impermissible because of the false notion that Avalon's trading intent must be one-sided (e.g. either position-building or position-reducing), while Avalon is clearly a two-sided quasi-market maker. HFTs appear to believe that a market impact strategy for small size in the direction of accumulating a position with bona fide orders is a misrepresentation of intent, when clearly a trader is allowed to push and increase position while at the same time proactively placing orders at non-marketable to realize a profit in the capacity of a quasi-market maker capturing a spread.
87. The primary evidence of deception noted by HFT Quantlab for example is that is incurred trading losses.<sup>20</sup> Furthermore, BATS would not clarify the activity that it deemed manipulative and failed to provide any "objective standards" and "parameters" despite being pressed by Lek Securities to do so.<sup>21</sup>
88. HFTs, while reserving the notion of two-sided intent of orders for their own strategies, refuse to acknowledge that two-sided intent should be afforded to a quasi-market maker - even one whose interaction with HFTs orders results in HFT flaws being exposed to the market. Quasi-market makers, such as Avalon, are being held to one-sided intent and treated like an investor in this case, which clearly is a self-serving allegation from HFTs who want to claim that Avalon's orders were non-bona fide.
89. Hence, the center point of allegations appears to conflate HFT's incorrect model assumptions about market participant behavior in order anticipation strategies with the creation of artificial price impact and executions being received at alleged artificial price levels, allegations which avoid the evidence that Avalon's pressure strategy utilized bona fide orders that challenged market prices and engaged in in the process of price discovery.
90. Avalon's trading activity could probably have been compressed or even eliminated from the marketplace as a viable trading strategy if HFT market makers corrected the flaws in their trading activities and business model practices, including assumptions relating to their order flow anticipation strategies. Furthermore, by not correcting these systemic flaws in their predictive models, HFT market makers are likely to contribute to very distortions / disruptions in securities markets that they allege are artificial price changes.
91. Avalon's quasi-market making strategy, while clearly profitable, does not have the primary properties requisite for a market manipulation classification. Avalon's pattern of

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<sup>20</sup> See Deposition of John Huth, at 85 (Jan. 23, 2018) ("[T]hese sorts of manipulative activities cause us to do things where we lose money. And so we would keep our eye out for situations where we appeared to be losing money in a way that surprised us relative to what we expect from the back test and what we expect from our strategy.")

<sup>21</sup> See Phone Conversation Between Samuel Lek and Direct Edge (Oct. 6, 2013).

improving market / tightening spreads demonstrates consistent usage of bona fide orders that challenge markets and demonstrate the existence or lack thereof of buy and sell interest in the market. The use of the pressure strategy does not result in artificial price impact, but instead elucidates to Avalon and the market as a whole the levels where buyers and sellers will provide liquidity or take liquidity.

# V. Assessment

## Example A - Assessment of CERN Trading on November 1, 2012 (12:50:40 PM - 12:50:51 PM)

Trader	Symbol	Date	Time	Price	Quantity	Exchange	Visible Shares	Instruction	Order Name	Reorder Name	Report Sequence	Buy Order Balance	Sell Order Balance	Execution Balance	Best Bid	Best Offer	Adjusted Time	Adjusted Best Bid	Adjusted Best Offer
188_102S	CERN	11/1/12	12:50:40:000	77.15	1000	TAL	200	SSHRT	MBI-AVE-131184			0	1000	0	77.11	77.14	12:50:40:000	77.11	77.14
188_102S	CERN	11/1/12	12:50:42:000	77.11	100	TAL		BLY	MBI-AVE-131192			100	1000	0	77.12	77.14	12:50:42:000	77.12	77.14
188_102S	CERN	11/1/12	12:50:42:000	77.11	100	EDGA		BLY	MBI-AVE-131193			200	1000	0	77.12	77.14	12:50:42:307	77.12	77.14
188_102S	CERN	11/1/12	12:50:42:000	77.11	100	DATK		BLY	MBI-AVE-131194			300	1000	0	77.12	77.14	12:50:42:307	77.12	77.14
188_102S	CERN	11/1/12	12:50:43:000	77.12	100	TAL		BLY	MBI-AVE-131207			400	1000	0	77.12	77.14	12:50:43:086	77.12	77.14
188_102S	CERN	11/1/12	12:50:43:000	77.12	100	EDGA		BLY	MBI-AVE-131208			500	1000	0	77.12	77.14	12:50:43:137	77.12	77.14
188_102S	CERN	11/1/12	12:50:43:000	77.12	100	DATK		BLY	MBI-AVE-131209			600	1000	0	77.12	77.14	12:50:43:112	77.12	77.14
188_102S	CERN	11/1/12	12:50:43:000	77.12	100	TAL		BLY	MBI-AVE-131211			700	1000	0	77.12	77.14	12:50:43:203	77.12	77.14
188_102S	CERN	11/1/12	12:50:43:000	77.12	100	EDGA		BLY	MBI-AVE-131212			800	1000	0	77.12	77.14	12:50:43:255	77.12	77.14
188_102S	CERN	11/1/12	12:50:43:000	77.12	100	DATK		BLY	MBI-AVE-131213			900	1000	0	77.12	77.14	12:50:43:230	77.12	77.14
188_102S	CERN	11/1/12	12:50:44:000	77.13	100	TAL		BLY	MBI-AVE-131228			1000	1000	0	77.12	77.14	12:50:44:281	77.13	77.14
188_102S	CERN	11/1/12	12:50:44:000	77.13	100	EDGA		BLY	MBI-AVE-131229			1100	1000	0	77.12	77.14	12:50:44:305	77.13	77.15
188_102S	CERN	11/1/12	12:50:44:000	77.13	100	DATK		BLY	MBI-AVE-131230			1200	1000	0	77.12	77.14	12:50:44:282	77.13	77.14
188_102S	CERN	11/1/12	12:50:45:000	77.13	100	TAL		BLY	MBI-AVE-131241			1300	1000	0	77.13	77.15	12:50:45:020	77.13	77.15
188_102S	CERN	11/1/12	12:50:45:000	77.13	100	EDGA		BLY	MBI-AVE-131242			1400	1000	0	77.12	77.14	12:50:45:072	77.13	77.15
188_102S	CERN	11/1/12	12:50:45:000	77.13	100	DATK		BLY	MBI-AVE-131243			1500	1000	0	77.13	77.15	12:50:45:411	77.13	77.15
188_102S	CERN	11/1/12	12:50:45:000	77.13	100	TAL		BLY	MBI-AVE-131244			1600	1000	0	77.13	77.15	12:50:45:022	77.13	77.15
188_102S	CERN	11/1/12	12:50:45:000	77.13	100	EDGA		BLY	MBI-AVE-131245			1700	1000	0	77.13	77.15	12:50:45:020	77.13	77.15
188_102S	CERN	11/1/12	12:50:45:000	77.13	100	DATK		BLY	MBI-AVE-131246			1800	1000	0	77.13	77.15	12:50:45:411	77.13	77.15
188_102S	CERN	11/1/12	12:50:46:000	77.14	100	TAL		BLY	MBI-AVE-131249			1900	1000	0	77.14	77.15	12:50:45:934	77.13	77.15
188_102S	CERN	11/1/12	12:50:46:000	77.14	100	EDGA		BLY	MBI-AVE-131250			2000	1000	0	77.14	77.15	12:50:45:985	77.14	77.15
188_102S	CERN	11/1/12	12:50:46:000	77.14	100	DATK		BLY	MBI-AVE-131251			2100	1000	0	77.14	77.15	12:50:45:961	77.14	77.15
188_102S	CERN	11/1/12	12:50:46:000	77.14	100	TAL		BLY	MBI-AVE-131252			2200	1000	0	77.14	77.15	12:50:46:073	77.14	77.15
188_102S	CERN	11/1/12	12:50:46:000	77.14	100	EDGA		BLY	MBI-AVE-131253			2300	1000	0	77.14	77.15	12:50:46:125	77.14	77.15
188_102S	CERN	11/1/12	12:50:46:000	77.14	100	DATK		BLY	MBI-AVE-131254			2400	1000	0	77.14	77.15	12:50:46:100	77.14	77.15
188_102S	CERN	11/1/12	12:50:46:000	77.14	100	TAL		BLY	MBI-AVE-131259			2500	1000	0	77.14	77.15	12:50:46:531	77.14	77.15
188_102S	CERN	11/1/12	12:50:46:000	77.14	100	EDGA		BLY	MBI-AVE-131260			2600	1000	0	77.14	77.15	12:50:46:683	77.14	77.15
188_102S	CERN	11/1/12	12:50:46:000	77.14	100	DATK		BLY	MBI-AVE-131261			2700	1000	0	77.14	77.15	12:50:46:659	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.15	200			SLD SHRT	MBI-AVE-131184		1	2700	800	-200	77.14	77.15	12:50:47:290	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.15	100			SLD SHRT	MBI-AVE-131184		2	2700	614	-389	77.14	77.15	12:50:47:290	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.15	100			SLD SHRT	MBI-AVE-131184		3	2700	511	-489	77.14	77.15	12:50:47:298	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.15	80			SLD SHRT	MBI-AVE-131184		4	2700	431	-569	77.14	77.15	12:50:47:298	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.15	200			SLD SHRT	MBI-AVE-131184		5	2700	231	-769	77.14	77.15	12:50:47:314	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.15	100			SLD SHRT	MBI-AVE-131184		6	2700	131	-869	77.14	77.15	12:50:47:365	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	TAL		BLY	MBI-AVE-131263			2800	131	-869	77.14	77.15	12:50:46:751	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	EDGA		BLY	MBI-AVE-131264			2900	131	-869	77.14	77.15	12:50:46:772	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	DATK		BLY	MBI-AVE-131265			3000	131	-869	77.14	77.15	12:50:46:778	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	TAL		BLY	MBI-AVE-131268			3100	131	-869	77.14	77.15	12:50:46:923	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	EDGA		BLY	MBI-AVE-131269			3200	131	-869	77.14	77.15	12:50:46:802	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	DATK		BLY	MBI-AVE-131270			3300	131	-869	77.14	77.15	12:50:46:950	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	TAL		BLY	MBI-AVE-131272			3400	131	-869	77.14	77.15	12:50:47:007	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	EDGA		BLY	MBI-AVE-131273			3500	131	-869	77.14	77.15	12:50:46:975	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	DATK		BLY	MBI-AVE-131274			3600	131	-869	77.14	77.15	12:50:47:006	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	TAL		BLY	MBI-AVE-131275			3700	131	-869	77.14	77.15	12:50:47:156	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	EDGA		BLY	MBI-AVE-131276			3800	131	-869	77.14	77.15	12:50:47:189	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	DATK		BLY	MBI-AVE-131277			3900	131	-869	77.14	77.15	12:50:47:162	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	TAL		BLY	MBI-AVE-131278			4000	131	-869	77.14	77.15	12:50:47:210	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	EDGA		BLY	MBI-AVE-131279			4100	131	-869	77.14	77.15	12:50:47:262	77.14	77.15
188_102S	CERN	11/1/12	12:50:47:000	77.14	100	DATK		BLY	MBI-AVE-131304			4200	131	-869	77.14	77.15	12:50:47:237	77.14	77.15
188_102S	CERN	11/1/12	12:50:48:000	77.14	100	TAL		BLY	MBI-AVE-131284			4300	131	-869	77.14	77.15	12:50:47:548	77.14	77.15
188_102S	CERN	11/1/12	12:50:48:000	77.14	100	EDGA		BLY	MBI-AVE-131285			4400	131	-869	77.14	77.15	12:50:47:799	77.14	77.15
188_102S	CERN	11/1/12	12:50:48:000	77.14	100	DATK		BLY	MBI-AVE-131286			4500	131	-869	77.14	77.15	12:50:47:775	77.14	77.15
188_102S	CERN	11/1/12	12:50:48:000		100	DATK		CXL BLY	MBI-AVE-131296	MBI-AVE-131286		4400	131	-869	77.14	77.15	12:50:48:000	77.14	77.15
188_102S	CERN	11/1/12	12:50:48:000		100	EDGA		CXL BLY	MBI-AVE-131297	MBI-AVE-131285		4300	131	-869	77.14	77.15	12:50:48:000	77.14	77.15
188_102S	CERN	11/1/12	12:50:48:000		100	TAL		CXL BLY	MBI-AVE-131298	MBI-AVE-131284		4200	131	-869	77.14	77.15	12:50:48:000	77.14	77.15
188_102S	CERN	11/1/12	12:50:48:000		100	DATK		CXL BLY	MBI-AVE-131299	MBI-AVE-131280		4100	131	-869	77.14	77.15	12:50:		

Timestamp	mtype	symbol	shares	price	mpid_exid	mid_sc	sip.bsize	sip.bid	sip.ask	sip.asize
12:50:44.289	trd	CERN	100	77.14	ARCA	@F	500	77.13	77.14	100
12:50:47.292	trd	CERN	100	77.15	INET	@F	2700	77.14	77.15	600
12:50:47.292	trd	CERN	100	77.15	INET	@F	2800	77.14	77.15	300
12:50:47.293	trd	CERN	100	77.15	ARCA	@	2900	77.14	77.15	200
12:50:47.294	trd	CERN	200	77.15	ARCA	@	2800	77.14	77.15	200
12:50:47.295	trd	CERN	189	77.15	ARCA	@	2800	77.14	77.15	200
12:50:47.302	trd	CERN	100	77.15	ARCA	@	2900	77.14	77.15	200
12:50:47.919	trd	CERN	200	77.15	ARCA	@	3200	77.14	77.15	200
12:50:47.969	trd	CERN	100	77.15	ARCA	@	3200	77.14	77.15	200
12:50:48.620	trd	CERN	100	77.15	FINRA	@	300	77.14	77.15	100
12:50:48.656	trd	CERN	100	77.145	FINRA	@	300	77.14	77.15	100
12:50:48.918	trd	CERN	100	77.14	FINRA	@	300	77.14	77.15	100
12:50:49.028	trd	CERN	100	77.15	ARCA	@F__	300	77.14	77.15	100
12:50:49.136	trd	CERN	100	77.15	FINRA	@	300	77.14	77.18	100

92. The tables above provide data for Hendershott’s Exhibit 7a. The first table corresponds to the order and execution history over the segment as produced in the backup materials accompanying Hendershott’s report. The second table above represents the historical tick data captured from the SIP over the trading segment as provided by Thesys. For the second table, Avalon’s trades that are identifiable in the historical tick data are highlighted in green.

- a. Starting at 12:50:40 PM Avalon send a non-marketable limit to NYSE ARCA sell short 1000 shares of CERN at \$77.15 with a display size of 200 shares behind the NBO of \$77.14. This is the “quiet” side order which sets an Avalon’s upper limit to sell as part of a quasi-market making spread capture strategy.
- b. At 12:50:42 PM, Avalon sent 3 orders to EDGA, NYSE ARCA, and NASDAQ totaling 300 shares to buy CERN at \$77.11 behind the NBB of \$77.12, thus establishing a two-sided market and forming the initial buy orders for Avalon’s “loud” side pressure strategy.
- c. At 12:50:43 PM, Avalon sent 6 additional orders to EDGA, NYSE ARCA, and NASDAQ totaling 600 shares to buy CERN at \$77.12 joining the NBB of \$77.12. Avalon is testing the next level of buy interest with its pressure strategy.
- d. At 12:50:44 PM, Avalon sent 3 orders EDGA, NYSE ARCA, and NASDAQ totaling 300 shares to buy CERN at \$77.13 improving the NBB of \$77.12 and establishing a new NBB of \$77.13. Avalon has tightened the spread as it tests the next level of buy interest with its pressure strategy.
- e. At 12:50:44.289 PM, the NBO of \$77.14 x 100 was bought by a liquidity taker and the NBBO subsequently widened to \$77.13 by \$77.15.
- f. At 12:50:45 PM, Avalon joined the NBB of \$77.13 by sending 6 orders to EDGA, NYSE ARCA, and NASDAQ totaling 600 shares to buy CERN at \$77.13. Avalon is testing the next level of buy interest with its pressure strategy and demonstrating there are no natural sellers that will trade against its limit orders active in the market.
- g. At 12:50:46 PM, Avalon sent 9 orders to EDGA, NYSE ARCA, and NASDAQ totaling 900 shares to buy CERN at \$77.14, continuing to challenge the market with its pressure strategy and demonstrating the absence of natural sellers.
- h. At this time, Avalon has a total of 27 orders totaling 2700 shares which have tightened the NBO from \$77.11 to \$77.14. Avalon’s trading has successively

exposed the lack of sellers at all four price levels. In fact, only one trade for 100 shares has occurred in the market by a buyer for \$77.14 at this time. Avalon is maintaining a two-sided market by posting 1000 shares at \$77.15, but has not exposed its sell order for more than 200 shares.

- i. Avalon's two-sided market at 12:50:47, bidding at 900 shares at the NBB of \$77.14 and offering 1000 shares at the NBO of \$77.15, is providing a one tick wide market at this time, and is providing significant liquidity available on both sides of the market which corresponded to 1600 shares total displayed size at the NBB and 700 shares total displayed size at the NBO. Avalon's trading activity has demonstrated to the market a lack of sellers on the contra side of its pressure strategy (which encountered no resistance) and implies the fair value of CERN is closer to the offer. Avalon's orders bounded a reasonable fair value for CERN at this point given the lack of any aggressive response by the market participants. Avalon's exposure of the lack of sellers at the price point contributes to price discovery. Avalon is not required to display its full quantity at \$77.15, nor does the order embed deceptive information.
- j. Starting at 12:50:47 PM, one or more buyers start to aggress against the NBO of \$77.15 and executes against Avalon and other participants. Avalon executes 869 shares at \$77.15.<sup>22</sup>
- k. After Avalon's quiet side order is partially filled. Avalon cancels all its outstanding buy orders. Having now established a short position, most likely because Avalon has rationally determined it should not employ the pressure strategy to challenge the market in the direction contrary to its newly established short position, which would be expected create market impact that would negatively impact the profitability of the short position.
- l. At 12:50:48 PM 300 shares of off-exchange liquidity trades within the bid-ask spread.
- m. At 12:50:48 PM, Avalon sends a marketable order to sell for 100 shares of CERN and executes at \$77.14. Shortly, thereafter, Avalon's executes the remainder of its quiet side order, executing 131 shares at \$77.15.
- n. At 12:50:49 PM, the NBBO is now \$77.14 by \$77.18. Avalon's buy orders have not executed due to the complete absence of natural sellers. Avalon's quiet side order has executed in full at \$77.15 and it now has a mark-to-market loss relative to the midpoint of \$77.16, which is further evidence that Avalon's pressure strategy contributed to price-discovery by revealing the lack of sell interest at lower price levels at this time.
- o. Overall, Avalon's pressure strategy did not result in any execution due to a lack of contra liquidity in the form of natural sellers. Had Avalon been able to execute at its buy prices, it would have been positioned to exit favorably at the higher offer it had posted. Although Avalon's pressure strategy shows intent to challenge the market, resulting in market impact, it also has the dual purpose of

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<sup>22</sup> It should be noted that Avalon's partial fills below a round lot size of 100 are not disseminated over the SIP and are only evident in Avalon's transaction log.

capturing a market making spread below its offer price. Avalon's pressure strategy did not result in artificial price impact, but in fact provided real information to Avalon and the market as a whole on the lack of sellers at various price points. Avalon itself provided more liquidity at a better price than the market actually was willing to provide when it sold at the \$77.15 price incurring a short-term mark-to-market loss.

- p. A claim of artificial price impact is ill-founded, as Avalon showed it could not buy at any price any quantity below its offer of \$77.15 without being a liquidity taker, nor could any other market participant active on the exchanges at that time. The failure of execution cannot be attributed to non-bona fide intent, as the orders were placed in the most likely scenario to attract sellers who required access to significant liquidity.
- q. Avalon's desire to challenge the liquidity below its offer is not manipulative, nor does Avalon need to show any intent to be one-sided. Avalon is permitted to increase or decrease its position as it sees fits, operating as a two-sided quasi-market maker who consistently demonstrates it will buy below and sell above a trading range.
- r. Avalon's decision to cancel the orders associated with its pressure strategy is not manipulative or evidence intent to submit non-bona fide orders. The cancellation is a natural response not to continue to aggress against the market as a buyer when Avalon has just entered into a short position, a rational and permissible response to the trading activity. Furthermore, there is no a priori intent to cancel for Avalon would have undoubtedly had a different response if it had established a long position, which may have resulted in activity such as cancelling its quiet side to exit the long position at a higher price or may have resulted in no cancellations at all. The conditional nature of Avalon's orders as a two-sided quasi-market maker must be acknowledged for any legitimate assessment of its cancellation activity.

## Example B - Assessment of CERN Trading on November 1, 2012 (12:50:52 PM - 12:51:15 PM)

Trader	Symbol	Date	Time	Price	Quantity	Exchange	Visible Shares	Instruction	Order Name	Reorder Name	Report Sequence	Buy Order Balance	Sell Order Balance	Execution Balance	Best Bid	Best Offer	Adjusted Time	Adjusted Best Bid	Adjusted Best Offer
188.102S	CERN	11/01/12	12:50:52.000	77.17	100	EDGEX		SSSIRT	MBI-AVE-131410		0	100	-1100	77.14	77.18	12:50:52.004	77.14	77.17	
188.102S	CERN	11/01/12	12:50:53.000	77.16	100	EDGEX		SSSIRT	MBI-AVE-131411		0	200	-1100	77.14	77.18	12:50:53.004	77.14	77.14	
188.102S	CERN	11/01/12	12:50:53.000	77.16	100	TAL		SSSIRT	MBI-AVE-131448		0	300	-1100	77.14	77.16	12:50:53.023	77.14	77.16	
188.102S	CERN	11/01/12	12:50:53.000	77.16	100	EDGEX		SSSIRT	MBI-AVE-131449		0	400	-1100	77.14	77.16	12:50:53.024	77.14	77.16	
188.102S	CERN	11/01/12	12:50:53.000	77.16	100	DATK		SSSIRT	MBI-AVE-131450		0	500	-1100	77.14	77.16	12:50:53.050	77.14	77.16	
188.102S	CERN	11/01/12	12:50:53.000	77.15	100	EDGEX		SSSIRT	MBI-AVE-131461		0	600	-1100	77.14	77.16	12:50:53.135	77.14	77.16	
188.102S	CERN	11/01/12	12:50:53.000	77.14	100	EDGEX		SSSIRT	MBI-AVE-131483		0	700	-1100	77.13	77.15	12:50:56.576	77.13	77.14	
188.102S	CERN	11/01/12	12:50:53.000	77.14	100	EDGEX		SSSIRT	MBI-AVE-131486		0	800	-1100	77.13	77.14	12:50:57.547	77.13	77.14	
188.102S	CERN	11/01/12	12:50:53.000	77.14	100	EDGEX		SSSIRT	MBI-AVE-131487		0	900	-1100	77.13	77.14	12:50:57.547	77.13	77.14	
188.102S	CERN	11/01/12	12:50:53.000	77.13	100	EDGEX		SSSIRT	MBI-AVE-131497		0	1000	-1100	77.13	77.14	12:50:58.005	77.12	77.14	
188.102S	CERN	11/01/12	12:50:53.001	77.13	100	EDGEX		SLD SSSIRT	MBI-AVE-131497		0	900	-1200	77.13	77.14	12:50:58.005	77.12	77.14	
188.102S	CERN	11/01/12	12:50:53.000	77.11	100	EDGEX		SSSIRT	MBI-AVE-131504		0	1000	-1200	77.08	77.09	12:50:59.500	77.06	77.09	
188.102S	CERN	11/01/12	12:50:53.000	77.11	100	EDGEX		SSSIRT	MBI-AVE-131505		0	1100	-1200	77.08	77.09	12:50:59.555	77.06	77.09	
188.102S	CERN	11/01/12	12:50:53.000	77.07	1200	EDGEX	200	BLY	MBI-AVE-131519		1000	1100	-1200	77.07	77.11	12:51:00.509	77.07	77.11	
188.102S	CERN	11/01/12	12:51:02.000	77.09	100	EDGEX		SSSIRT	MBI-AVE-131557		1200	1200	-1200	77.07	77.11	12:51:02.271	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.08	100	EDGEX		SSSIRT	MBI-AVE-131571		1200	1300	-1200	77.07	77.09	12:51:03.475	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	TAL		SSSIRT	MBI-AVE-131605		1200	1400	-1200	77.07	77.08	12:51:04.075	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	EDGEX		SSSIRT	MBI-AVE-131606		1200	1500	-1200	77.07	77.08	12:51:04.977	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	DATK		SSSIRT	MBI-AVE-131607		1200	1600	-1200	77.07	77.08	12:51:05.003	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	TAL		SSSIRT	MBI-AVE-131612		1200	1700	-1200	77.07	77.08	12:51:05.104	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	EDGEX		SSSIRT	MBI-AVE-131613		1200	1800	-1200	77.07	77.08	12:51:05.132	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	DATK		SSSIRT	MBI-AVE-131614		1200	1900	-1200	77.07	77.08	12:51:05.190	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	TAL		SSSIRT	MBI-AVE-131617		1200	2000	-1200	77.07	77.08	12:51:05.207	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	EDGEX		SSSIRT	MBI-AVE-131618		1200	2100	-1200	77.07	77.08	12:51:05.323	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	DATK		SSSIRT	MBI-AVE-131619		1200	2200	-1200	77.07	77.08	12:51:05.355	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	EDGEX		SSSIRT	MBI-AVE-131623		1200	2400	-1200	77.07	77.08	12:51:05.721	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	DATK		SSSIRT	MBI-AVE-131623		1200	2400	-1200	77.07	77.08	12:51:05.740	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.08	100	TAL		SSSIRT	MBI-AVE-131626		1200	2600	-1200	77.07	77.08	12:51:05.831	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.08	100	EDGEX		SSSIRT	MBI-AVE-131627		1200	2700	-1200	77.07	77.08	12:51:05.884	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.08	100	DATK		SSSIRT	MBI-AVE-131628		1200	2800	-1200	77.07	77.08	12:51:05.873	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.08	100	TAL		SSSIRT	MBI-AVE-131629		1200	2900	-1200	77.07	77.08	12:51:06.893	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.08	100	EDGEX		SSSIRT	MBI-AVE-131630		1200	3000	-1200	77.07	77.08	12:51:06.920	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.08	100	DATK		SSSIRT	MBI-AVE-131631		1200	3100	-1200	77.07	77.08	12:51:06.923	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	TAL		SSSIRT	MBI-AVE-131633		1200	3200	-1200	77.07	77.08	12:51:06.900	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	EDGEX		SSSIRT	MBI-AVE-131634		1200	3300	-1200	77.07	77.08	12:51:06.900	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	DATK		SSSIRT	MBI-AVE-131635		1200	3400	-1200	77.07	77.08	12:51:06.900	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	TAL		SSSIRT	MBI-AVE-131638		1200	3500	-1200	77.07	77.08	12:51:06.900	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	EDGEX		SSSIRT	MBI-AVE-131639		1200	3600	-1200	77.07	77.08	12:51:06.900	77.07	77.11	
188.102S	CERN	11/01/12	12:51:03.000	77.09	100	DATK		SSSIRT	MBI-AVE-131640		1200	3700	-1200	77.07	77.08	12:51:06.900	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	TAL		SSSIRT	MBI-AVE-131659		1200	3800	-1200	77.07	77.08	12:51:06.920	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	EDGEX		SSSIRT	MBI-AVE-131660		1200	3900	-1200	77.07	77.08	12:51:06.947	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	DATK		SSSIRT	MBI-AVE-131661		1200	4000	-1200	77.07	77.08	12:51:06.917	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	TAL		SSSIRT	MBI-AVE-131662		1200	4100	-1200	77.07	77.08	12:51:07.037	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	EDGEX		SSSIRT	MBI-AVE-131663		1200	4200	-1200	77.07	77.08	12:51:07.091	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	DATK		SSSIRT	MBI-AVE-131664		1200	4300	-1200	77.07	77.08	12:51:07.064	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	TAL		SSSIRT	MBI-AVE-131672		1200	4400	-1200	77.07	77.08	12:51:07.175	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	EDGEX		SSSIRT	MBI-AVE-131673		1200	4500	-1200	77.07	77.08	12:51:07.175	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	DATK		SSSIRT	MBI-AVE-131674		1200	4600	-1200	77.07	77.08	12:51:07.175	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	TAL		SSSIRT	MBI-AVE-131675		1200	4700	-1200	77.07	77.08	12:51:07.185	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	EDGEX		SSSIRT	MBI-AVE-131676		1200	4800	-1200	77.07	77.08	12:51:07.238	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	DATK		SSSIRT	MBI-AVE-131677		1200	4900	-1200	77.07	77.08	12:51:07.212	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	TAL		SSSIRT	MBI-AVE-131678		1200	5000	-1200	77.07	77.08	12:51:07.262	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	EDGEX		SSSIRT	MBI-AVE-131679		1200	5100	-1200	77.07	77.08	12:51:07.213	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.08	100	DATK		SSSIRT	MBI-AVE-131680		1200	5200	-1200	77.07	77.08	12:51:07.267	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.07	1200	EDGEX		CNL BLY	MBI-AVE-131691	MBI-AVE-131539	0	5200	-1200	77.07	77.08	12:51:07.900	77.07	77.11	
188.102S	CERN	11/01/12	12:51:07.000	77.07	100	EDGEX		SSSIRT	MBI-AVE-131692		0	5300	-1200	77.07	77.08	12:51:07.945	77.07	77.11	
188.102S</																			

timestamp	mtyp	symbol	oid	shares	price	mpid_exchange	sip.bsize	sip.bid	sip.ask	sip.asize
12:50:55.141	trd	CERN	UTDFT_CERN_Q	100	77.14	INET	100	77.14	77.16	800
12:50:55.142	trd	CERN	UTDFT_CERN_Z	100	77.14	BATS	100	77.14	77.16	800
12:50:55.160	trd	CERN	UTDFT_CERN_K	100	77.13	EDGX	400	77.13	77.14	200
12:50:55.161	trd	CERN	UTDFT_CERN_K	200	77.13	EDGX	400	77.13	77.14	200
12:50:55.468	trd	CERN	UTDFT_CERN_Z	100	77.14	BATS	400	77.13	77.15	300
12:50:57.598	trd	CERN	UTDFT_CERN_K	300	77.13	EDGX	100	77.13	77.14	300
12:50:58.011	trd	CERN	UTDFT_CERN_K	100	77.13	EDGX	200	77.12	77.14	300
12:50:58.015	trd	CERN	UTDFT_CERN_K	100	77.12	EDGX	100	77.11	77.14	300
12:50:58.440	trd	CERN	UTDFT_CERN_K	100	77.12	EDGX	100	77.11	77.13	600
12:50:58.880	trd	CERN	UTDFT_CERN_Q	100	77.11	INET	100	77.09	77.1	300
12:50:58.881	trd	CERN	UTDFT_CERN_Q	100	77.1	INET	100	77.09	77.1	300
12:50:59.436	trd	CERN	UTDFT_CERN_B	100	77.09	BX	300	77.06	77.09	300
12:50:59.448	trd	CERN	UTDFT_CERN_D	100	77.09	FINRA	300	77.06	77.09	200
12:50:59.448	trd	CERN	UTDFT_CERN_D	200	77.09	FINRA	300	77.06	77.09	200
12:50:59.582	trd	CERN	UTDFT_CERN_D	100	77.09	FINRA	300	77.06	77.08	700
12:50:59.715	trd	CERN	UTDFT_CERN_D	100	77.08	FINRA	300	77.06	77.08	700
12:50:59.767	trd	CERN	UTDFT_CERN_Q	100	77.08	INET	300	77.06	77.08	700
12:50:59.767	trd	CERN	UTDFT_CERN_Q	100	77.08	INET	300	77.06	77.08	700
12:50:59.767	trd	CERN	UTDFT_CERN_D	200	77.08	FINRA	300	77.06	77.08	700
12:50:59.769	trd	CERN	UTDFT_CERN_Z	200	77.08	BATS	600	77.07	77.1	200
12:50:59.769	trd	CERN	UTDFT_CERN_Z	100	77.08	BATS	600	77.07	77.1	200
12:50:59.769	trd	CERN	UTDFT_CERN_Z	100	77.08	BATS	600	77.07	77.1	200
12:51:00.411	trd	CERN	UTDFT_CERN_C	100	77.07	NSX	200	77.06	77.1	600
12:51:01.261	trd	CERN	UTDFT_CERN_D	100	77.09	FINRA	200	77.07	77.1	300
12:51:09.046	trd	CERN	UTDFT_CERN_Q	100	77.04	INET	200	77.03	77.05	300
12:51:09.156	trd	CERN	UTDFT_CERN_D	100	77.05	FINRA	100	77.03	77.05	200
12:51:10.723	trd	CERN	UTDFT_CERN_D	100	77.06	FINRA	200	77.03	77.06	100
12:51:10.762	trd	CERN	UTDFT_CERN_Q	100	77.06	INET	500	77.04	77.09	300
12:51:10.764	trd	CERN	UTDFT_CERN_Q	100	77.08	INET	200	77.05	77.08	100
12:51:10.765	trd	CERN	UTDFT_CERN_Z	100	77.09	BATS	200	77.05	77.08	100
12:51:10.766	trd	CERN	UTDFT_CERN_Q	100	77.08	INET	300	77.05	77.09	300
12:51:10.768	trd	CERN	UTDFT_CERN_Q	100	77.09	INET	400	77.06	77.09	300
12:51:10.769	trd	CERN	UTDFT_CERN_Q	100	77.09	INET	700	77.07	77.1	200
12:51:10.769	trd	CERN	UTDFT_CERN_Q	100	77.09	INET	700	77.07	77.1	200
12:51:10.769	trd	CERN	UTDFT_CERN_Z	100	77.09	BATS	700	77.07	77.1	200
12:51:10.769	trd	CERN	UTDFT_CERN_Z	100	77.09	BATS	700	77.07	77.1	200
12:51:10.769	trd	CERN	UTDFT_CERN_Z	200	77.09	BATS	700	77.07	77.1	200
12:51:14.511	trd	CERN	UTDFT_CERN_P	100	77.1	ARCA	100	77.09	77.11	1000
12:51:14.947	trd	CERN	UTDFT_CERN_P	100	77.1	ARCA	200	77.1	77.11	900
12:51:14.947	trd	CERN	UTDFT_CERN_P	100	77.1	ARCA	200	77.1	77.11	900

93. The tables above provide data for Hendershott's Exhibit 7b. This example for CERN follows shortly after the 1100 share short position is established in Example A above.
- a. At 12:50:52 PM, Avalon sent 1 order to EDGX totaling 100 shares to sell CERN at \$77.17 improving the NBO of \$77.18. Avalon, having established a short position is now challenging the capacity of buy interest observed in the market by providing additional liquidity that tightens the spread with its pressure strategy.
  - b. At 12:50:53 PM, Avalon sent 4 orders to EDGX, NYSE ARCA, NASDAQ, and EDGA totaling 400 shares to sell CERN at \$77.16 improving the NBO of \$77.17 tightening the spread with its pressure strategy.
  - c. At 12:50:55 PM, Avalon sent 1 order to EDGX totaling 100 shares to sell CERN at \$77.15 improving the NBO of \$77.16, tightening the spread with its pressure strategy.
  - d. At 12:50:57 PM, Avalon sent 4 orders to EDGX, NYSE ARCA, NASDAQ, and EDGA totaling 400 shares to sell CERN at \$77.14 improving the NBO of \$77.15, tightening the spread with its pressure strategy.
  - e. At 12:50:58 PM, Avalon sent 1 order to EDGX totaling 100 shares to sell CERN at \$77.14 which collided with the NBB and resulted in 100 shares sold short at \$77.14.
  - f. At 12:50:59 PM, Avalon sent 2 orders to EDGX totaling 200 shares to sell CERN at \$77.10, tightening the spread with its pressure strategy.
  - g. Starting at 12:51:00 PM Avalon send a non-marketable limit to EDGA to buy 1200 shares of CERN at \$77.07 with a display size of 200 shares at the NBB of \$77.07. This is the "quiet" side order which sets Avalon's lower limit to buy as part of a quasi-market making spread capture strategy.
  - h. At 12:51:02 PM, Avalon sent 1 order to EDGX totaling 100 shares to sell CERN at \$77.09, tightening the spread with its pressure strategy.
  - i. At 12:51:03 PM, Avalon sent 1 order to EDGX totaling 100 shares to sell CERN at \$77.08, tightening the spread with its pressure strategy.
  - j. At 12:51:05 PM, Avalon sent 12 orders to NYSE ARCA, EDGA, and NASDAQ totaling 1200 shares to sell CERN at \$77.09 with its pressure strategy.
  - k. At 12:51:06 PM, Avalon sent 6 orders to NYSE ARCA, EDGA, and NASDAQ totaling 600 shares to sell CERN at \$77.08 with its pressure strategy.
  - l. At 12:51:06 PM, Avalon sent 6 orders to NYSE ARCA, EDGA, and NASDAQ totaling 600 shares to sell CERN at \$77.09 with its pressure strategy.
  - m. At 12:51:07 PM, Avalon sent 6 orders to NYSE ARCA, EDGA, and NASDAQ totaling 1500 shares to sell CERN at \$77.08 with its pressure strategy.
  - n. At 12:51:07, Avalon canceled its quiet side order for 1200 shares to buy CERN for \$77.07.
  - o. At 12:51:07 PM, Avalon sent 3 orders to EDGX totaling 300 shares to sell CERN at \$77.07 with its pressure strategy.
  - p. At 12:51:07 PM, Avalon sent 11 orders to EDGX totaling 1100 shares to sell CERN at \$77.06 with its pressure strategy.

- q. At 12:51:10 PM, Avalon canceled 57 orders totaling 5700 shares to sell associated with its pressure strategy and left 9 orders totaling 900 shares to sell existing in the market.
- r. Starting at 12:51:10 PM Avalon sent a marketable limit to EDGA to buy 1200 shares of CERN at \$77.10 with a display size of 200 shares and traded through the NBB of \$77.06, exiting its position and locking in a gain. Avalon was fully filled in 11 separate executions at prices from \$77.06 to \$77.09.
- s. At 12:51:07 PM, Avalon canceled the 9 remaining orders totaling 900 shares to sell CERN associated with its pressure strategy and exited the market, flat inventory and booking a profit.
- t. Over this period, Avalon's orders on both the loud and quiet side encountered difficulty executing due to liquidity constraints in the market, including volume associated with off-exchange trading that was not accessible to Avalon. Other market participants appears to have been competing for the limited volume that executed on exchanges. While Avalon's pressure strategy had market impact, other traders were also active in the stock and competed for liquidity with aggressive orders. At the same time, Avalon had difficulty executing its quiet side orders against natural liquidity takes. At the end of the sequence. Avalon chose to close out its position with a marketable order after it was unable to execute orders that in a more liquid environment would have likely been filled.

Example C - Assessment of TV Trading on August 12, 2015 (10:13:31 AM - 10:13:57 AM)

94. - Assessment of TV Trading on August 12, 2015 (10:13:31 AM - 10:13:57 AM)<sup>23</sup>

- a. Hendershott notes that "[i]n Exhibit 8a, the trader begins the Loop with no outstanding orders or shares" and that "[a]t around 10:13:35, the trader places 2 purchase limit orders for 3,500 shares each at \$32.37." These orders are placed at the lower end of Avalon's view of the potential trading range and correspond to quiet side orders used in Avalon's quasi market making strategy. These orders are bona fide and non-manipulative.
- b. Hendershott then notes that "At around 10:13:54, the trader places 12 sale limit orders for 1,000 to 3,000 shares each at increasingly lower prices from \$32.40 to \$32.38." This order placement is consistent with Avalon's pressure strategy, however the orders do not tighten the spread and are placed at or behind the offers. The sell orders do not execute, but also do not have any price impact.
- c. And yet, Hendershott claims that "[t]hese Loud-side sale orders appear to have successfully placed downward pressure on the stock price. Shortly after the Loud-side sale orders end, both purchase orders execute, with the trader purchasing shares at a price lower than available before the loop started." Hendershott's assessment is misleading, as Avalon's quiet side order was the best bid prior to any of its loud-side orders being routed to the market. The

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<sup>23</sup> Hendershott Report, paras. 35-36, at 16 and Exh. 8a.

- supposed downward price movement suggested by Hendershott occurred before any of Avalon's sell orders were even entered into the market.
- d. Hendershott then notes that "[t]he remaining Loud-side sale orders are cancelled around the same time." Again, this is misleading. According to the data produced with Hendershott's report, Avalon's sell orders were all cancelled *before* the execution of Avalon's buy orders. Those buy orders thus no longer meet Hendershott's criteria for "layer loops" as there is no contemporaneous "order imbalance" at the time the buy side orders execute.
  - e. Hendershott concludes: "In summary, the trader is able to acquire a long position through the purchase of shares at prices that appear to have been depressed by the Loud-side sale orders." In this example, the price impact Hendershott attributes erroneously to Avalon was actually caused by other market factors.

#### Example D - Assessment of TV Trading on August 12,2015 (10:14:05 AM - 10:14:44 AM)

##### 95. Assessment of TV Trading on August 12,2015 (10:14:05 AM - 10:14:44 AM)<sup>24</sup>

- a. In a continuation of Avalon's trading of TV as discussed in Example C, Hendershott discusses the second phase of Avalon's trading activity. Hendershott notes that "[i]n Exhibit 8b, the trader appears to sell his long position at an advantageous price by creating an artificial appearance of demand. The trader first places two sale limit orders, and then places multiple Loud-side purchase orders in a short period of time." Hendershott further clarifies that "[a]t around 10:14:08, the trader places 2 sale limit orders for 3,500 shares each at \$32.43. At around 10:14:41, the trader places 12 purchase limit orders for 1,000 to 3,000 shares each at increasingly higher prices from \$32.40 to \$32.42"
- b. As with the previous example, the data produced along with Hendershott's report shows that Avalon's buy orders have no price impact as the market price remains constant throughout the sequence. Also, again, all of Avalon's buy orders were canceled before any of the sell orders were executed. Thus, as with the last example, this sequence does not meet Hendershott's criteria as there is no contemporaneous "order imbalance" at the time the "quite" side orders were executed.
- c. Hendershott concludes that "[i]n summary, this trader is able to sell his long position through the sale of shares at prices that appear to have been inflated by the Loud-side purchase orders. Over these two back-to-back Loops the trader bought low and sold high." Avalon's quasi-market making strategy intends to support prices at both ends of the trading range as a liquidity provider. The fact that the orders associated with Avalon's pressure strategy were submitted after the alleged price impact was caused by other market participants is evidence

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<sup>24</sup> *Id.* para. 37, at 16 and Exh. 8a.

that Hendershott's analysis is insufficient and cannot reliably support the allegations against Avalon even in these limited examples he introduces.

Example E - Assessment of AIG Trading on December 18, 2014 (1:50:46 PM - 1:50:56 PM)

96. Assessment of AIG Trading on December 18, 2014 (1:50:46 PM - 1:50:56 PM)<sup>25</sup>

- a. Hendershott's exhibits notes that "60 sale orders for 100 shares each are placed at gradually decreasing prices within 6 seconds" These orders are legitimate orders that are tightening the spread on the offer price. Due to a lack of contra-side liquidity, the orders do not execute, but instead demonstrate no natural buyers of liquidity at each successive price. This sequence of trades is the pressure strategy that challenges and probes buy interest in the market. The strategy demonstrates the lack of buyers to Avalon and the market as a whole, which does not create sellers, but may influence natural buyers to seek to execute at lower, more favorable prices or may influence natural sellers to trade more aggressively. Avalon's orders may expose of the lack of buyers, but this effect is not manipulative, but rather provides new information to the market. Avalon's posting of aggressive orders that tighten the market and that are sufficiently exposed are orders that demonstrate a bona fide intent and cannot be held responsible for a failure to execute in the absence of contra-side liquidity and natural buyers.
- b. The exhibit then notes that "3 hidden purchase orders for 3300 shares in total are then placed." Avalon places its buy orders below it sell orders to make a two-sided market. These orders are consistent with Avalon's quasi-market making strategy and define the end of the trading range Avalon has determined it would support. Avalon should not be penalized for choosing to provide offsetting liquidity at a lower price than its offers. The use of a hidden order is sensible given comparable use of hidden orders by HFTs and other market participants. At this stage Avalon has no certainty whether its offers or bids will trade and each side of its quote is bona fide and subject to execution risk. Furthermore, it can make an instantaneous profit based on spread capture if both sides of its two-sided market are executed.
- c. After Avalon establishes a two sided market, the exhibit notes that "3200 shares are executed within 2 seconds of the purchase orders." At this point, Avalon has provided liquidity below its offer prices. The fact that it trades on its bid price is thoroughly consistent with the information provided by its aggressive offers, which demonstrated to Avalon and the market that there were no natural buyers. Avalon \provided liquidity on the bid after it determined there was little competition from other market participants through the market impact of its pressure strategy.

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<sup>25</sup> Second Supplemental Report of Terrence Hendershott, Ph.D. Exh. 18 (Mar. 15, 2018).

- d. The exhibit notes that “[h]alf of the 60 sale orders are cancelled within half of a second” and that “[t]he remaining 30 outstanding sale orders are cancelled within 2 seconds following the last execution,” presumably as evidence of a non-bona fide intent in the offers. However, the cancellation activity is a completely rational and legitimate response of a market maker who has traded one side of its two-sided market.
- e. Avalon could have kept its offers in the market to sell and realized a one cent spread with rebate. Instead, it chooses the equally reasonable tactic of canceling orders. Avalon is rationally incentivized to minimize market impact of its own offers on its long position so it can capture a larger spread.
- f. The resulting trade sequence was conditional, and Avalon would have undoubtedly acted differently if its offers had traded instead of its bids. Consequently, Hendershott’s sampling is biased in that it does not represent all other conditional trading sequences that might arise out of Avalon’s pressure strategy and quasi-market making strategy. For example, had Avalon executed on its offers and entered into a short position, it may have chosen to keep its hidden bids or it may have canceled its bids in order to maintain the short position and capture a wider spread by exiting the inventory at a lower price. Hence, in two-sided market making strategies, it is sensible and rational to cancel orders with potential price impact that are on the contra-side of the market maker’s position. Hendershott erroneously assigns an intended side to Avalon’s two-sided quasi-market making strategy which appears resilient irrespective of which side trades.
- g. Avalon is not required to be one-sided in intent and should be assessed on its activity as a two-sided quasi-market maker with intent on both sides of the market. Furthermore, any argument that Avalon’s aggressive one-tick wide market as seen in this example involved non-bona fide orders is confusing a lack of contra-side liquidity with an intent not to execute. In this example, there is no evidence Avalon could have executed its aggressive sell prices without paying a taker fee and crossing the spread.

Example F - Assessment of MA Trading on November 7, 2014 (12:40:21 PM - 12:40:28 PM)

97. Assessment of MA Trading on November 7, 2014 (12:40:21 PM - 12:40:28 PM)<sup>26</sup>

- a. In this example, Hendershott’s exhibit notes that “70 purchase orders for 100 shares each are placed at gradually increasing prices within 4 seconds.” Similar to Example E, the aggressive bids form a pressure strategy that confirms the absence of natural sellers, as Avalon tightens the spread at successively higher levels. The information that Avalon produces through this iterative process demonstrates the lack of natural contra-side sellers that would be expected to trade against Avalon’s buyers. As Avalon conducts its pressure strategy, natural buyers may respond to the exposure of a lack of sell interest by buying more

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<sup>26</sup> *Id.* Exh. 19.

- aggressively and natural sellers may choose to respond similarly by trying to sell at a higher price. The exposure of a lack of natural sellers at higher prices is not manipulative, but produces real information that assists Avalon in determining its notion of trading range and valuation for the security and will produce legitimate information that assists in price discovery for the market as a whole.
- b. The exhibit then notes that “3 hidden sale orders for 3,300 shares in total are placed between purchase orders.” As in the previous example, Avalon now posts an order at a higher price that provides liquidity as part of a quasi-market making strategy, presumably at the end of its trading range at a price it has determined it should support. Irrespective of what side of the market Avalon trades, it has posted orders that form a rational bid/offer spread and which are sufficiently available to the market for interaction. To the extent that either side does not trade, it is directly do to the lack of contra-side liquidity.
  - c. The exhibit then notes that “[t]he 3 sale orders are executed completely during the same second” and that “[a]ll 70 outstanding purchase orders are cancelled within 2 seconds following the last execution” As in the previous example, the fact that the quiet side traded is consistent with Avalon’s demonstration that there were no natural sellers in the market that would execute against its aggressive posted bids. When Avalon executed on its offer price, its economic incentives changed and it had no reason to post prices with potential adverse price impact on the contra-side to its position.
  - d. Any view that the sequence above implies a non-bona fide intent fails to recognize that the orders placed can have conditional outcomes and that fill-rates are a function of liquidity taking activity over which market makers have no control. For example, Avalon aggressive bids could have collided with natural sellers and Avalon would have undoubtedly made different trading decisions had its two-sided activity resulted in a short position.

Example G/H - Assessment of TUP Trading on July 11, 2013 (11:54:08 AM - 11:54:29 AM)

98. Assessment of TUP Trading on July 11, 2013 (11:54:08 AM - 11:54:29 AM)<sup>27</sup>

- a. These two examples are consistent with the previous examples. Hendershott’s exhibit notes that the sequence begins with “[a] hidden purchase order for 2,200 shares with a max show of 500 shares.” This order should be recognizable as an order consistent with Avalon determining a lower end of the trading range that it will trade in a quasi-market making capacity.
- b. Hendershott’s exhibit then indicates that “49 sale orders for 100 shares each are placed at gradually decreasing prices within 3 seconds,” which, as discussed in the previous examples, is behavior consistent with Avalon’s pressure strategy, where it post aggressive sell prices that tighten the spread. If such orders execute, then Avalon has discovered buy interest that resists the pressure strategy and can reassess its valuation and expectations.

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<sup>27</sup> *Id.* Exhs. 20a & 20b.

- c. In this example, the trader does not encounter opposing buy interest with its pressure strategy and “[t]he hidden purchase order is executed completely during the same second.” As noted in previous examples, Avalon’s aggressive sell orders demonstrate a lack of buy interest at successively lower prices which provides information to Avalon and to the market as a whole. Natural sellers may respond to Avalon’s pressure strategy by selling more aggressively and natural buyers may choose to trade at lower, more favorable prices after the lack of buy interest at Avalon’s posted sell prices is demonstrated to the market. These reactions are not causal and the information Avalon creates for the market is legitimate and non-manipulative.
- d. After Avalon enters into a long position at the lower end of the trading range, the exhibit notes that “[a]ll 49 outstanding sale orders are cancelled within 5 seconds following the last execution.” As discussed in previous examples, the fact that Avalon has now accumulated a long position in its two-sided market making activity has changed its incentive and has a legitimate basis for doing so.
- e. Avalon thus cancels its offers and places “[a] hidden sale order for 2,200 shares with a max show of 500 shares is placed between purchase orders” Again, this is a normal use of hidden orders to exit inventory in a manner that minimizes adverse price impact against its position.
- f. Avalon then continues to post aggressive prices in a manner that would increase its long position through its pressure strategy. As the Hendershott’s exhibit notes, Avalon sends “64 purchase orders for 100 shares each are placed at gradually increasing prices within 4 seconds.” Given the executions that occurred on Avalon’s quiet side bid price, it should be expected that Avalon’s pressure strategy to execute at subsequent higher prices would result in additional executions. However, no contra-side liquidity is available. Irrespective of the reason why there is no offsetting liquidity, Avalon’s aggressive posting now demonstrates the lack of buy interest and no sellers trade against Avalon’s bids.
- g. As with previous examples, Avalon’s quiet side order executes in this sequence and “[t]he hidden sale order is executed completely during the same second,” after which “4 purchase orders are cancelled during the sale executions while the remaining 60 outstanding purchase orders are cancelled within 6 seconds.” As noted previously, the cancellation is rational and not evidence of a lack of bona fide intention in the original orders.
- h. In this example, it is possible that Avalon was trading in an environment where there is a lack of natural buyers and sellers on both sides of the market and primarily interacted with HFT firms running order anticipation / order book pressure strategies or other types of market makers. If so, this would provide some explanatory basis for why Avalon’s pressure strategy has difficulty executing, especially if HFT strategies are acting to step ahead of traders that tighten prices and act to diminish the liquidity available to Avalon’s aggressive orders. If HFT strategies make trading decisions that anticipate future movement based on imperfect models and information, there is no legitimate argument that Avalon deceived such market makers. Furthermore, Avalon chooses to

trade at a *higher price* on the contra-side of its pressure strategy, activity that counteracts momentum. That HFTs take liquidity against Avalon's contra-side orders is evidence of disagreement between Avalon and other market participants with regard to the appropriate prices that might be sensibly traded by posting contra-side liquidity.

## VI. Opinions

### Opinions Concerning the Hendershott's Analysis

*Hendershott implicitly relies on an expanded definition of spoofing and layering that is logically contradictory and more sensibly described as disruptive trading*

99. Hendershott provides the following definition of layering: “[Layering] is typically done by placing orders on the two sides of the market in an imbalanced manner, e.g., there are more buy orders than sell orders with the trader generally not intending to execute orders on the buy side.”<sup>28</sup> More generally, Hendershott states: “Layering involves placing orders on both the buy and sell sides of the market. Limit orders on one side of the market are entered without the intent of executing in order to benefit the orders on the other side that are intended to execute. Once the desired execution occurs, the remaining orders are cancelled.”<sup>29</sup>
100. Hendershott essentially claims that Avalon's traders' strategy is typical of layering, and he does not reference other forms of spoofing and layering. However, Avalon's trading strategies are neither typical nor representative of layering.
101. By contrast, the above-referenced FINRA's definition stated that “[l]ayering involves the placement of multiple, non-*bona fide*, limit orders on one side of the market at various price levels at or away from the NBBO.” (emphasis added) In other words, trading strategies improving the NBBO do not fit a typical scenario. Moreover, given the time-price priority system employed by many trading venues as a general principle, orders placed “at or away from the NBBO” incur a much smaller risk of execution and hence could be cancelled more easily compared to orders improving the NBBO. It is problematic to classify such NBBO-improving orders as not meant to be executed. Since Avalon's orders emphasized improving the NBBO on one side of the market, the corresponding conclusion is that this approach does not the definition of layering.
102. The SEC defines layering: “Layering concerns the use of non-*bona fide* orders, or orders that the trader does not intend to have executed, to induce others to buy or sell the security at a price not representative of actual supply and demand. More

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<sup>28</sup> Expert Report of Terrence Hendershott, Ph.D. para. 14, at 6-7 (Apr. 3, 2017) [hereinafter Hendershott Report].

<sup>29</sup> *Id.* para 13, at 6. Moreover, Hendershott clarified his use of the definition of “layering”: “Layering is often used to refer to spoofing when multiple spoofing orders are used. Because the trading activity at issue here involves multiple orders I will use layering throughout.” *Id.* para. 13 n.6, at 6.

specifically, a trader places a buy (or sell) order that is intended to be executed, and then immediately enters numerous non-bona fide sell (or buy) orders for the purpose of attracting interest to the bona fide order. These non-bona fide orders are not intended to be executed. The nature of these orders is to induce, or trick, other market participants to execute against the initial, bona fide order. Immediately after the execution against the bona fide order, the trader cancels the open, non-bona fide orders, and repeats this strategy on the opposite side of the market to close out the position.”<sup>30</sup>

103. Hendershott’s approach resembles disruptive trading rules adopted by individual exchanges, such as BATS,<sup>31</sup> and FINRA,<sup>32</sup> which left out intent and include trading activity irrespective of the bona fide or non-bona fide nature of trading. More specifically, the FINRA rule matches the BATS rule, which is oriented around practices which BATS believes negatively impacts its market participants, and a reasonable inference is that one of the protected groups is comprised of HFTs. BATS sought to create an expanded definition of “layering” (with that actual term being left out from the final version of the rule) that would prohibit Avalon-like behavior, which involves aggressive tightening of the NBBO. BATS specifically left out the intent angle in the definition in the process of approval, and FINRA chose the same approach. Both rules were passed after the bulk of Avalon’s trading occurred, which is alleged to have taken place “from approximately December 2010 through at least September 2016,” and they would characterize Avalon’s trading as disruptive. For Avalon to be responsible for more than disruptive trading, the behavior would have to have deceptive non-bona fide orders and artificial price impact. Hendershott appear to dismiss this concern with the argument of typicality, without addressing the novelty and logical incoherence of this approach to layering and spoofing as a form of market manipulation. The very idea that *aggressive* orders that tighten the NBBO, which are most likely to be in the top-of-the-queue, are not intended to be filled is nonsensical.

104. Hendershott’s expanded definition of spoofing and layering is flawed because it claims that orders aggressively improving the NBBO at successive price points are intended to be canceled, while ignoring the utility of such behavior for market impact strategies with bona fide orders. Moreover, this definition is also flawed because it incorrectly assigns artificial pricing to orders which represent a real trading interest and hence result in true impact.

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<sup>30</sup> Hold Bros. On-Line Inv. Servs., LLC, Exchange Act Release No. 67,924, Investment Company Release No. 30,213, at 5 (Sept. 25, 2012) (settled proceeding), <https://www.sec.gov/litigation/admin/2012/34-67924.pdf>

<sup>31</sup> Order Granting Approval of a Proposed Rule Change by BATS Exchange, Inc. to Adopt Rule 8.17 to Provide a Process for an Expedited Suspension Proceeding and Rule 12.15 to Prohibit Disruptive Quoting and Trading Activity, Exchange Act Release No. 77, 171, 81 Fed. Reg. 9017 (Feb. 18, 2016), <https://www.gpo.gov/fdsys/pkg/FR-2016-02-23/pdf/2016-03740.pdf>.

<sup>32</sup> Notice of Filing and Immediate Effectiveness of a Proposed Rule Change by Financial Industry Regulatory Authority, Inc. to Provide a Process for an Expedited Proceeding and Adopt a Rule to Prohibit Disruptive Quoting and Trading Activity, Exchange Act Release No. 79,361, 81 Fed. Reg. 85,650 (Nov. 21, 2016), <https://www.gpo.gov/fdsys/pkg/FR-2016-11-28/pdf/2016-28458.pdf>.

*Hendershott's analysis is primarily centered on erroneously characterizing Avalon's pressure strategy as a layering strategy involving non-bona fide orders intended to be canceled and resulting in artificial price impact*

105. To present a more representative (and logical) view, layering typically involves obvious intent to cancel (i.e., not execute) *unconditionally rather than responding to specific market conditions*, which may include, placing orders deep in the book to avoid execution. Here, we are observing an effort to extend the more coherent spoofing and layering definitions, where orders are certainly non-bona fide, to the circumstances of the Avalon case. Hendershott maintains that “[i]n layering the Loud-side orders are characterized as non-bona fide because the layering trader does not intend those orders to execute.”<sup>33</sup> In fact, aggressive strategies that tighten the NBBO at successively better prices are typically intended to collide / interact with non-marketable limit orders / take liquidity, and the very nature of this practice is contradictory to the notion that such orders are not bona fide. Avalon's pressure strategy combines exploratory trading and market impact components as it “challenges” various levels by improving upon the market, either colliding with buy and sell interest or demonstrating to itself and to the market as whole the lack thereof.
106. Notwithstanding Hendershott's failure to consider that his categorization of “loud orders” that set the best price in the market are in fact the exact type of orders that should execute against natural liquidity seekers, he claims that a failure to execute relative to quiet side orders is a primary indicator that such orders are misleading and hence are not intended to be executed. He does not start with a basic question why many orders improving the NBBO do not execute, nor does he assess whether or not such orders could have executed in light of the available market liquidity and historical records of disseminated last sales. Hendershott also does not consider the obvious pattern in Avalon's trading strategy where Avalon improves / tightens markets by sending additional layers of orders in the conditions where its pressure strategy has not collided with opposing buy / sell interest, which of course would be associated with an intrinsic bias towards a lower execution rate. Hendershott does not look at the activity of HFTs who stepped ahead of Avalon's orders using low latency price-feeds and special order types to gain superior placement in order book queue relative to Avalon to determine the impact of competition on Avalon's filled rate. All of these potential inquiries would provide exact information on why orders were not executed. Despite such natural biases being evident in examples he puts forth, he assigns to such orders an intent not to execute where the historical data Hendershott has access to provides clarifying detail on why such orders did not execute as is evident in the assessment of Examples A-H above. Implicit in Hendershott's argument that Avalon's “loud orders” are intended to be canceled is the notion that Avalon should be held responsible for the lack of counterparties and superior execution technology of HFTs, a misguided view that he presumably does not apply to the commonly known low-fill rates of HFT market makers. Hendershott also fails to recognize that the absence of trading activity against Avalon's

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<sup>33</sup> Hendershott Report, para. 13 n.9, at 7.

pressure strategy is primary evidence that such orders are not creating artificial price impact, but instead are creating legitimate price impact that exposes the willingness or unwillingness of participants to take liquidity at each price level and informs Avalon and the market as a whole on available levels buy/sell interest in the market.

107. Hendershott distinguished between the loud side, which is the side where Avalon conducted its pressure strategy, which incorporates properties of both exploratory trading and market impact strategies, and the quiet side, where Avalon did not engage in such strategies, but acted as a quasi-market maker. Hendershott essentially claims that the loud side activity creates an artificial appearance of supply and demand. However, Hendershott does not focus on the typical layering and spoofing practices (e.g., posting large orders deep in the book), but instead focuses on orders which tighten the market and rest for sufficient time to be expected to execute. Hendershott claims that such orders are creating an artificial appearance, presumably because they have market impact, and then argues that such orders are non-bona fide because they did not execute frequently, despite being exposed at the best price and being exactly the sort of order that should execute where there are liquidity takers willing to access the best price in the market. Orders which improve the market and rest for sufficient period, challenging market prices, do not create artificial price impact but elucidate true buy and sell interest in the market. Such orders do not provide an artificial appearance, but do provide an *actual* appearance as tradable prices and are necessarily bona fide orders, irrespective of such orders having the additional intent to have market impact or exploratory trading purposes or for such orders to be canceled in conditional circumstances in response to market price changes, market executions, or the execution of a strategy's orders.<sup>34</sup>

108. Hendershott states that layering is aimed to “improve the execution of the trader’s opposite side orders.”<sup>35</sup> However, bona fide orders can have positive market impact that results in a better price. A trader willing to buy and sell over a trading range may place buy orders which demonstrate that there are no sellers at a certain price. By elucidating that there is no sell interest at a given price level, it may result in other market participants submitting more aggressive buy orders based on that information. The initial order does not create buyers, but rather demonstrates to such buyers the absence of sellers which in turn may influence them to submit buy orders at a higher price resulting in an improvement in the execution of a trader’s opposite side orders. Such price impact cannot be seen as artificial. If such market impact results in a trader being able to sell at a higher price, it is not the result of artificial impact on execution but the lack of sellers at lower prices, which had been exposed to the market by a trader’s buy orders and taken into consideration by other buyers.

109. Hendershott states that “layering orders can cause other traders to execute marketable trades at prices that they would not have accepted had they known the true supply and demand.”<sup>36</sup> However, different trading strategies may collide, supplant, or

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<sup>34</sup> *Id.* para. 14, at 6.

<sup>35</sup> *Id.* para. 13, at 6.

<sup>36</sup> *Id.* para. 46, at 22.

otherwise interact each other, such as Avalon-like strategies and HFT strategies, and any one of them is not necessarily manipulative even though it creates a different picture of supply and demand, which may as well be “true.” Essentially, Avalon’s unexecuted orders associated with its pressure strategy elucidate the lack of contra-side liquidity. The pressure strategy in this buying scenario that is associated with unexecuted orders does not cause the absence of sellers, but merely exposes the absence of sellers. If the price rises as a result of other buyers’ actions, it is not because these buyers were deceived with artificial prices, but because the buyers were responding to the lack of sellers which the original trader’s buy orders exposed to the marketplace as a whole. It should be emphasized that many market strategies may have a price impact, but the very existence of a price impact is not and cannot be illegal per se.

*Hendershott’s analysis provides erroneous explanatory mechanisms for biases evident in his metrics, and his analysis does not account for market liquidity in explaining execution fill rates*

110. Hendershott states that “a successfully implemented layering strategy must involve Loud-side shares being executed less often than quiet-side shares, even though Loud-side shares are more numerous.”<sup>37</sup> However, it makes little sense to look at execution imbalance as indicative of Avalon’s culpability unless the primary metric distinguishes orders that could have been executed but cancelled before that and orders that could not be executed. To be clear, Hendershott’s primary model includes a significant proportion of trades that could not be executed in any instance, even though such orders were placed at prices most likely to execute.

111. Hendershott claims that loud side orders that improve markets are creating artificial pricing and the failure to execute is evidence of an intent to cancel. A more obvious (and more logical) explanation is that loud side orders do not get executed because there is no contra-side liquidity, the information that in itself enhances price discovery. In the absence of contra-side liquidity, Avalon maintains a quiet side order to exit the trade without market impact. If anything, Avalon is basically adding liquidity to the contra-side price. In general, Avalon appear to engage in the process of aggressing and choosing exit prices intelligently. Hendershott’s analysis is predicated on the concept that loud side orders are not bona fide because they did not get executed, thus penalizing Avalon for improving the NBBO, although this enhanced liquidity was not chosen to trade with by other market participants. If the loud side orders cannot trade, that would often be a symptom of the theoretical value being closer to the quiet side order prices. The market itself is defining which side trades. Hendershott is attributing lower fill rates to Avalon when other market participants’ lack of interests, despite an opportunity for order interaction, is the primary reason.

*Hendershott’s analysis does not address the interaction between Avalon’s pressure strategy and HFT book pressure algorithms in explaining the market impact and execution fill rate of Avalon’s traders’ strategy*

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<sup>37</sup> *Id.* para. 20, at 9.

112. Hendershott states that “[i]nformation on pending orders also helps forecast future actions of other market participants that can be incorporated in trading strategies.”<sup>38</sup> This statement presumably justifies HFTs that use order book information to forecast price movements and step ahead (e.g., tighten the spread or take liquidity) of order flows of other market participants or otherwise react to such order flow. On the other hand, hidden orders are used by certain traders precisely to mask intentions, which is not manipulative per se. Irrespectively, an extension of Hendershott’s logic would suggest that HFTs need to isolate customer orders / longer-term horizon orders and would benefit from other quasi-market making strategies being eliminated.
113. Hendershott states that “[m]arket participants usually expect the existing bids and offers to reflect an unbiased estimate of supply and demand for stocks.”<sup>39</sup> Yet, that does not translate into the existence of some intrinsic balance in the order book in the absence of Avalon-like trading. If Avalon demonstrates the lack of sellers or buyers, other market participants may act (e.g., withdraw liquidity or improve). It appears that the primary complaint about Avalon is about HFT algorithms that step ahead of order imbalances and bet that liquidity takers would sell to them. If such HFTs collide with Avalon, as it sets a trading range, then Avalon is stabilizing a price that HFTs presumably want to exasperate beyond that trading range. In fact, it is one of the key activities of statistical arbitrage firms and other quasi-market makers to engage in mean reversion strategies that provide offsetting resistance to HFT strategies in the market.
114. While it is my opinion that Avalon’s pressure strategy did not result in artificial pricing, I would also note that a similar (and false) claim could equally be levied at HFTs for orders that improved over large orders in the order book and that caused orders that otherwise would execute not to execute. In other words, if Avalon put aggressive orders on the loud side, improving the bid, and HFTs stepped ahead of those orders and moved the market up or took liquidity on the offer, then the very HFTs being concerned in the retrospect that they bought too high would in fact be the primary reason why the loud side did not trade. Moreover, given their apparent dissatisfaction with executed transactions as noted in the depositions, these HFTs are admitting that their aggressive improvement was not intrinsically desired. If HFTs interfere with the execution of orders and contribute to the imbalance between the loud and quiet sides of Avalon’s traders’ strategy, then it appears that they have an integral impact on the price impact alleged to be artificial. Given a potentially intense interaction between Avalon’s and HFTs’ strategies, being a factor in the metrics seen, any assessment of Avalon’s trading requires a knowledge of HFT strategies and transaction records. Hendershott’s refusal to address the question of counterparties of Avalon and why orders are not executed because of HFT activity is misguided. Clearly, the core of this case is assessing the interaction of Avalon’s traders’ strategies with participants complaining about it in order to assess to what degree such interaction resulted in execution rates / price movements seen here.

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<sup>38</sup> *Id.* para. 12, at 5.

<sup>39</sup> *Id.* para. 46, at 22.

115. Hendershott equates Avalon’s conduct with layering and provides a long list of alleged harms from this conduct.<sup>40</sup> Many of these allegations are no different from typical complaints from institutional investors concerned about HFT strategies that step ahead of institutional order flow, where such investors commonly end up paying a higher price. However, for both Avalon’s pressure strategy and HFTs book pressure strategies, the primary behavior of challenging the market with aggressive orders in fact improves some dimensions of market quality. More generally, instead of functioning in the mode of passive market making, HFT order book algorithms often diminish liquidity. In fact, Quantlab takes liquidity ahead of order book pressure as a taker. Overall, saying that Avalon is unambiguously hurting the market, especially as compared to HFTs, is naive. When HFTs steps ahead of order imbalance, that may influence other market participants to pay a higher price and trigger some of the costs that Hendershott is citing. However, this activity is an important part of market liquidity. Avalon’s orders function very much like HFTs’ bona fide orders that aggressively improve markets.
116. While HFTs appear to suggest that their algorithms are gamed or tricked by Avalon’s behavior, flawed algorithms themselves are causing an unfavorable interaction with the market. Market participants like Avalon should not be expected to conform their behavior to misguided models / assumptions of other market participants, such as HFTs using flawed order book pressure models that require one-sided market participants with fully displayed orders to extract short-term alpha. The burden is on the developers of order book pressure algorithms to adopt such algorithms to the realities of the market and responses of other traders (e.g., institutional investors slicing orders to mask their intentions, quasi-market making over longer time intervals, liquidity arbitrageurs, etc.). If HFTs respond to other short-term traders who pressure the market with more aggressive prices and collide with trading ranges of Avalon-like traders, then it is the responsibility of HFTs to adopt and tailor their strategies. If they cannot adapt such strategies, it may be a sign that the market has evolved beyond simplistic order book pressure alpha. Lastly, it is problematic in itself to claim that an algorithm has been deceived, given that algorithms are mechanistic processes that attempt to embody human concepts imperfectly. Algorithms do not have beliefs in any intrinsic sense that can be deceived. Hendershott’s view of what the order book should confirm to is inherently naive, implicitly requiring that behavior that does not meet algorithmic developer’s assumptions to step ahead of order flows or which cause false positives signals are equivalent to non-bona fide order scenarios.

*Hendershott incorrectly characterizes market makers strategies with outdated concepts relative to Avalon’s quasi-market making strategy*

117. Hendershott states that “initiating and closing a group of purchase and sale orders within 60 seconds can potentially represent a legitimate high frequency trading strategy.”<sup>41</sup> At the same time, a 60-second round trip loop is reasonable for quasi-

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<sup>40</sup> *Id.* paras. 45-47, at 21-23.

<sup>41</sup> *Id.* para. 18, at 8.

market making strategies in general, not just HFT strategies. Moreover, market impact strategies are not illegal per se. Avalon is permitted to challenge markets and to impact the market even if it is a favorable impact for itself. Likewise, there is nothing inherently illegal with aggressing on one side while being passive on the other.

118. Hendershott states that “a market maker with a long position will typically place more sell orders and also be more likely to execute those sell orders.”<sup>42</sup> However, market makers are very cognizant of market impact and would not march a long position with asymmetric sizes against themselves unless there was some utility in the market impact. Market makers vary, but they often take liquidity to reduce inventory as part of not telegraphing intentions to the market. Another approach for a market maker could employ hidden orders. More generally, to imply that market makers would use a loud side strategy to exit risk is erroneous and patently contradicts the behavior of Quantlab, a key player in this case.<sup>43</sup> HFTs steps ahead of other orders in milliseconds, lock the market, get to the top of queue, or have off-exchange relationships. That explains why HFTs exit more efficiently, but even with those mechanisms they should expect similar adverse market impact on the loud side. HFT market making strategies can at times use hidden and reserve orders in their strategies (as well as access dark liquidity in dark pools), which is evident in the tick data of many exchanges. HFTs will collide on price ticks using special order types to exit aggressively. Furthermore, many HFTs have short-lived order life-times (less than a second) after improving the market with aggressive orders to avoid adverse selection bias. In fact, order submission and cancellation rates on the inventory accumulation side of HFT are the highest when order book signal exists for which HFTs seek to increase position and collide with other traders during a “crumbling quote” condition, a behavior not inconsistent with Avalon’s behavior, but with the latter occurring over shorter time intervals. Furthermore, it has been my direct experience that some of the top market makers use loud side approaches on the inventory increasing side for both equities and options market making strategies. Hendershott’s characterization of market maker activity when in a position is in no way representative of modern marking making strategies and is reminiscent of simplistic academic representations of the function of market makers. In light of such realities of modern market making, including heavy reliance of HFT market makers on order book pressure models, Hendershott’s conclusion that “such characteristics are unlikely to arise unintentionally or as part of a non-layering trading strategy that places orders on both sides of the market, such as market making”<sup>44</sup> is simply incorrect.

*Certain biases in Avalon’s trading are explainable, rational, and non-manipulative*

119. Hendershott’s interpretation is that “Order and Execution Imbalances do not arise unintentionally and are not consistent with market making, but are consistent with

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<sup>42</sup> *Id.* para. 24, at 11-12.

<sup>43</sup> See Deposition of John Huth *passim* (Jan. 23, 2018).

<sup>44</sup> *Id.* para. 11, at 4.

a layering strategy.”<sup>45</sup> However, the characteristics of Avalon’s pressure strategy are consistent with market impact strategy and many market maker position building techniques. It is rational to aggress the direction you are long and add more to the position, which may be inferred from Hendershott’s own materials.<sup>46</sup> If such orders do not get filled, it is a sign that one’s position has a positive bias and the failure of execution is a signal indicating no contra liquidity and may indicate that a trader should aggress further and accumulate additional position. If a trader chooses to place orders to exit higher (based on his view of expected trading range), that would produce market impact in the contra direction. Typically one does not want market impact in the contra direction of his or her position, which can result in a negative impact on the mark-to-market profitability, so traders are very sensitive to sending what Hendershott would characterize as “loud side” orders to reduce a position. Hence, Avalon’s quiet side strategy is rational and consistent with legitimate quasi-market making. Hendershott’s own description of Avalon’s traders’ strategy<sup>47</sup> is characteristic of a market impact strategy with bona fide orders aggressing and demonstrating to the market that there is no opposing liquidity while choosing an exit at a higher price. In my opinion, such activity provides more value to the market in price discovery than HFT order book pressure models, which trade ahead of institutional orders and scalp out for a highly compressed and minimal profit. More specifically, Avalon’s traders’ strategy challenges the market when it may be in disequilibrium due to various parties hiding their respective trading interests.

120. Hendershott makes the following claim: “The Order and Execution Imbalances are consistent with layering and highly unlikely to occur by chance.”<sup>48</sup> This assessment ignores the inherently iterative / sequential nature of order placement which can have significant impact as a bias on such measurements. Consider that loud side orders iteratively demonstrate a lack of contra-side interest at each successive level by tightening the spread, with each price point conditioned on the existence or lack contra-side liquidity and that additional orders are submitted when previous orders have not resulted in executions. While the reason for unexecuted orders and frequency of orders are directly tied to the sequence of the strategy, Hendershott essentially assigns blame to Avalon for the unexecuted orders ignoring that that they are the natural consequence of Avalon’s aggressive tightening of the spread in an iterative manner, which of course results in high unexecuted counts when no contra-side liquidity is available. If Avalon’s loud side orders executed immediately, the unexecuted order rate would have of course been lower because of contra-side liquidity available and Avalon would have naturally sent fewer orders on that side of the market overall.

121. Consequently, Avalon’s exposure of a lack of contra-side liquidity on its loud-side results in legitimate pressure toward its quiet side. Such execution imbalances are an artifact of the strategy itself and cannot be generalized without addressing each level

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<sup>45</sup> *Id.* para. 25, at 12.

<sup>46</sup> *See id.* Exh. 4.

<sup>47</sup> *Id.* para. 25, at 12-13.

<sup>48</sup> *Id.* para. 21, at 10.

and each trading decision in the sequence. For example, improving the market by trying to buy at a higher price may reduce the probability that one's current posted order to buy would execute, but the new more aggressive order to buy will execute with a higher likelihood of trading relative to the previous order. This iterative impact is expected to improve the probability of executing into a position, but it would also negatively impact execution fill rates of previously posted order and would lead to bias in Hendershott's generalized statistics noted above. Hendershott's order and execution imbalance measurements effectively penalize traders who try to get filled by posting more aggressive orders for not being filled at less aggressive prices, a wholly illogical proposition which ignores the sequential / iterative / conditional process of trading. Hendershott's generalized statistics thus mischaracterize the trading process as a whole and dismiss the importance of sequential strategy components that result in such biases, including a series of unexecuted orders resulting in additional orders (which may also remain unexecuted). A generalized statistical approach that does not address the sequential nature of a given strategy is prone to the basic concept of *survivorship bias*.<sup>49</sup>

122. Avalon's quiet side orders execute with higher likelihood precisely because Avalon has exposed a lack of natural contra-side opposing interest to the quiet side through its pressure strategy to which market participants legitimately reacts. In other words, when Avalon demonstrates there are no buyers by tightening the spread at successively higher prices, it is because there is no contra-side liquidity to sell, information that other market participants would often recognize and which may influence them to modify their interaction with the market. Avalon's sell order on the quiet side executes for the same reason that the buy order on the loud side of the market does not execute - a lack of sell interest in the market. In the absence of competing sell interest, Avalon's hidden order to sell is much more likely to trade. Hendershott confuses artificial price impact with activity that iteratively exposes buy and sell interest in the market to Avalon and to the market as a whole and produces legitimate price impact and rational execution rates.

123. As noted previously, with regards to Avalon's behavior where loud side orders are canceled after quiet side execution,<sup>50</sup> it should be noted that such behavior is rational and does not indicate that loud side orders were non-bona fide. If a market maker trades on one side of the market and builds a position, it is not in its interest to aggress against its newly formed position and to create adverse price impact that would lead to a mark-to-market loss. The desire not to create market impact subsequent to a trade is indicative of a change in a market maker's utility, which was necessarily different prior to the execution.

124. Hendershott also notes that Avalon's pressure strategy trades are less profitable than its quiet side trading,<sup>51</sup> which is sensible given that Avalon utilize aggressive orders for its pressure strategy within its trading range while quiet side orders are placed

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<sup>49</sup> See, e.g., *Survivorship Bias*, Wikipedia, [https://en.wikipedia.org/wiki/Survivorship\\_bias](https://en.wikipedia.org/wiki/Survivorship_bias) (last visited May 10, 2018).

<sup>50</sup> Hendershott Report, Exh. 3.

<sup>51</sup> *Id.* paras. 29-31, at 13-15.

behind the NBBO at the ends of the trading range. Given that Avalon's traders' strategy is profitable, it is sensible for the wider margin trades to have a higher realized spread than the aggressive lower margin trades.

125. It should also be noted that Avalon's quiet side orders are likely to have higher short-term mark-to-market losses, given that they rely on mean reversion properties of the market while Avalon's aggressive orders can have higher market to market gains. This bias is a natural extension of the strategy and align with common bias in momentum versus mean reversion "alphas" that market makers traditionally incorporate into their strategies. More generally, realized spreads would naturally be different under different time horizons in trading regimes associated with momentum and mean-reversion properties of price evolution, properties common to market conditions with "book pressure," price impact from aggressive trading, and offsetting liquidity-provision strategies.

### **Opinions Concerning the Interaction Between Avalon's Traders' Strategies and HFT Market Making Strategies**

126. HFTs that improve the market and trade or do trade / execute on the other side are performing a similar activity to Avalon's quasi-market making strategy. However, while Avalon challenges markets directly using its pressure strategy by tightening the NBBO, HFTs appear to be waiting for orders from institutional customers to appear in the order book before stepping ahead of such orders using order book pressure models. Hendershott's analysis is consistent with HFT opinions that implicitly demand the untenable requirements that (a) all intraday traders should only use order book pressure models to determine when to aggressively improve the NBBO and, (b) if HFT strategies are not used, then a trader must be a one-sided market participant. Such requirements are anti-competitive and would not permit quasi-market makers to aggressively improve the market over shorter horizons using market impact and exploratory trading strategies.
127. Hendershott's analysis, through the omission of alternative strategies as explanatory variables, implies that only certain types of interaction with the order book are permissible, despite the fact that pressure and quiet side trading are also consistent with HFT behavior, which translates the charges against Avalon into the protection of HFT business models. In fact, Quantlab and HRT appear to be primarily concerned about their own losses, and, likewise, BATS seems to be motivated by the interests of its key customers.
128. From Avalon's perspective, in in the course of its quasi-market making strategies, other market participants may freely trade based on flaws in their algorithms, but that would not mean that Avalon is required to abstain from trading if Avalon's orders are bona fide. A significant flaw in HFTs' algorithm is that, unlike statistical arbitrage firms, they do not have longer time horizons / valuation models, and, accordingly, HFTs place undue reliance on short-term book pressure models. This flaw in the way they do

business is the primary reason behind a toxic interaction with Avalon's trading activities, and the onus is on HFTs to adjust their trading activities / responses.

129. Broken strategies in themselves cannot be "deceived." Moreover, algorithms themselves are typically not adaptable in the manner humans are, and such algorithms need to be continuously adjusted and reprogrammed to adapt. The failure of trading algorithms to account for a variety of participants in the order book is not solved by prohibiting quasi-market making strategies, as well as strategies that challenge pricing and test stress markets. HFTs' algorithmic trading flaws are solved by either enhancing valuation models as many statistical arbitrage firms have done and / or incorporating human traders into the process of market markets (i.e., the so-called "grey box" trading). In any manner, the idea of market participants being somehow deceived by non-HFT parties triggered by the presence of HFT order book pressure models is misguided.
130. The HFT theoretical values associated with the HFT that testified against Avalon appear to be primarily based on order book imbalance. HFT strategies anticipate that aggressive posting activity will continue at higher prices and choose to pay a premium above the prices posted with the view that additional liquidity seeking will occur that will pay higher prices. Implicitly, HFTs are running de facto market impact strategies themselves through such aggressive posting. If Avalon provides significant contra liquidity at prices more aggressive than its contra-side orders, and if HFTs do not continue trade aggressively when their strategies collide with Avalon's quiet side orders, it is likely that Avalon's quiet side will set the end of the trading range.
131. HFT market makers appear overly reliant on order anticipation strategies. Instead of building valuation models that provide deeper notions of fair value, thus making a market around a stable notion of fair value, HFT strategies are overly sensitive to changes in order book and engage in rapid stepping ahead of orders placed. The risk to such strategies is that market impact strategies and exploratory trading strategies can reveal market information that HFT algorithms will utilize to become overly aggressive.

### **Opinions Concerning the Allegations Against Avalon**

132. The SEC misinterprets the nature of some of the trading strategies, primarily notions of the legality of aggressive trading to challenge markets, notions of bona fide order usage, and notions of artificial price impact.
133. Oftentimes, Avalon's traders posted aggressive nonmarketable orders that improved the market price by tightening the spread. "Pushing," i.e., improving the NBBO, is not illegal in itself, and this approach does not equate or even resemble layering. While this trading strategy is based on market impact, it does not involve artificial pricing in contrast to price discovery.
134. There is no evidence in the data sample I have reviewed that the orders were not bona fide. More specifically, these orders generally improved the NBBO and were available for interaction with other traders for a sufficient period of time. Logically, Avalon cannot be punished merely because others did not always choose to trade against such orders, given the lack of trading interest at a superior / improved price.

135. Avalon's pressure strategy is not an example of layering under traditional definitions which place non-bona fide orders and which have demonstrated intent not to execute. Trading strategies evident in the sample cannot be described as layering, and I am not aware of a valid approach for describing and/or interpreting them as such. Moreover, such strategies appear to lack the essential characteristic of market manipulation, the existence / intent of artificial price impact.<sup>52</sup>
136. Hendershott does not show that orders were non-bona fide and fails to address the fundamental incompatibility between orders that aggressively tighten the NBBO and orders intended to be canceled. Hendershott does not factor in order lifetime, liquidity, and actual trading activity into assessing the execution fill-rate. Basic measurements central to analyzing execution fill rates, such as individual order lifetimes, are not investigated and the total supply of liquidity-taking market volume transacting at Avalon's limit order prices is not addressed, despite the importance of such measurements in impacting execution fill rates.
137. Furthermore, Hendershott provides no basis for defining and measuring artificial price impact. Instead, he appears to base his analysis on the assumption that aggressive orders that tighten the market, and which necessarily create price impact, are in fact non-bona fide and intended to avoid executing, a notion that is illogical when posted for reasonable time intervals. Hendershott's focus on low execution fill rates of loud side orders as a primary evidence of non-bona fide order placement essentially dismisses the primary explanation for why orders that aggressively tighten the spread do not execute, namely, the lack of contra-side liquidity that could execute against Avalon's posted orders. Hendershott also dismisses the information utility of orders placed under the conditions most likely to achieve an execution by tightening the spread and which still remain unexecuted. Such orders providing exploratory and market impact utility by demonstrating to the trader and the market as a whole the absence of contra-side liquidity, and they are in fact examples of non-artificial price impact.
138. Arguing that an aggressive order that improves the market and challenges the market is non-bona fide is akin to accusing a person who repeatedly enters a busy street and stands in front of cars as intending *not* to get hit because the drivers swerve to avoid him. In Avalon's case, its aggressive orders did not trade because potential counterparties choose not to trade with them.
139. The use of the term "layering" by Avalon is consistent with the description of Adam Nunes of Hudson River Trading described who indicated that it was common to use the term *layering* to "stack" the book to multiple price levels with bona fide orders.<sup>53</sup>
140. In recent years, brokers are hesitant to take regulatory risk for strategies that post orders at multiple price book due to the cost of regulatory inquiries into layering

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<sup>52</sup> While there is a movement to broaden the very definitions of spoofing / layering by individual securities exchanges and FINRA, as described above, this expansion is not a mandate to change the scope of the term "market manipulation."

<sup>53</sup> Deposition of Adam Nunes, at 72-74 (Apr. 6, 2018). More specifically, Nunes made the following remark: "I don't believe layering had the same connotation that it currently does." *Id.* at 73.

strategies, irrespective if the orders are bona fide or not. This is a compliance inquiry area and thus a risk by brokers, who were concerned about the cost of inquiries associated with manipulative layering and spoofing. However, that does not mean the strategies are manipulative or otherwise illegal.

141. Avalon conducts a form of quasi-market making strategy that Hendershott incorrectly characterizes as manipulative as he contrasts Avalon's traders' strategy to simplistic academic concepts of market making. Hendershott does not recognize that posting asymmetric sizes on different sides of the market is not manipulative, nor does he recognize that maintaining a position, posting to add to the position, while planning to exit that position at a better price is not manipulative. Market makers continually engage in both increasing and decreasing inventory management while capturing a spread over a trading range, and do so while managing market impact to their advantage. Such strategies often will make use of concentrations of orders at different price points across trading venues, providing asymmetric sizes as well as asymmetric distance from a fair value of the asset.
142. Rather than an independent force leading to artificial pricing, the market impact of Avalon's trading activity was a result of and a reaction to legitimate trading interest done with bona fide orders, ultimately contributing to price discovery. Avalon's pressure strategies primarily served to assess buy and sell interest, as well as to challenge the price levels in the market.
143. Avalon's trading does not match the profile of spoofing / layering or other forms of market manipulation, but rather is most consistent with quasi-market making strategy that is embedding a market impact strategy.
144. Avalon did not create artificial prices or inaccurate supply / demand. Exposing the lack of sell interest in the market does not cause artificial buy interest to arise, nor does it cause sell interest to decrease. However, natural buyers may choose to respond to the exposure of a lack of sell interest with buy orders that result in real (non-artificial) price impact. Furthermore, natural sellers may choose to respond to the exposure of a lack of sell interest by canceling their sell orders and trying to sell at a more favorable price, activity, which also results in real (non-artificial) price impact.
145. Furthermore, it must be emphasized that the HFTs that traded against Avalon were not deceived. Avalon's pressure strategy was transparent in communicating an intention to tighten the spread with bona fide orders that were exposed for potential execution with liquidity takers. Avalon's quiet side orders were bona fide and utilized hidden or reserve orders in a manner typically utilized by institutional traders.

## Conclusions

146. Avalon's trading strategy incorporates a mix of exploratory trading, market impact, and quasi-market making / scalping strategies.
147. Avalon's traders' strategy might best be described as a quasi-market making / scalping strategy that embeds a pressure strategy with market impact / exploratory trading utility. Avalon created neither false liquidity nor artificial market impact. Instead,

it consistently demonstrated the lack of buy and sell interest at particular levels in the market and then took speculative positions at sensible price points.

148. As an overarching observation based on my analysis of the provided data, Avalon's trading activity:

- a. does not constitute market manipulation more generally because it does not produce an artificial price impact and often has a corrective effect on the market;
- b. does not amount to layering as a species of market manipulation and / or within the meaning of these terms as used in the securities industry; and
- c. does not violate any laws or regulations specifically referenced by the SEC.

Date: May 11, 2018



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Haim Bodek

## **Exhibit A**

### **Haim Bodek**

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#### ***Summary***

Haim Bodek is a Managing Principal of Decimus Capital Markets, LLC, a tactical consulting and strategic advisory firm focused on high frequency trading and market structure in equities, derivatives, FX, and cryptoassets. Decimus Capital Markets, LLC provides a wide range of regulatory consulting and expert services, including those relating to expert testimony in litigation and interaction with regulatory agencies. Mr. Bodek was formerly a founder and Chief Executive Officer of Trading Machines LLC, an independent high frequency options trading firm. Prior to his tenure at Trading Machines, Mr. Bodek was a Managing Director and Joint Global Head of Electronic Volatility Trading at UBS and a Vice President at The Hull Group/Goldman Sachs. He is an electronic trading executive and algorithmic trading strategist with 20 years of experience in the automated trading space.

Mr. Bodek is widely recognized as a leading expert in U.S. equities market structure, specializing in the regulation of high frequency trading and trading venues, as well as a wide range of trading practices. As reported by the *Wall Street Journal* and elsewhere, Mr. Bodek has actively assisted the SEC in several highly-technical investigations that resulted in substantial monetary fines, including record-setting fines imposed on the New York Stock Exchange and Direct Edge, and significant changes in practices of certain trading venues, including admissions of inaccurate disclosure. Moreover, Mr. Bodek is a well-known expert in litigation, who has provided expert reports, testimonial services, and confidential consulting services in numerous engagements, which included *Klein v. TD Ameritrade* and *United States v. Taub*.

Mr. Bodek is the author of two books on market structure regulation, *The Problem of HFT: Collected Writings on High Frequency Trading & Stock Market Structure Reform* released in January 2013, and *The Market Structure Crisis: Electronic Stock Trading, High Frequency Trading, and Dark Pools* released in November 2015.

Mr. Bodek earned a B.A. in Mathematics and Cognitive Science from the University of Rochester. He formerly held the Series 3, 4, 7, 24, 55, 63 and 65 registrations.

#### ***Expertise***

Algorithmic and Systematic Trading Strategy • Automated Liquidity Sourcing and Provisioning • Options Market Making/Electronic Volatility Trading • Market Structure and Market Microstructure • Large-Scale Electronic Trading Systems Architecture • High Frequency Trading Strategies and High Frequency Options Trading Strategies • Electronic Trading Risk Controls • Best Practices for Low-Latency and Co-Location • Exchange Special Order Types/Order Matching Engine Features • Broker-Dealer Formation/ Operation • Order Flow Routing/ Internalization/Payment for Order Flow • REG NMS • REG SHO

#### ***Highlights***

- Conducted a comprehensive review of special order type functionality for all U.S. equities exchanges that provided regulators a blueprint for exchange regulatory reforms implemented by the SEC over the 2012-2014 period

- As a whistleblower, provided information to the SEC in connection with enforcement actions that have resulted in substantial fines imposed on key market players and changes in their practices
- Founded Trading Machines LLC, a high frequency options trading firm that executed upwards of ½ percent of the U.S. options market, using minimal risk capital during a period of heavy industry compression
- Headed the Electronic Volatility Trading (“EVT”) business at UBS that captured a significant market share in the global options market making space (roughly 5% of U.S. equity options market alone)
- Instrumental in negotiating an exclusive seven-year option order routing arrangement between UBS and Charles Schwab & Co. and designed and oversaw the implementation of its associated options order router
- Comprehensive expertise in 25+ markets globally, including market structure, API details, special order types properties, as well as regulatory, compliance and membership obligations
- Executive sponsorship and technical oversight of four major electronic trading builds, each of which has captured significant market share in U.S. equity options markets
- Over a decade of experience with electronic market structural change, including direct assistance to governmental agencies resulting in U.S. equity market structure regulatory reforms and enforcement actions

## ***Experience***

### ***Decimus Capital Markets, LLC, Stamford, CT***

#### **Founder, Managing Principal**

***July 2011 — Present***

Founded Decimus Capital Markets, LLC (“DCM”), a tactical consulting and strategic advisory firm that assists hedge funds and proprietary trading firms in optimizing execution through broker relationships, order flow arrangements, and electronic trading systems. DCM also provides consulting services and research products that focus on market structure, electronic execution, and market regulation/compliance. DCM offers a wide range of regulatory consulting and expert services, including those relating to expert testimony in litigation and interaction with regulatory agencies. Notable research accomplishments include a multi-year review of special order type functionality for all U.S. equities exchanges and a comprehensive review of market structure litigation in U.S. equities from 2011-2016.

Representative engagements as an expert include:

- *SEC v. Lek Securities*: currently serving as a testifying expert for one of the defendants in connection with allegations of market manipulation; analyzing trading strategies and specific series of transactions that have been alleged to be manipulative
- *Klein v. TD Ameritrade*: currently serving as a lead testifying expert for the plaintiff in a class action against a large retail brokerage in connection with alleged violations of the duty of best execution and corresponding harm to investors; produced expert reports and rebuttal reports with a unique approach to identification and measurement of economic harm; court testimony / deposition; extensive use of data, including tick-by-tick historical data
- *United States v. Taub*: currently serving as a lead testifying expert for the defendant in a criminal case, as well as the related civil and in rem proceedings, in connection with allegations of market manipulation; produced an expert report challenging the allegations and specific examples of purported illegal transactions; extensive use of data, including tick-by-tick historical data
- *Kluger v. United States*: served as an expert of record for the plaintiff in a lawsuit challenging a criminal conviction; provided an expert declaration about the nature and technical details of electronic trading and order matching engines

- *Confidential*: served as a consulting expert for the plaintiff in a class action against several exchanges in connection with disclosure practices; advised on framing the complaint and the relevant allegations
- *Confidential*: served as a consulting expert for the plaintiff in a class action against a broker-dealer in connection with order handling practices; advised on technical details of the complaint, calculation of damages, and settlement negotiations

***Trading Machines, LLC, Stamford, CT***

**Founder, Chief Executive Officer/Chief Compliance Officer** *September 2007 — March 2011*

Founded Trading Machines LLC, a high frequency options trading firm that executed upwards of ½ percent of the U.S. options market, using minimal risk capital during a period of heavy industry compression. Notable technical accomplishments include a signal-based options autohitter / delta sweeper, a single-side options quoter adapted for each market, a signal-based “sweep event” hedger, a post-only hedger adapted for each equity market, stock microprice logic/pricefeed filtering, and real-time adverse selection/slippage metrics.

***UBS Securities, LLC, Stamford, CT***

**Managing Director, Electronic Volatility Trading**

**Executive Director, Electronic Volatility Trading**

**Director, Electronic Volatility Trading**

*March 2003 — August 2007*

January 2006 — August 2007

January 2004 — January 2006

March 2003 — January 2004

Joint Global Head of the Electronic Volatility Trading business unit, a global options market making desk encompassing 25+ equity and equity derivatives markets with net trading revenue of \$75M in 2007 and roughly 5% U.S. options market share. Co-chair of Automated Derivatives Strategies, a unit consisting of 70+ technical and quantitative staff tasked with deploying EVT platform into all equity derivatives desks globally (e.g. warrants, flow desks). Negotiated and specified 7-year exclusive options order routing agreement with Schwab and designed its requisite options order router. Notable technical accomplishments include the first “dynamic sizing” bulk-message quoter introduced into the U.S. options market, an embedded auto-hitting/posting strategy utilizing quote messages, bulk-quoting prioritization and throttling logic, an electronic trading risk control framework, customized algorithms for price improvement auctions, and a “point of impact” delta hedger.

***Sixfold Technologies, LLC, Chicago, IL***

**Founder and CEO** June 2002 — March 2003

*June 2002 — March 2003*

Founded Sixfold Technologies, LLC, an early-stage startup providing of low-level software and hardware infrastructure products for large-scale analytical and scientific computing. Its first prototype product was a PXE network boot server appliance.

***The Hull Group/Goldman Sachs, Chicago, IL***

**Vice-President, Equities Division, Goldman Sachs**

**Associate, Equities Division, Goldman Sachs**

**Financial Engineer, The Hull Group**

*September 1997 — June 2002*

December 2000 — June 2002

September 1999 — December 2000

September 1997 — September 1999

Sole financial engineer, primary quantitative programmer, and speed specialist dedicated to all aspects of electronic trading execution for options markets. Notable technical accomplishments a specialized

autohitting engine for Eurex that used a “polling” pricefeed, a bulk-message quoter implemented for the ISE launch, and combination auto-hitting/posting strategy for Kospi options utilizing limit orders.

**Magnify, Inc, Chicago, IL**  
**Senior Member of Technical Staff**  
**Member of Technical Staff**

**February 1996 — September 1997**  
February 1997 — September 1997  
February 1996 — February 1997

Designed and developed machine learning library for the PATTERN data mining product, the center point of which was an assemble-based implementation of Breiman’s CART algorithm. Successfully completed Phase I and Phase II pilots with Visa International, resulting in production use of PATTERN for real-time credit card fraud detection.

**VictorMaxx Technologies, Inc., Deerfield, IL**  
**Developer Support and Relations**

**October 1995 — February 1996**  
October 1995 — February 1996

Responsible for software development to support virtual reality head-mounted display.

## ***Publications***

H. Bodek, forthcoming. “A Case Study in Regulatory Arbitrage and Information Asymmetry: High Frequency Trading and the Post Only Intermarket Sweep Order.” In *Global Algorithmic Capital Markets: High Frequency Trading, Dark Pools, and Regulatory Challenges*, edited W. Matli. Oxford University Press.

H. Bodek and S. Dolgoplov, 2015. “The Market Structure Crisis: Electronic Stock Exchanges, High Frequency Trading, and Dark Pools” Decimus Capital Markets, LLC.

H. Bodek, 2013. “The Problem of HFT: Collected Writings on High Frequency Trading & Stock Market Structure Reform.” Decimus Capital Markets, LLC.

H. Bodek, R. L. Grossman, and I. Pulleyn, 1997. “The Data Mining and Analysis of Packet Data for Detecting Network Intrusions.” In *Proceedings of First International Conference on the Practical Application of Knowledge Discovery and Data Mining*.

R. L. Grossman, H. Bodek, D. Northcutt, and V. Poor, 1996. “Data Mining and Tree-Based Optimization.” In *Proceedings of the Second International Conference on Knowledge Discovery & Data Mining*, edited E. Simoudis, J. Han, and U. Fayyad. Menlo Park, CA: AAAI Press/MIT Press.

## ***Education***

B.A. in Mathematics and Cognitive Science, University of Rochester, 1995

## ***Qualifications***

Series 3, 4, 7, 24, 55, 63, 65 (lapsed, requires re-registration)

## **Exhibit B**

### **Reviewed Materials:**

Complaint, SEC v. Lek Sec. Corp., No. 1:17-cv-01789-DLC (S.D.N.Y. Mar. 10, 2017), <https://www.sec.gov/litigation/complaints/2017/comp-pr2017-63.pdf>

Expert Reports of Terrence Hendershott, Ph.D. (Apr. 3, 2017) (including supplements / materials)

Deposition of John Huth (Jan. 23, 2018)

Deposition of Adam Nunes (Apr. 6, 2018)

Tick data for the relevant time period provided by Thesys Technologies, LLC

### **Information About Prior Depositions and Court Testimony Within the Last Four Years:**

*Klein v. TD Ameritrade*, 8:14-cv-00396, United States District Court for Nebraska

### **Information About Publications Within the Last Ten Years:**

H. Bodek, forthcoming. “A Case Study in Regulatory Arbitrage and Information Asymmetry: High Frequency Trading and the Post Only Intermarket Sweep Order.” In *Global Algorithmic Capital Markets: High Frequency Trading, Dark Pools, and Regulatory Challenges*, edited W. Mattli. Oxford University Press.

H. Bodek and S. Dolgoplov, 2015. “The Market Structure Crisis: Electronic Stock Exchanges, High Frequency Trading, and Dark Pools” Decimus Capital Markets, LLC.

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**EXPERT REPORT OF HAIM BODEK  
CROSS-MARKET STRATEGY**

UNITED STATES DISTRICT COURT  
SOUTHERN DISTRICT OF NEW YORK

SECURITIES AND EXCHANGE COMMISSION V. LEK SECURITIES CORPORATION, SAMUEL LEK, VALI  
MANAGEMENT PARTNERS dba AVALON FA LTD, NATHAN FAYYER, and SERGEY PUSTELNIK a/k/a  
SERGE PUSTELNIK

Civil Action No. 17-1789

May 11, 2018

## **I. Introduction**

1. My name is Haim Bodek. I am currently the Managing Principal of Decimus Capital Markets, LLC, a consultancy that advises on U.S. securities market structure and provides expert witness services. I was formerly a founder and Chief Executive Officer of Trading Machines LLC, an independent high frequency options trading firm. Prior to my tenure at Trading Machines, I was a Managing Director and Joint Global Head of Electronic Volatility Trading at UBS, a global securities firm. My curriculum vitae is attached as Exhibit A. A list of documents I have reviewed is attached as Exhibit B.
2. In addition to my expert witness experience, I have actively provided the U.S. Securities and Exchange Commission information to assist in several investigations that resulted in substantial monetary fines and significant changes in practices of certain trading venues, including but not limited to admissions of inaccurate disclosures in exchange rule filings.
3. I have been retained to analyze transactions in connection with the claims asserted in civil proceedings docketed at No. 17-cv-1789 and to respond to the expert reports produced in connection with these proceedings by Terrence Hendershott and Neil Pearson. I produced this report in my capacity as an expert engaged on behalf of defendant Vali Management Partners dba Avalon FA Ltd (“defendant” or “Avalon”).
4. I am qualified to provide expert testimony in this litigation because of my extensive background as an electronic trading executive and algorithmic trading strategist, with roughly twenty years of experience in the automated trading space. I have been engaged as a testifying or consulting expert in several lawsuits to provide both quantitative and qualitative analysis while leveraging my in-depth knowledge of industry practices and the architecture of the electronic trading process.
5. Furthermore, I have had direct experience with the toxic interaction between cross-market trading strategies and options market making strategies in the mid-2000s in my capacity as the lead algorithmic trading strategist at UBS and later in my capacity as a Joint Global Head of Electronic Volatility Trading at the same firm. For a six-month period, I focused on adapting UBS market making algorithms to address an unexpected reduction in profitability caused by a cross-market trading strategy operated by Assent Trading LLC, a strategy which appears indistinguishable to me when compared to Avalon’s cross-market trading strategy. While being employed in that capacity, I pursued several potential solutions which, as indicated by Marin Nitzov of Citadel in his deposition on April 3, 2018, Citadel itself has been pursuing.

## **II. Assignment**

6. I have been engaged by Avalon to prepare an expert report for the benefit of its legal counsel assessing the claims of the U.S. Securities and Exchange Commission (“SEC”) that Avalon and traders trading in Avalon’s brokerage account participated in manipulative schemes

7. To accomplish this, I reviewed, among other things, the Complaint by the SEC dated March 10, 2017, the materials provided by Neil Pearson, an expert engaged by the SEC, and Mr. Nitzov's and Mr. DeMaio's deposition transcripts.
8. I have been asked to offer my opinions concerning equity and options trading described as "cross-market manipulation" by the SEC and Professor Pearson.
9. I am being compensated at \$750/hour, with additional predetermined fixed payments totaling to \$50,000 paid at different stages of this engagement.
10. Exhibit B to this Report and the citations in the footnotes below contain a listing of the various documents and information that I considered in this matter. If needed, I may prepare graphic or illustrative exhibits to use at trial based on the opinions expressed herein, and I may also use facts, documents or exhibits submitted by other experts for Defendants or other parties in this action.
11. My work in this matter is ongoing, and I reserve the right to supplement my current analysis as additional information becomes available and the source material is further analyzed, including the reports and testimony of other expert witnesses in this matter..

### **III. Background**

#### **Electronic Options Market Making**

12. Modern electronic exchanges are typically characterized by electronic limit order books that provide displayed prices to the marketplace in the form of bids and offers (i.e., "buy" and "sell" orders for specific quantities of shares), although some types of exchange orders may be "hidden" (i.e., undisplayed) in whole or in part.
13. Market makers are a special class of market participant that stand ready to buy and sell a security and to profit from the differential between the buy and sell price, which is typically referred to as "capturing the spread."
14. Options market makers continuously quote on up to fifteen (15) equity options exchanges operating in the United States, typically posting two-sided quotations to buy and sell 10 or more contracts per listed option. It is common for an equity options exchange to list over a hundred options for each equity, representing different strike prices and expiration dates. The continuous quoting requirement on multiple exchanges places the options market maker in a precarious position where it is posting more liquidity than it desires to trade or which can be hedged in the stock market. For example, if an options market maker is quoting options for IBM "10 up" on ten exchanges, it might be exposed to trading a synthetic exposure in the equity corresponding to 10 (size) X 10 (exchanges) X 100 (option products) X 100 (multiplier) X 0.40 (delta) X 0.60 (quoting requirement) = 240,000 shares on the buy and sell side. This example in itself represents an enormous instantaneous risk of exposure, but in fact corresponds to a quoting requirement for a smaller market maker. Typically, the largest options market makers quote much larger

sizes than the minimum size of 10 contracts, ranging from hundreds to thousands of contracts in each posted quote.

15. Furthermore, and to add to the many equities options exchanges, such as CBOE or NYSE American (formerly AMEX), have pro-rata market models, which allocate larger percentages of incoming market and marketable limit orders to those market makers that are posting the largest quoted size. This market model causes market makers to post orders for quoted sizes which can at time be hundreds of times the quantity that the options market maker actually intends to trade.
16. Generally, if an options market maker traded all the quantity he had posted, the cost of hedging in the equity market would result in instantaneous losses. Over the years a number of events have occurred where hundreds of thousands to millions of dollars were lost by options market makers that executed quantity across their posted quotations that were never intended to be executed, a phenomenon sometimes compounded by technological glitches, and which resulted in significant losses.<sup>1</sup> For this reason, exchanges have introduced market maker protection features to prevent market makers from having significant losses due to being swept across multiple exchanges and products for sizes that for all practical purposes are not intended to be traded.
17. It is generally understood in the industry that the oversized liquidity available in the options market is potentially damaging to market makers because they may be forced to actually trade on their posted size beyond what can be effectively hedged in the equity market. It is also well-known that the liquidity available in the options market can be exploited by sophisticated participants who are effectively taking advantage of liquidity in a manner that exposes market makers to undesirable costs. Options market makers generally tolerate losses caused by large market participants that trade on posted quotes for large sizes and seek to minimize losses through sophisticated risk management and hedging strategies. Counterparty reports, which provide information on the identities of counterparties to an option market maker's trades, are typically examined on a next-day basis to identify firms that are exploiting imperfections in an options market making strategy. At times, activity that is considered outside of the norm is escalated either directly to the counterparty's broker or indirectly through the exchanges for informal resolution, most often due to the perceived toxicity of the trading and most often without any allegation of market abuse.

### **Manipulative Trading, Spoofing, Layering, and Disruptive Trading**

18. Avalon is charged with violations of several provisions of the federal securities statutes, namely Sections 17(a)(1) and 17(a)(3) of the Securities Act of 1933, Section 10(b) of the

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<sup>1</sup> See, e.g., Goldman, Sachs & Co., Exchange Act Release No. 75,331 (June 30, 2015) (settled proceeding), <https://www.sec.gov/litigation/admin/2015/34-75331.pdf>; FINRA Dep't of Mkt. Reg. v. Ronin Capital, LLC, Proceeding No. 20120315358 (Aug. 28, 2014) (settled proceeding), <https://www.nyse.com/publicdocs/nyse/markets/nyse-american/disciplinary-actions/2014/Ronin%20Capital%20Decision.pdf>.

Securities Exchange Act of 1934 and the corresponding Rule 10b-5, and Section 9(a)(2) of the Securities Exchange Act of 1934. Essentially, the SEC's "cross-market manipulation" claims are premised on allegations of artificial pricing. For instance, the SEC maintained that Avalon's cross-market trading activities "could and would artificially move the price of the stock and corresponding options."<sup>2</sup> It is my understanding that challenged orders in this case had been entered by independent contractors trading through Avalon's account at Lek Securities. Moreover, it is my understanding that neither Avalon's principals nor any other employees of Avalon entered any of the challenged orders. When discussing "Avalon's" trading in this Report, I am referring to the trading engaged in by these independent contractors placing orders and executing trades through Avalon's account. I am not expressing an opinion as to whether Avalon or its principal or employees bear any direct or indirect responsibility for that trading.

19. Note however that trading activity invariably impacts the market itself in the sense that any transaction, let alone a trading strategy based on a series of transactions, has some marginal impact on the market price. Critically, price impact of a given strategy is not necessarily "artificial" even when such impact could be reasonably anticipated by the trader in question. Moreover, legitimate trading activity may be misinterpreted as having a manipulative design, particularly in a scenario of executing larger trades that *inherently* move the market. This bias may be compounded when all transactions for a given strategy are not assessed holistically. Furthermore, the economic purpose and intent of transactions must not only be assessed on an individual basis, but also in the context of the full transaction sequence associated with the strategy in question.
20. The true price of a security is a moving target, as it constantly changes with the arrival of different types of fundamental information (e.g., news about companies, industries, and the economy in general) and non-fundamental information (e.g., other market participants' orders and trading intentions).
21. Consider the case where a trader executes against the market by trading multiple buy orders at successively more aggressive prices. Such activity does not create artificial price movement although the price might rise significantly over the period of posting and might actually mean-revert to original levels at a later time. Regardless of the final equilibrium point, such orders demonstrate the lack of willing counterparties to sell against the trader's aggressive buy orders, which otherwise would be expected to execute except for the singular condition in which there are no interested counterparties to trade against the posted buy prices. The trader's activity in this scenario does not cause the absence of sellers, but merely exposes the absence of sellers. If the price rises as a result of other buyers' actions, it is not because these buyers were deceived with artificial prices, but because the buyers were responding to the lack of sellers which the original trader's buy orders exposed to the marketplace as a whole.

## Price Discovery

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<sup>2</sup> Complaint para. 87, at 33, *SEC v. Lek Sec. Corp.*, No. 1:17-cv-01789-DLC (S.D.N.Y. Mar. 10, 2017), <https://www.sec.gov/litigation/complaints/2017/comp-pr2017-63.pdf>.

22. The process of price discovery, in which the price of an asset is determined by trading activities of market participants and the resulting buying and selling pressures, typically produces legitimate (and at times extreme) price movements until an equilibrium price is achieved. Note, however, that in practice the equilibrium is often a temporary phenomenon directly related to the activity of market makers and other market participants trading the asset. New market participants may choose to enter or exit positions; market makers may adjust their prices due to changing market conditions; and customers holding a position may choose to realize gains or losses.
23. For example, a market maker that has incurred losses trading against a large market participant would often “widen” its bid-ask spread and / or shift its notion of the fair value of the asset until that large market participant is no longer willing to pay the spread to trade with the market maker or until the market maker is willing to bear the risk of repeated trades given its assessment that there is a sufficient spread to be captured.
24. The notion of an equilibrium (i.e., a stable price of an asset) in the short-term is more indicative of a situation in which market participants do not find sufficient economic gain in challenging the prevailing price of an asset by deploying capital to trade against resting bids or offers, as opposed to a notion of the market finding an intrinsic value to an asset under the “efficient market hypothesis.”
25. Market participants use a wide variety of trading strategies in order to achieve excess risk-adjusted return, which is known as “alpha.” Inevitably, a search for alpha, as well as its persistence, may be jeopardized by errors and random occurrences. Certain strategies become more or less successful as the market evolves, and, moreover, different types of strategies may have unusual and/or unexpected interactions with one another, whether they compete with each other or not.
26. Specialized trading strategies relevant to this inquiry are market impact strategies and liquidity arbitrage strategies.

### **Market Impact Strategies**

27. Market impact is the effect that a market participant has on market prices when he buys or sells an asset. Market impact costs constitute an additional cost a trader must pay to enter into a position, as the process of consummating the transaction itself may change the market price in an adverse direction.
28. While market impact has been traditionally seen as representative of the cost of liquidity with regard to the reference price prior to attempting execution, the price movement itself can also be a confirmation of a trader’s belief that a given security is mispriced relative to its fair value and that the lack of liquidity that opposes that trader’s position is a confirmation of a perceived mispricing.
29. All large traders have the potential for significant impact on the market and must manage that impact or otherwise be exposed to excessive slippage. The primary way a large trader can manage that impact is to control the execution size and the aggressiveness of his prices.

30. For example, it is a standard industry practice to execute large orders by slicing an order into smaller “child” orders so as not to reveal to the market the presence of large buy and sell orders. One pervasive phenomenon is a general decrease of average trade size across trading venues. As recently noted by the SEC’s Division of Trading and Markets, “In contrast to trading volume, average trade size fell substantially for both NASDAQ and NYSE stocks [from 2005 to 2014] . . . [A]verage trade size fell by 53% for NASDAQ stocks (from 434 to 204 shares) and by 75% for NYSE stocks (from 777 shares to 195 shares).”<sup>3</sup> It is important to note that this phenomenon is not explained by smaller positions or trading interests being preferred by investors, but rather by changing industry practices that utilize more efficient or appropriate execution strategies to execute larger orders using multiple child orders.
31. It is common for market participants to routinely mask trading intentions, which essentially amounts to concealing information from the marketplace, in order to improve the execution quality and access to liquidity.
32. While aggressively trading with large orders is usually considered poor management of market impact that leads to information leakage and market impact costs, and is often criticized as being disruptive to markets, price impact can also benefit certain types of traders. For example, a trader who engages in a “momentum trading” strategy may take liquidity in a speculative manner, anticipating that depleted liquidity on one side of the market would permit him to exit his position because liquidity seekers would demand liquidity at a price favorable to that trader. This activity is often incorrectly referred to by outside observers as “manipulation” when the trader is successful at capturing a profit. Yet, more generally, this activity is a legitimate form of speculation that assists in price discovery and in no way is guaranteed to produce a successful result. Quite frequently, retail day traders engage in this form of speculation unsuccessfully and incur losses in part due to transaction costs associated with momentum trading and the tendency for such traders to buy at inflated prices and to sell at depressed prices without the materialization of additional liquidity seekers willing to trade at profitable exit points for such speculators.
33. While some may incorrectly label aggressive trading as market manipulation, it essentially is a form of price discovery and correction that offsets the ambiguity put into the market by other market participants concealing their target positions. When the price is impacted, this outcome encourages other participants with undiscovered buy and sell interest to engage in the market until buy and sell interest arrives at a new equilibrium price range. In fact, aggressive trading can improve markets by correcting imbalances of buy and sell interest that have remained as a result of efforts by market participants to conceal the true depth of such interest. In other words, such trading strategies are in fact the opposite of market manipulation, as they push the market price closer to the “true” price rather than create artificial deviations from that true price.
34. To condense, aggressive trading does not in itself constitute market manipulation, and its features, such as “real” trading interest / consummated transactions and a likely

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<sup>3</sup> Memorandum on Rule 611 of Regulation NMS from the SEC Division of Trading and Markets to the SEC Market Structure Advisory Committee 12 (Apr. 30, 2015), <https://www.sec.gov/spotlight/emsac/memo-rule-611-regulation-nms.pdf>.

correction of the prevailing market price rather than an artificial price impact, point in the direction that this trading strategy is unlikely to be manipulative. More generally, as recognized by some courts, a trading strategy with an expected market impact is not in itself illegal. For instance, one court applied the standard that, “[w]hen the transaction is effected for an investment purpose . . . there is no manipulation, even if an increase or diminution in price was a foreseeable consequence of the investment.”<sup>4</sup>

35. Market makers, including non-registered market makers and high frequency trading (“HFT”) firms, often quote bid and offer sizes that obfuscate the direction they intend to trade the bulk of their respective positions. Withholding information about an intended buy or sell interest is not a deceptive practice, but an intrinsic behavior of traders who may have significant market impact depending on the liquidity profile of the security in question.
36. An important concept applicable to both market impact strategies and the liquidity arbitrage strategies discussed below is the estimation of the liquidity premium, a notion that represents the premium that must be paid to the market beyond the current market price to execute a given order size. For liquidity providers, the liquidity premium is a source of return. For liquidity takers, the liquidity premium is a source of costs. In a practical sense, the transaction costs incurred (i.e., the spread and implicit price impact) when executing a given order size can be thought of as the most basic proxy for the liquidity premium.<sup>5</sup>
37. The instantaneous cost of transacting a given amount of shares in the lit market (i.e., the “slippage”) is an important measurement for assessing the potential liquidity premium for an asset. Nassim Taleb refers to this measure as a “practitioner’s measurement for liquidity.” The measure is generally used by professional trading firms as a liquidity measurement surrogate. It is further noted that “[s]lippage is not always a precise measure of liquidity for a particular commodity, but it provides a reliable comparative measurement of liquidity between markets.” The author defines slippage as being calculated by “taking the variation between the average execution price and the initial middle point of the bid and the offer.”<sup>6</sup>
38. The instantaneous cost / slippage in a transaction for a particular number of shares of a security is generally a reasonable surrogate for determining the potential order of magnitude of market impact / price impact costs for that security (assuming that liquidity

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<sup>4</sup> *United States v. Mulheren*, 938 F.2d 364, 368 (2d Cir. 1991).

<sup>5</sup> The academic literature has analyzed the concept of liquidity premium, oftentimes while comparing securities with different characteristics, but also in the context of liquidity in the same asset. *See, e.g.*, Christian Ewerhart & Natacha Valla, *Financial Market Liquidity and the Lender of Last Resort*, FIN. STABILITY REV., Feb. 2008, at 133, 142 n. 11 (“Competitive market makers typically set prices such that the certainty equivalent of their material payoff is not affected through the execution of incoming order-flows. Initially, the price only depends on contemporaneous buy and sell orders. However, when uncertainty prevails as to whether liquidity shocks may shortly occur or not, market prices will depend on whether or not the liquidity shock has actually materialized. In case a shock indeed occurs, all constrained sellers who had not sold before will be forced to liquidate their positions. In case not, however, a subpopulation of investors may still sell the asset. In both cases, the equilibrium asset price reflects the limited risk-taking capacity of market makers, which implies a liquidity premium for one side of the market.”).

<sup>6</sup> NASSIM NICOLAS TALEB, DYNAMIC HEDGING: MANAGING VANILLA AND EXOTIC OPTIONS 68-69 (1997).

is not replenished) and thus for the potential order of magnitude that the lit market is “pricing in” for the liquidity premium. Generally, it is reasonable to use the terms “instantaneous cost,” “slippage,” and “liquidity premium” interchangeably when assessing the instantaneous costs for executing a given share quantity in the lit market.

39. For example, if a market participant has a 10,000 share targeted position and a visible displayed quantity for a stock trading at a midpoint price of \$30.00 that can be filled in totality with an instantaneous sweep that results in an average execution price at \$30.25, then the slippage / liquidity premium captured by the market will be  $10,000 * (\$30.25 - \$30.00) = \$2500$ . If this hypothetical market participant indeed sweeps the market, this action is likely to move the market in the direction of the expected \$30.25 “sweep price,” but it may actually execute at a better or worse price depending on the market’s reaction to his trading activity.
40. While this hypothetical market participant experiences an instantaneous cost and apparent price impact of \$0.25, subsequent actions of market participants are critical to determine the extent of the persistent price impact. If market makers replenish the price, then mean reversion toward the original market price of \$30 is more likely and the trader is expected to realize the cost of the full estimated slippage or even more when exiting the position. However, if market makers provide a portion or all of the liquidity and then access the market itself in order to eliminate their position over the \$30.00 to \$30.25 trading range, then the market is likely to show a persistent price impact that exceeds the expected \$30.25 average execution price. In the latter scenario, the trader might even be able to realize a gain if he can exit the position by providing liquidity instead of paying the slippage costs at the exit. Avalon’s trading is generally consistent with this latter scenario.
41. Basic logic dictates that a market maker willing to sell 10,000 shares at \$30 to a liquidity seeker when the instantaneous liquidity available in the lit markets would execute at an average price of \$30.25 is mispricing the liquidity premium inherent in the lit market. Furthermore, it follows that the cost for such market maker to exit 10,000 shares sold at \$30 buying back the shares in the lit market would result in an immediate loss on the order of magnitude of the instantaneous slippage which equates to a loss of \$2500 ( $\$0.25 \times 10,000$  shares). Hence, it should be evident that a trader with knowledge of the displayed order books aiming to execute such quantity in the conditions described above would naturally seek out liquidity providers that would provide an average fill price closer to the current market price if possible, especially after assessing the available liquidity in the lit market.
42. To the degree Avalon anticipated that the options market makers who were counterparties to Avalon’s options trades would seek to hedge their risk exposures in the equities market, Avalon’s market impact orders can also be considered informed orders which sought to step ahead of such anticipated order flows.

### **Liquidity Arbitrage Strategies**

43. Liquidity arbitrage is an established and legitimate speculative strategy that focuses on warehousing risk in an asset in anticipation that market participants would, at some point

in the future, be willing to pay a premium for accessing that liquidity (the “liquidity premium”) and thus compensate the liquidity arbitrageur for holding that risk. The term “liquidity arbitrage” has been applied to a variety of practices, such as buying shares of pre-IPO companies in secondary private markets and selling them in the public markets post-IPO,<sup>7</sup> transacting in near fungible or otherwise closely correlated assets (such as arbitraging stocks of similar companies or arbitraging baskets of securities vis-a-vis exchange-traded funds),<sup>8</sup> or engaging in low-latency arbitrage across different trading venues,<sup>9</sup> as well as liquidity providing strategies in equities markets.<sup>10</sup>

44. In the context of market making in equities markets more specifically, the term “liquidity arbitrage” is often used to describe the capture of the risk premium associated with momentary lapses in the supply of liquidity for a security. Because market makers demand an increased premium for carrying additional units of risk for an asset, the otherwise available liquidity may be eliminated from the market over a short time period.
45. Liquidity arbitrage is centered on the concept that a short-term price movement incorporates a liquidity premium component that can be captured by a speculator prepared to bear risk over periods when other market participants are *unwilling* to bear risk but *willing* to pay the spread or price impact to exit their positions. From this point of view, liquidity arbitrage is a natural extension of market making spread capture over a longer intraday time period. Implicitly, liquidity arbitrage cannot be conducted successfully unless the trader has a reasonably accurate assessment of a security’s valuation and its supported trading range, as well as opportunities to trade with counterparties at the desired prices corresponding to the speculator’s assessment of the liquidity premium.
46. Some academic studies focused on the issue of liquidity arbitrage describe it as the phenomenon based on profiting from temporary gaps in liquidity. As stated in one of these studies, “[L]iquidity arbitrageurs [engage in] tracking price pressures due to liquidity frictions and entering the market in order to provide immediacy and to cash the liquidity premium. Their intervention tends to correct price imperfections due to liquidity shocks and thus lowers the intra-day return volatility. Once the prices are back to their fully revealing information level, the arbitrage traders will liquidate their positions in order to benefit from the price reversals.”<sup>11</sup>
47. As explained in more detail by the same study, “[Liquidity arbitrageurs] enter the market to exploit the presence of the liquidity events . . . . A liquidity event is represented by a

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<sup>7</sup> See, e.g., Michael Jones, *Hedge Funds Beat the Market by Avoiding It*, PANDO (Nov. 13, 2013), <https://pando.com/2013/11/13/hedge-funds-beat-the-market-by-avoiding-it/>.

<sup>8</sup> See, e.g., Davide Tomio, *Arbitraging Liquidity* (Jan. 2017), <http://davidetomio.com/jmp>.

<sup>9</sup> For instance, the Securities Traders Association, a leading industry association, described strategies exploiting discrepancies between the consolidated data feed and the faster / more information-rich private data feeds as a form of liquidity arbitrage. Brett F. Mock, Chairman & John C. Giese, President and CEO, Sec. Traders Ass’n, Comment Letter to the SEC on the Concept Release on Equity Market Structure 12 (Apr. 30, 2010), <https://www.sec.gov/comments/s7-02-10/s70210-170.pdf>.

<sup>10</sup> See, e.g., Serge Darolles et al., *Measuring the Liquidity Part of Volume*, 50 J. BANKING & FIN. 92 (2015).

<sup>11</sup> Serge Darolles et al., *When Market Illiquidity Generates Volume 3* (Oct. 5, 2011), [http://www.crest.fr/ckfinder/userfiles/files/pageperso/gmero/MERO\\_DAROLLES\\_LeFOL\\_OCT\\_2011.pdf](http://www.crest.fr/ckfinder/userfiles/files/pageperso/gmero/MERO_DAROLLES_LeFOL_OCT_2011.pdf).

temporary order imbalance due to trade asynchronization among the active traders. In the presence of a liquidity event, trades occur at two dates. At time 1, the liquidity arbitrageurs observe price imperfections due to the order imbalance among the active traders and enter the market to provide immediacy. At time 2, they liquidate their positions as other active traders arrive to the market with opposite order imbalances."<sup>12</sup>

48. The corrective action by firms that trade against mini-flash crashes can be seen as the purest form of this type of liquidity arbitrage. Because market makers might be unsure of the fundamental value of the asset during extreme events and risk entering into a transaction at a very disadvantageous price, this activity is colloquially referred to as "catching a falling knife."
49. With regard to short-term price movements of a significant magnitude (which is sometimes known as "momentum"), it is important to understand that liquidity itself is a fundamental component in the short-term pricing dynamics.<sup>13</sup> Accordingly, a decision by one or more market participants to choose price levels to support with significant sizes in part dictates the value of the asset as reflected in a "fair" market price. The term "market making" in part embeds the concept of a market maker choosing price levels to "make a market" and supply risk at levels that are based on its view of price range and valuation, effectively dictating a liquidity premium it requires to trade.
50. The practice of "making a market" by definition implies that the liquidity provider (or an individual trader) is in part setting the bounds of potential short-term price movements in the market. The practice of maintaining price levels to capture a liquidity premium is not manipulative. In fact, it is an important component of informed market participants' risk allocation to bound the movement of securities' prices within certain ranges. Choosing to impact the market by "defending" a price, therefore bounding price movement or otherwise impacting a given security, is especially important for market participants acting as liquidity arbitrageurs in order to successfully capture a liquidity premium for warehousing risk, especially in the age of low-inventory HFT market makers that often do not warehouse risk in a manner that assists in naturally establishing such bounds to price movement.
51. Outside of low-latency scalping strategies, markets makers are typically compensated by bearing risk and over time realizing a spread, in part based on the differential of the theoretical value of an asset and actually tradable prices, but also by incorporating an additional markup to compensate for the desired liquidity premium or spread, as well as the adverse selection bias that market makers are typically exposed to in the lit markets. Needless to say, with the decimalization of securities markets, market makers must be increasingly compensated by realizing a spread that is greater than the minimum trading increment or "tick size" (typically, \$0.01) by utilizing valuation models that dedicate a

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<sup>12</sup> *Id.* at 4.

<sup>13</sup> It should be noted that the link between liquidity / liquidity premium / liquidity arbitrage has been addressed, albeit from different angles, in the academic literature. See, e.g., Daniel Page et al., *Momentum and Liquidity on the Johannesburg Stock Exchange*, 5 INT'L J. ECON. & FIN. STUD. 56 (2013); Lubos Pastor & Robert F. Stambaugh, *Liquidity Risk and Expected Stock Returns*, 111 J. POL. ECON. 642 (2003); Ronnie Sadka, *Momentum and Post-Earnings-Announcement Drift Anomalies: The Role of Liquidity Risk*, 80 J. FIN. ECON. 309 (2006).

theoretical “edge” relative to the current prices one can transact at irrespective of being either a maker or taker. Thus in a market in which the average spread is close to the minimum trading increment, a market maker could still capture a spread of multiple ticks to compensate for taking that risk.

52. Market makers must at all times accurately assess liquidity in the lit markets and adjust their position exposure and order size exposure to account for realistic estimations of the liquidity premium that should be captured for certain order sizes, and, accordingly, it is essential for such market makers to pass over and reroute orders that do not satisfy sensible liquidity premium requirements.
53. If a market maker provides liquidity and immediately capitulates (e.g., by accessing the market to eliminate the position instead of bearing the risk), most often this action would result in an immediate and potentially severe loss depending on the order size and available liquidity. Market makers are in the business of capturing a liquidity premium based on superior valuation and assessment of liquidity, not paying it to the market.
54. When market makers fail to function in a manner that limits the potential rewards from liquidity arbitrage, other participants may choose to enter the market to capture the perceived liquidity premium associated with short-term price movements and dislocations as a discriminatory liquidity provider / liquidity arbitrageur, with this category including proprietary trading firms, hedge funds, and other speculative traders. Such participants perform a vital task when market makers do not participate in the lit markets with a sufficient capacity for risk-taking.
55. Implicitly, the concept of a liquidity premium incorporates the practical reality that short-term prices are primarily impacted by liquidity flows (supply and demand of posted as well as hidden liquidity) and that such change in available liquidity serves to establish a range of traded prices around the equilibrium price or “fair value” of the asset. After all, liquidity flows by definition are impacted by large participants, market makers, speculators, and other investors warehousing liquidity, with their legitimate transactions having price impact.
56. Speculative trading, liquidity providing, and arbitrage activity of sizable activity will stress test such equilibrium points, which, when done by market participants employing bona fide orders that incur risk, form the basic process of price discovery. Despite the potential for price volatility in a given security, the overall market impact and reaction to such forms of trading activity by definition are not mechanisms of producing artificial price movement even if they contribute to fluctuations in prices that appear disruptive, noisy, or beneficial to some market participants at the expense of others.
57. It is also worthy of noting that the market impact of one market maker that is seeking to exit a position can produce adverse price impact for other market makers who share a similar position, influencing them to exit positions to prevent further mark-to-market losses. In such scenarios, some market makers will tend to act as liquidity seekers in the way they interact with the market and other market makers, and they will transfer inventory among themselves until an equilibrium is established in which several market makers collectively retain inventory and support price levels. This process of risk transfer between market makers is often the primary factor that influences short-term price movements in the market after large trades are executed against the “crowd” of market

makers, especially in the context of illiquid securities that rely heavily on market makers for liquidity.

58. Overall, market impact strategies and liquidity arbitrage share common traits in that they rely on execution tactics that elicit information from the market about buy / sell interest levels in the market with execution strategies provides information on opportunities to trade aggressively with significantly large sizes. Despite regulatory concerns that aggressive trading can be disruptive when liquidity is scarce and market impact is high, the activity covering these strategies, which may oftentimes interact with each other, is vital for a functional liquidity provision (including quasi / de facto liquidity provision) and the mechanism of price discovery in the marketplace. Such strategies are legitimate and not manipulative.

### **Challenges of Electronic Options Market Making**

59. Electronic options market making is facing a number of challenges in the evolving architecture of securities markets, which could be traced back to the emergence of decimalization (i.e., the minimum price increment of one cent) in the early 2000s. One of the key needs for market makers to manage hedging and risk management costs in a decimalized environment where spreads and margins have compressed from nickel to penny spreads.
60. As noted, and given the fact that options market makers almost always quote more size in the options market than they desire to execute, a primary persistent issue for market makers to avoid trading excessive size with large institutional traders. This problem is exasperated by the proliferation of competing options exchanges, continuous quoting requirements adopted by exchanges, and the pro-rata exchange market model, all of which cause options market makers to place an excessive amount of liquidity in the market at sizes that are not economically sensible.
61. Given that it is common for large institutions to trade both equity options and underlying stocks at different times and to be aware of market impact, flow desks, i.e., options trading desks, at major investment banks commonly trade in a manner that shares many similarities with Avalon's cross-market strategy.
62. Within the automated options market making industry, it is common to discuss the business as a practice of monetizing retail order flow to pay for the costs of providing institutional traders too favorable of a price for the provided liquidity. Retail order flow can have more than 95% "edge retention" which is a measure of the percentage of spread expected to be realized prior to hedging costs, while institutional options orders most often have negative edge retention, which correspond to an expected loss of the spread.
63. Of all the risk management costs associated with an options market making strategy, the cost of hedging exposure with the underlying equity is typically the most expensive, as options market makers are frequently forced to become liquidity demanders in the stock market to offset such risks.
64. Outside of direct hedging activity in the stock market, options market makers have devised a variety of ways to address the stock "hedging problem", the most common is to lean options quotes in a manner that reduce risk exposure, thus providing superior

pricing on one side of the market. This strategy was referred to by Mr. Nitzov in his deposition.<sup>14</sup> Other approaches are also used to reduce hedging costs which include offsetting risks with exposure in correlated equities, utilizing equity index futures and ETF to offset portfolio and sector exposures, and the implementation of “flip out” strategies which exit undesirable risks for a small transaction loss against other option market makers that are quoting excessive liquidity.

65. With regard to direct hedging in the stock market, the most common approach to hedging oversized orders is to sweep the stock market as a liquidity taker with a “point of impact” (POI) delta-hedging algorithm that responds to notification of options trades in real-time and which executes instantaneous hedge in the stock market in milliseconds.
66. A “point of impact” hedging algorithm must operate in milliseconds because it depletes liquidity in the stock market prior to the arrival of stock orders that other option market makers have traded at the same time, a frequent occurrence with regard to large options order that trade on pro-rata exchanges. The market maker that utilizes a slower “point of impact” hedging algorithm will typically execute at a worse price than his competitors.
67. In fact, the adverse price movement experienced by options market makers for large trades is typically exasperated by the proliferation of “point of impact” hedging algorithms which have price impact that is adverse to the options market makers position. Many desks will tune their POI delta hedging algorithm to “overhedge” and to take a speculative position that is contrary to the options trade that is hedged. Overhedging parameter settings of 120% are not uncommon that result in speculative position exposure, a setting that is meant to step ahead of hedging order flows of competing options market makers in a speculative manner.
68. A number of the larger options market makers choose to bear larger risk exposures and hedge with stock only periodically, which in my experience was certainly the case with Citadel in 2010 or thereabouts and which Mr. Nitzov’s deposition implies may still be the case.<sup>15</sup> Options market makers that refuse to incur hedging costs over short-term periods are especially sensitive to the adverse price impact related to POI hedging and the presence of sophisticated participants employing market impact strategies in the equity underlying. It is likely that Citadel itself is overly exposed to Avalon’s liquidity arbitrage strategy given its position as one of the largest liquidity providers in the options market, as well as a firm that seeks to control hedging costs by tolerating directional risk exposures that other options market makers typically hedge aggressively. Given Citadel’s peculiar approach to managing directional risk exposure in conjunction with its exposure to liquidity arbitrage activities caused by its excessive quoting, it is not surprising that this firm is trying to frame Avalon’s cross-market strategy as manipulative instead of modifying its business model.
69. I spent roughly half of my fifteen-year career in options market making focusing on addressing delta-sweep strategies in the options market, which included the aggressive use of POI strategies as well as frequent execution against mispricings in other options market quotations due to model disagreements with regard to the underlying securities.

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<sup>14</sup> Deposition of Marin Nitzov, at 109-10 (Apr. 3, 2018).

<sup>15</sup> See *id.* at 92-94, 165.

Throughout, I developed expertise in the limitations of the stock market itself to support the hedging activities of options market makers. This experience led me to learn about unfair advantages HFTs had on major exchanges, which resulted in the record fine against Direct Edge for inadequate disclosure of order types on its two exchanges.<sup>16</sup> In sharp contrast to Citadel and other options market makers, I chose to reduce the dependence of my liquidity providing strategies on posting oversized quotations in the options market as a mechanism of addressing hedging costs in the post-decimalization phase of the U.S. equities options market evolution.

70. The combination of the incentive for options market makers to quote excessive liquidity at economically unsound margins in conjunction with the excessive cost of stock hedging (in part due to the self-inflicted slippage caused by options market makers employing aggressive hedging strategies) creates a near-insurmountable problem for options market makers who would rather avoid trading with large traders such as Avalon.
71. The importance of the structural and still unresolved flaws in the options market making industry is critical to understanding why Avalon's strategy works. Furthermore, given the industry resistance to resolving the market structure issues directly through efforts to diminish incentives to quote at economically unsound prices and sizes, it is logical for Citadel to attempt to frame cross-market trading and options market liquidity arbitrage as manipulative, no matter how questionable that assertion is.
72. In my own experience, while cross-market trading strategies had a negative impact on the profitability of the options market making business that I focused on, it was clear to me that the only solution was to quote at levels that were sensibly priced to incorporate the cost of hedging and risk management, a solution which results in a natural reduction in market share relative to options market makers like Citadel who do not choose to quote rational prices and sizes given the available liquidity in the stock market.
73. While Avalon's cross-market strategy may be damaging to Citadel's market making profitability and may interfere with its ambitions to remain the options market maker with the largest market share, a reframing of the strategy as prohibited market manipulation is not only illogical but eliminates legitimate liquidity arbitrage in the market, a process which serves a check and balance on the fragile ecosystem the options market making industry has created which depends on displayed market making liquidity being withheld from the very market participants it purports to serve.

## **IV. Observations**

### **General Observations About Avalon's Cross-Market Strategies**

74. The Cross-Market Delta Sweep Strategy is primarily a market impact and liquidity arbitrage strategy. The market impact component of the strategy is executed through

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<sup>16</sup> EDGA Exch. Inc., Exchange Act Release No. 74,032 (Jan. 12, 2015) (settled proceeding), <http://www.sec.gov/litigation/admin/2015/34-74032.pdf>.

equities trading activity. The liquidity arbitrage component of the strategy is executed through options trading activity.

75. The market impact component of the cross-market strategy uses bona fide orders to challenge prices in the equities market in a speculative manner, accumulating risk against contra-side buy / sell interest. When Avalon is a buyer, for example, it will trade against contra-side sell interest in a speculative manner increasing a long position against natural sellers until the price impact diminishes and the upper limit of the natural trading range of the security is discovered.
76. Avalon's cross-market strategy is not unique, but in fact has been used for nearly two decades in the automated options markets, where structural flaws in the business models of options market makers, as well as structural flaws in the options market structure itself, have produced excessive liquidity in the options market which can and are frequently exploited by liquidity arbitrageurs.

### **Avalon's Cross-Market Strategy – Market Impact Strategy Component**

77. The market impact component, while intended to impact the stock to determine the scope and scale of contra side liquidity and interest, utilizes bona fide orders executed in a speculative capacity, which by executing against legitimate opposing contra-side buy / sell interest cannot be deceptive nor result in artificial price impact.
78. The use of bona fide orders that results in significant trading activity and which intends to discover the liquidity limits of contra-side liquidity with market impact is a legitimate and central component of speculative activity in the marketplace and a central component of market price discovery. Not only is it permissible for a large trader to challenge the market with a speculative position, it is permissible for a trader to desire or intend its continued trading activity to have favorable market impact.
79. Speculative traders want to generate profitable trading activity and will often aggress against a market when they can demonstrate that opposing liquidity / interest is weak, a process that exposes information to the market on actual levels of liquidity and encourages market participants to reassess pricing and to respond to the presence of the speculative trading activity. Contra-side traders may disagree and oppose the large trader's speculative position by increasing a contra-side speculative position against the trader. Contra-side traders may choose not to respond to the trader, may choose to exit the market, or may trade in a manner that agrees with the speculative position that the trader. These responses are natural and central components of price discovery, where a mix of short-term and long-term traders, institutional vs. retail traders, and liquidity taker and providers interact and naturally respond in accordance with their trading and investment intentions.
80. Market impact strategies are not deceptive, but on the contrary are transparent to the market as a whole, announcing that one or more speculative traders intend to challenge the market prices. The act of aggressively trading with bona fide orders against real buyers and sellers cannot be interpreted to be deceptive, even when the positions taken are large and the market impact is significant. All large traders necessarily have market impact

and speculative traders and market makers alike intend to defend their view of pricing by allocating risk capital.

81. Market impact strategies of course have price impact and, when sizeable positions are built, can have a significant impact upon market prices which may not be in the interest of market participants with contra-side positions including market makers. To the degree that contra-side traders do not challenge a large speculative trader with opposing interest, they may be exposed to mark-to-market or actual losses. However, the speculative trader has not in such conditions produced artificial price impact, but natural price impact by trading against bona fide orders against opposing real customers and depleting opposing interest that is demonstrated to be limited by such trading. The speculator has changed the liquidity profile of the security through such action and, through speculative risk-taking, may or may not result in a profit. Irrespective of how the speculative trading impacts the interest of particular participants, including market makers, the price impact is legitimate consequence of speculative risk-taking and cannot be considered artificial in any manner.

#### **Avalon's Cross-Market Strategy – Liquidity Arbitrage Strategy Component**

82. The liquidity arbitrage strategy component of Avalon's strategy seeks to either "cover" or reverse position at the far ends of the trading range utilizing the oversized liquidity available in the options market.
83. After Avalon has established a mark-to-market profit in the equity, it must cope with the cost of liquidity for exiting or hedging its position to realize or protect the gain. Although the price impact caused by Avalon's market impact strategy may generate a positive mark-to-market profit when it has built a position, such price impact is not desirable when one is seeking to exit inventory and liquidity is not sufficient to exit in full at the current price. The options market provides a viable alternative for existing or reversing position at the ends of the trading range.
84. As noted, the options market making business has a structural flaw that permits access to synthetic long and short positions in the underlying at prices far cheaper than the liquidity premium costs of the equities market for participants willing to manage the other dimensions of risk exposure associated with options.
85. By accessing the options market to establish large synthetic stock exposure at the ends of its trading range, Avalon incurs a liquidity premium cost that is far cheaper in the options market. To the extent that options market participants on the contra-side of Avalon's execution are not willing to bear such risk exposures, they may choose to hedge such exposures in the stock market and may pay the liquidity premium that Avalon seeks to avoid as well as create market impact favorable to Avalon's options trades. If market participants that were on the contra-side to Avalon's options trades are posting quotes to reduce such risk exposure, are taking on speculative risk exposures themselves, or are willing to bear increased risk without hedging, which is all very common behavior for options market makers, such participants would not be expected to pay the liquidity premium at all by accessing stock market liquidity.

86. Avalon's activity in the options market is no different from trading practices of large options traders on options flow desks of investment banks, which often access options market liquidity in a comparable manner and trade both options and stock with considerable price impact. However, when compared to Avalon's trading activity, options flow desk traders tend to enter into large positions for longer time horizons associated with client trade facilitation, as well as proprietary positions. Thus Avalon's behavior is largely distinguishable in the market because of the frequency and entry and exit in risk exposures over shorter time horizons. It should be noted that large traders are not required in any sense to confine their strategies to any duration of investment time horizon. Regardless of a large options trader's investment time horizon, such traders typically access oversized liquidity in the options market and produce undesirable risk exposures, excessive hedging costs, and adverse price impact for options market makers.
87. Options market maker firms like Citadel tolerate trading losses from institutional order flow desks that access oversized liquidity as a business cost and have no recourse but to improve their trading algorithms and adjust trading parameter settings to cope with institutional order flows. The frequency of Avalon's cross-market strategy, shorter time horizon, and aggressive liquidity arbitrage activity appear to have singled out Avalon for false allegations of market manipulation by Citadel as it assessed trading losses for large orders in its counterparties report.

### **Summary Characteristics of Avalon's Trading Strategy**

88. Avalon engages in a pattern of *market impact strategies* in the equity markets to aggressively trade against the market in a manner to validate the absence of buy / sell interest in the contra direction of its accumulated position and to validate Avalon's assessment of liquidity, valuation, and trading range. Such activity is primarily evident prior to and after Avalon has built an options position.
89. Avalon's market impact strategy is not conducted as a stand-alone strategy with a siloed profitability, but instead is traded in conjunction with an options component which is essential to accessing liquidity and locking in profit / and or establishing a contra-side exposure at favorable levels in the trading range. These orders essentially assist Avalon in establishing the lower and upper ends of a trading range where opposing interest resides beyond Avalon's risk capacity / tolerance and where sensible options trades should be executed in a contra-side direction, thereby locking in profits and establishing new speculative positions.
90. Avalon's strategy is characterized by a pattern of speculative *liquidity arbitrage strategies* against options market makers, accessing significant liquidity that is not available in the equities at favorable levels.

## **VI. Assessment**

## Opinions Concerning Pearson's Analysis

*Pearson's analysis is primarily centered on erroneously characterizing Avalon's cross-market strategy as inherently manipulative and without any other economic rationale*

91. As his primary thesis, Pearson states that “[b]ecause the Cross-Market Strategy involves purposely creating artificial prices, I consider the strategy to be manipulative,”<sup>17</sup> but throughout the report he does not define artificial price impact nor does he provide any evidence of Avalon’s intent for price impact beyond Avalon’s submission of aggressive orders, which were primarily marketable orders as a liquidity taker. It is not clear how an aggressive liquidity taker building up a speculative position with bona fide orders intended to be traded against opposing buy/sell interest could possibly be interpreted as manipulative. The only conceivable explanation is that Pearson equates artificial price impact with an activity that intends to have price impact. Furthermore, Pearson indirectly makes the argument that an intent to challenge market prices in a speculative fashion somehow disrupts the “natural interplay of supply and demand,”<sup>18</sup> which inherently puts forth the nonsensical view that other market participants are not interacting with the market via speculative positioning, price impact, liquidity arbitrage, and market impact, which is a common property of proprietary trading strategies.
92. In the cross-market strategy, the trader executing the strategy first buys or sells stock to challenge with a price impact strategy in order to determine whether there is an opposing interest, and, if there’s no interest, to trade the price aggressively until he meets resistance. If the security’s price is not impacted, then the strategy would not actually accumulate a position. Pearson characterizes it as follows: “In the Cross-Market Strategy a trader executing the strategy first buys or sells stock to impact the stock price and cause the stock to trade at an artificial price level.”<sup>19</sup> However, this type of trading is indistinguishable from speculative risk-taking, which does not by itself produce any artificial price impact.
93. Pearson states that “the trader . . . trades options to establish an options position that will benefit when the underlying stock and options prices return toward their previous levels.”<sup>20</sup> The trader is going to bet that there would be a return by exiting the position synthetically at a higher price and/or reversing the position at a higher price. This course of action would be pursued when the trader sees that there is no more price impact. Another observation is that the risk profile is flattened / reversed at that point, constituting a new speculative position. The stock position cannot be seen as an independent factor relative to the synthetic stock component options position because of inherent fungibility. There is going to be an expectation of reversion in a case where a trader sells more options than corresponding stocks. Overall, such a trader first buys

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<sup>17</sup> Expert Report of Neil D. Pearson, Ph.D. para. 10, at 4 (Mar. 16, 2018) [hereinafter Pearson Report].

<sup>18</sup> *Id. passim*.

<sup>19</sup> *Id.* para. 25, at 12.

<sup>20</sup> *Id.*

stock, gets out of the stock-related risk by establishing an options position, and then reverses position / counterside. It is not disputed that the trader takes a short position at a higher range.

94. Pearson notes that “[o]ne can expect that the trader’s purchase or sale of a large number of options will often cause market makers to hedge their positions by either buying or selling the underlying stock.”<sup>21</sup> Although it is true that such a trader is challenging the options market makers who might cause favorable impact for the trader when they hedge or otherwise exit risks; the trader has arrived on a view on the risk-reward utility of his speculative positioning in options precisely because of his activity to challenge levels of buy / sell interest in the stock market. Options market makers that are not actively and continuously involved in the stock market may not have comparable information on buy / sell interest, though equity market makers certainly receive information flows from their trading. To the extent that Avalon and / or other market participants are more informed about buy / sell interest in the stock market through active trading, then they are certainly more informed than an options market maker that is accessing stock liquidity as a liquidity taker after accumulating significant risk exposures. If options market makers do not simultaneously make markets in both options and equities in an integrated liquidity providing business model, then they will bear the adverse selection cost of providing oversized synthetic stock liquidity in the options market. Furthermore, options market makers do not act as a liquidity provider in the stock, but rather as liquidity takers, they need to quote sizes and prices that reflect the costs of hedging risk exposures. Historically, firms such as GETCO, KCG, Goldman Sachs, and Quantlab are known to have leveraged both stock and options expertise in single desks and have taken advantage of less informed market makers in a manner often trading against options market prices with aggressive “delta sweep” strategies. Pearson’s apparent criticism of Avalon’s inherent “delta sweep” strategy is ignorant of the extensive use of delta sweep strategies options market makers use to trade against posted quoting, often for synthetic stock hedging purposes or to take direct advantage of mispricing of stock prices implicit in options market maker quotations. Such activity has historically been 30-40% of automated options market making volume, though certain firms are far more aggressive in “picking off” competitors on such mispricings in the stock prices used for options quotations or to reduce risk exposures.
95. While Pearson recognizes that options market makers may access the stock market to hedge risk exposures in a manner that is adverse to their interest,<sup>22</sup> he confuses Avalon’s liquidity arbitrage activity, which takes advantage of business model inefficiencies in the options market making industry, with manipulative behavior. If options market makers decide to pay the liquidity premium as a hedging cost when there is insufficient liquidity available in the underlying stock, then the trader with a contra-side position to options

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<sup>21</sup> *Id.*

<sup>22</sup> *See id.* para. 26 n.24, at 14 (“When options market makers sell stock they are likely to find that there is limited demand for the stock at the artificial price of \$100.50 per share because the trader has stopped buying stock (and cancelled his outstanding buy orders) and the previous natural interplay of supply and demand implied a stock price of \$100 per share. As a result, the option market makers’ hedge trades push stock prices down.”).

market makers is likely to benefit from price impact in the underlying stock. Given the oversized liquidity available in the options market, large liquidity takers will frequently benefit from such price impact which in itself is a form of liquidity arbitrage capture because the trader has received a better price for the delta risk exposure liquidity than was available in the underlying market. If options market makers do not incorporate the liquidity premium associated with hedging costs into their quotes prices and size, it has priced its quotations in a manner that suggest it will not hedge. If the options market maker does in fact hedge after posting oversized quotations at too favorable a price, it has created conditions that are exposed to liquidity arbitrage activity and have created inefficiencies which should be corrected by speculators and arbitrageurs. Because the options industry has created the previously noted competitive pressures to quote excessive liquidity, many have learned that frequently accessing the stock market as a liquidity demander creates costs that are incompatible with their business model.

96. While a number of sophisticated options market makers have integrated their HFT and market making desks, other large options markers such as Citadel have typically siloed its options market making from its HFT stock trading businesses, which can lead to competitive disadvantages in managing hedging costs. While both Pearson and Nitzov acknowledge that options market makers quote oversized liquidity that is exposed to excessive hedging costs, neither acknowledge that options market makers need to capture enough margin to cover such hedging costs or participate in the equities market in a manner that can assist in mitigating or offsetting such costs. Nitzov in particular maintains the peculiar notion that reducing the excessive liquidity provided in the options market, which he readily admits exists,<sup>23</sup> would be detrimental to the marketplace. Instead, both Pearson and Nitzov seek to frame liquidity arbitrage as market manipulation to eliminate Avalon's liquidity arbitrage activity from the market, a notion which may be sensible to keep the business models of Citadel and other market makers intact, but in fact misuses regulatory processes to prevent market participants from legitimate trading against inefficiencies and distortions in the options market due to options market makers quoting excessive liquidity at irrational prices.
97. Pearson makes the following statement: "After establishing his options position, the trader begins liquidating his stock position, which further pushes the stock price toward its previous level."<sup>24</sup> Pearson's emphasis on the stock's previous level incorrectly confuses an artifact in Avalon's trading pattern as evidence that the original level reflects a notions of a "true" value of the security and the "natural" supply and demand of the stock. The tendency for the trader to exit large risks at prices close to the original level is an artifact of the trader's strategy and the price movement over the trading range, including levels where market equilibrium is evident, is largely impacted by the levels and timing associated with the trader's large risk transfers within both the options and stock markets. Pearson identification of stock returns in Exhibit 5<sup>25</sup> is not evidence of any reversion to a

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<sup>23</sup> Deposition of Marin Nitzov, at 198-99 (Apr. 3, 2018).

<sup>24</sup> Pearson Report, para. 25, at 12.

<sup>25</sup> See *id.* para. 58 at 28 ("The results in Exhibit 5 indicate that stock price movements during the Cross Market Loops did in fact reverse.")

true price, but an artifact associated with when the trader determines it will enter and exit risks. Over the period, the security traded at legitimate and non-artificial prices based on how the market processes the risk transferred to it. It should not be any surprise that entering into long risk exposures by buying increases the market price of a security with price impact and that exiting such risk exposures or reversing into a shorty position creates price impact that moves the market prices toward the previous levels. Furthermore, Nitzov himself indicated that options market makers may do similar activity and may take speculative risk increasing positions in both the options and stock when liquidity arbitrage activity occurs and implicitly the net impact of such speculative trading and risk transfer will lead to a final market price that in no way is certain to have any relation to a “true” price reflected in the original level which Pearson implies as indicative of a “natural” equilibrium.

98. Pearson’s toy example<sup>26</sup>, describing Avalon’s cross-market strategy, demonstrates an inherent unfamiliarity with liquidity-based strategies. Pearson argues that the strategy “pushes the price to an artificially high price,”<sup>27</sup> which is equivalent to arguing that buying stock creates artificial price impact, a notion that fails to recognize that buying a stock with price impact demonstrates a lack of contra-side liquidity which in fact evidence of legitimate and non-artificial price movement. With market impact strategies, the intent is to build a speculative position by challenging the market until a trading resistance is found, activity where the intent to have price impact through bona fide executions against opposing buy/sell interest.
99. After the cross-market strategy has had price impact, Pearson puts forward the speculative notion that “[o]ther than the trader executing the strategy, there is likely to be limited demand to buy the stock at this new price level.”<sup>28</sup> If the trader encountered resistance, this statement is true and non-controversial, but by no means a certain or even likely scenario if opposing sell interest is not discovered. Regardless, it is unclear why Pearson would have the opinion that there is a lack of buy interest at the higher price when clearly it has risen because *there is limited sell interest opposing Avalon’s buying*.
100. Pearson makes the following statement: “[D]ue to the trader’s stock purchases, the prices of call and put options are different from the prices that would have prevailed based on the natural interplay of supply and demand.”<sup>29</sup> While such prices would in fact be different had the trader not entered into a risk exposure in stock market, the trader is also a “natural” participant who speculative trading has demonstrated a lack of liquidity or opposing interest.
101. In this scenario, the trader has taken a speculative position and bought the stock up to a price. If the liquidity were available to exit without paying the liquidity premium in the stock, he would do so, but instead he accesses liquidity in the options market.<sup>30</sup> An

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<sup>26</sup> *Id.* para. 26, at 13-15.

<sup>27</sup> *Id.* para. 26, at 13.

<sup>28</sup> *Id.* para. 26, at 13.

<sup>29</sup> Pearson Report, para. 26, at 14.

<sup>30</sup> I have personally implemented controls to widen our margins when the 30-second VWAP price diverged in the stock beyond a threshold, which is quite successful in identifying such cases and which automatically widened out

options market maker's lack of knowledge of buy-sell interest in the stock market does not mean it was deceived. nor is the knowledge that a large trader will change direction at different levels deceptive.

102. Pearson makes the bold and inaccurate claim that “[t]he stock trading by the trader executing the Cross-Market Strategy alters the stock and corresponding options prices by injecting false information about supply and demand into the market, so that the stock and corresponding options trade at artificial price levels.”<sup>31</sup> Again, Pearson confuses the price impact of Avalon's actual trading with bona fide orders and resulting change upon supply and demand with the injection of “false” information. Such a claim could be made about any large participant who impacts supply / demand through discretionary trading. Consider a market maker that chooses to provide liquidity to a natural buyer and defends a price by trading significant size against the liquidity taker. This activity certainly does not inject “false” information about supply in demand into the marketplace nor is the market price artificially low due to the market maker's decision to support its level and act as resistance against the customer price's impact. The action by a party to alter supply and demand by choosing to take on a risk exposure is not false information about supply and demand, but actual real information. Pearson's claim that Avalon's aggressive trading in the stock leads to artificial price impact because it altered supply /demand by choosing to aggressively access liquidity in the market is equivalent to making an illogical claim that aggressive speculative trading with price impact that results in actual executions against opposing buy / sell interest leads to artificial price impact because the supply and demand in the market would have been different had the speculator not engaged in the market at all. Such a notion is not only misguided in this specific context, but it would also classify a host of common trading strategies as inherently illegal.

103. Along similarly problematic notions, Pearson claims that “[t]he Cross-Market Strategy is a manipulative and deceptive practice because the trader's stock transactions are for the purpose of moving stock prices and thus options prices so that the trader can buy or sell options at artificially favorable prices. The strategy thus introduces false information about supply and demand into both the stock and options markets. The trader thereby uses stock transactions to manipulate the prices of the stock and options.”<sup>32</sup> When considering the inherent fungibility of risk exposures in the stock market and the “delta” that can be traded in the options markets, this statement is equivalent to making the claim that taking a large speculative position in a stock injects false information because the potential price impact is consistent with your desire to trade out of the speculative position at a higher price. Whether the trader decided to exit risk in the options market or the stock market, *both* markets are providing a form of

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quoted market. It is the natural resistance to implementing such concepts due a desire to maximize market making volume and options order flow relationships that cause options market makers to quote aggressively when equities market makers / statistical arbitrage firms are demanding wider margins or become one-sided in the underlying security.

<sup>31</sup> *Id.* para. 29, at 16.

<sup>32</sup> *Id.* para. 30, at 16.

liquidity in the underlying security at prices agreed upon by market participants. Furthermore, a speculative trader is permitted to put on a speculative long position with the desire to lock in a profit and/or trade in a reverse position at a higher price assuming the market does in fact rise. If the subsequent trade depresses the price, that is not evidence of artificial price impact, but instead further evidence of legitimate speculative trading and risk transfer. A trader who has traded in the stock is not under any obligation to forewarn participants in the options market that it may exit its risk exposures or take a reverse position in the options market after it has put on a speculative position in the stock market. Pearson does not grasp the basic fact that there is nothing inherently wrong about aggressing against the stock market until resistance limits are found and then accessing oversized liquidity in the options market in order to exit. Many momentum traders get into winning trades by taking on a speculative risk position and then find difficulty exiting. Traders may exit with correlated assets, on other venues, and of course through options. A plan to lay off risk and reverse positions at sensible price points based on the conditional response of orders and identifying points of buy and sell interest is a natural, legitimate strategy. It is either rewarded for its speculative risk exposure matching buyers and sellers across equity and options markets, or it loses money as speculative activity does. If options market makers provide favorably priced exits with oversized liquidity and do not participate in the stock market to better assess buy / sell interest, do not manage their hedges, and hedge out risk aggressively for orders they never wanted to execute, then they are not deceived but rather have not adapted their strategies to effectively make markets in the “delta” component. Options market makers are also subject to dividend arbitrage, volatility arbitrage, interest rate arbitrage, etc. and are exposed to similar situations where informed participants can access mispriced liquidity.

104. Pearson states “[t]here does not appear to be any legitimate economic rationale for the trading activity that I identify with the Cross-Market Strategy.”<sup>33</sup> The significant risk exposures Avalon takes on its in speculative trading should be obvious to Pearson as a primary starting point for understanding the economic rationale of Avalon’s cross-market strategy. Large speculative traders are either compensated for the risks they take or they suffer the penalty of taking such risk, and this forms a vital component of the functioning of markets. Pearson’s implicit dismissal of the risk Avalon bears is evident in his allegation of no “economic rationale” to Avalon’s trading. To be clear, the economic rationale is that the trading strategy successfully captures an edge by challenging market prices, warehousing risks, and arbitraging mispriced liquidity in the options market quoted at a spread which does not include sufficient liquidity premium to pay for instantaneous delta-hedging costs. The strategy itself matches buyers and sellers over longer time horizons and compensates Avalon as a liquidity arbitrageur.

105. Pearson disputes the relevance of exploratory trading to describe Avalon’s trading,<sup>34</sup> which skirts the key distinctions, as well as overlaps, between exploratory trading and market impact strategies. It is true that a market impact strategy challenges

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<sup>33</sup> *Id.* para. 15, at 6.

<sup>34</sup> *Id.* para. 95 n.62, at 44.

the market to identify resistance level. This is not exploratory trading in a “testing sense”, but speculative risk taking that aggresses to find limits of buy / sell interest. If there is immediate resistance, the trader would not continue to aggress. This phase of trading is crucial for determining when positions should be built and reversed. Pearson misses the point in his belief that iterative trading in the stock does not actually drive discovery and inform Avalon of when it is sensible to enter and exit risks. Pearson’s dismissal of a witness’s statement about “find[ing] the real liquidity” ignores that this is the very approach Avalon used to find the resistance levels of real buyers and sellers.

106. Pearson disputes the definition of liquidity arbitrage<sup>35</sup> and appears to be unfamiliar with its industry usage, as well as the academic papers discussed above in this report.<sup>36</sup> The term “liquidity arbitrage” may refer to strategies that involve buying and holding illiquid assets that trade at a discount as compared to otherwise similar liquid assets (and thus have higher expected returns), and selling the otherwise similar liquid assets. Sometimes this takes the form of setting up a special purpose vehicle that buys a pool of illiquid assets, for example bank loans, and issues claims against them, for example collateralized loan obligations. However, the use of the term “liquidity arbitrage” by the defense witnesses also falls under the accepted usage of this term in their respective industry segment.
107. Pearson makes the following statement: “I find that there is no legitimate economic rationale for the Cross-Market Strategy because it is profitable only due to the trader’s ability to establish the options positions at artificial prices, which are caused by the trader’s own stock trading.”<sup>37</sup> However, this trading activity is profitable because the trader avoids paying the stock market liquidity premium by exiting risks in the options market. Corresponding prices were also available in the stock market but for a substantially smaller size. Implicitly, Pearson is claiming that the stock market is mispriced by speculative buying, which is not only implausible, but would mean that Avalon’s stock trading is illegal in itself and would require no discussion of the options market trading activity at all. This approach could be reduced to the claim that aggressively buying a stock is illegal because one might sell it out at a profit if there was positive price impact.
108. Notwithstanding FINRA’s recent references to “cross-market” and “cross-product” manipulation, this concept has been ill-defined, lacking a rigorous analysis of the role of non-bona fide orders and artificial price movement.
109. Pearson states that “[t]he Cross-Market Strategy is manipulative and deceptive, and harmful to the securities markets and market participants.”<sup>38</sup> In reality, options market makers that quote too much size and that are not accurately assessing buy / sell interest in the stock market lose money to liquidity arbitrageurs and, as a result, introduce distortion in the market as a whole. Moreover, Pearson states that “[t]he fact that the Cross-Market Strategy caused some market participants to either pay more or receive less

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<sup>35</sup> *Id.* para. 95 n.61, at 44.

<sup>36</sup> *See supra* paras. 42-57 of this report and especially para. 45.

<sup>37</sup> *Id.* para. 89, at 42.

<sup>38</sup> *Id.* para. 15, at 6.

than they otherwise would have paid or received obviously caused them harm.”<sup>39</sup> However, that would be the case with any large trader transferring risks to the market. While market participants paid less or more in case, it was because Avalon speculated with large positions. Such market participants did not transact at any artificial price and were not deceived.

*Pearson’s analysis fails to demonstrate the existence of non-bona fide orders and artificial price impact and to consider the inherent conditional nature of Avalon’s trading*

110. When a speculative trader trades with a market impact strategy over a sequence of orders and executions, and when such behavior leads to successively favorable prices, the strategy iteratively demonstrates the lack of opposing contra-side interest and acts as a confirmation signal, which can often influence the trader to continue to build upon the speculative position. On the other hand, if the trader encounters significant resistance, it is common not to build up position and will often choose to reduce inventory or execute an opposing position. When a trader utilizing a market impact strategy encounters significant resistance due to opposing interest, the lack of price impact or the adverse price impact acts as a contraindicator. Thus, the iterative nature of decision making in which each successive trade is conditioned on a favorable price impact of previous trades in a market impact strategy is essential to evaluate the trader’s intentions and to provide an explanatory framework for the price impact witnessed in that scenario. In other words, market impact strategies can naturally appear to be overly successful because traders do not build up position when they discover opposing interest. Or more simply, market impact strategies only work when the trader is actually correct in his iterative assessment of contra-side liquidity.

111. Pearson makes the following statement: “The options market makers would have found that there was limited demand for the stock at the artificial price level not because the trader learned about liquidity and found it lacking and then chose to execute the Cross-Market Strategy at that time, but rather because the trader created the situation of limited liquidity at the artificial stock price level by artificially raising the stock price above the level implied by the natural interplay of supply and demand, and then cancelling the buy orders that pushed up the stock price.”<sup>40</sup> It is certainly true that such a market participant challenged the liquidity of the market as a speculative trader. Reversing one’s position is not controversial once resistance is encountered, and there is no evidence of artificiality. Moreover, a change in the market conditions and the direction of trading would be associated with cancellations. In fact, one would presume the market would not revert unless Avalon exited or reversed its positions, while transferring large risk exposure to market makers. Such transfer of risk exposure does have market impact and is the primary basis for arguments that all the prices were transacted at real and legitimate values where the trader had to allocate significant risk for prices to move.

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<sup>39</sup> *Id.* para. 100, at 47.

<sup>40</sup> *Id.* para. 98, at 46.

Exhibit 6 to Pearson's report shows that Avalon's equity market share was significant and thus impacted price, which is direct evidence of large speculative trading.

112. Pearson's analysis is misguided, as illustrated by his example labeled "One-Directional Loop in DECK on October 3, 2014." Pearson provided the following narrative: "The price of DECK fell from \$95.135 to \$94.72 ... likely due to some combination of the tendency of stock prices that have been artificially altered to return to their previous level once they are no longer artificially inflated/depressed and delta-hedge trading by option market makers."<sup>41</sup> Pearson's illogical interpretation continually frames Avalon's market impact and liquidity arbitrage strategy under the guise of artificial price impact despite the fact that Avalon executed its trades in both the stock market and options market. This was done with bona fide orders that were transparent to the market and traded into large speculative positions with legitimate price impact. Furthermore, Pearson continued to put forward the erroneous notion that there is some "previous level" that exists in the stock market that would somehow be a resilient "true" value despite significant transfers of risk in the options and stock market that is conducted as Avalon's executes its speculative positions in both options and the stock market. Indeed, this a notion contrary to basic notions of price discovery and liquidity provision from both academic and industry perspectives.

- a. On October 3, 2014 starting at 12:56:23, Avalon traded into a sizable speculative stock position, accumulating 32,549 shares of DECK. Avalon executed its trades generally using a combination of aggressive posting and liquidity taking orders of variable size, typically using reserve orders with a displayed size of 100. The speculative long position in DECK was executed with bona fide orders and resulted in market impact which made a mark-to-market profit over the period which Pearson notes ended at 1:04:57 PM. Contrary to Pearson's opinion, I find no justification for the allegation that Avalon's speculative trading resulted in artificial price impact over the period. On the contrary, active participants in the stock market would have naturally been impacted by Avalon's buying activity and market makers on the contra-side of Avalon's buying activity may have had a negative mark-to-market loss that would be noticeable. The market prices over the period demonstrated legitimate prices given the absence of aggressive contra-side sellers to oppose Avalon's speculative buying and the sensible market reaction to its buying activity. It is unknown whether Avalon stopped buying due to resistance or risk limits or a combination of both or some other factor, nor is it required to have that information to assess the legitimacy of Avalon's trading activity over the time period.
- b. As Pearson notes, at 1:04:57 PM Avalon purchased 931 put options and was able to access, in Pearson's estimate, an instantaneous block of approximately 93,100 delta (i.e., synthetic share equivalents) in DECK due to the option market participants providing oversized liquidity. The fact that Avalon was able to transact this quantity of synthetic stock exposure in the options market is evidence of option market participants fundamentally mispricing the liquidity premium a

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<sup>41</sup> *Id.* para. 72, at 34.

market maker should have demanded if it planned to offset the synthetic stock / delta risk. The options market liquidity permitted Avalon to lock in a profit for the share position. The liquidity accessed would only have been realistically priced and sized if options market makers had already been short and their sizes and prices were intended to reduce risk without a hedging requirement.

- c. Pearson notes that the price in DECK declined to 94.72 after Avalon executed its large options trade, which presumably was in part due to option market makers paying the liquidity premium in the equity market for their irrationally sized and priced option liquidity. However, Pearson also claims that Avalon's trading activity "caused the price of DECK stock to be artificially high and the price of DECK puts to be artificially low, permitting Avalon to purchase the puts at a favorable price."<sup>42</sup> The notion of artificial price impact necessitates that there were non-bona fide orders submitted to the market and that the market is at a demonstrably artificial level. However, Pearson describes Avalon's activity as aggressive trading that accumulated a large position with bona fide orders intended to be executed, a fact that runs counter to an allegation of artificial price impact and consistent with the view that the stock price was reflective of legitimate price impact associated with a large buyer in the stock. At this time of Avalon's options trading, the stock market had responded to Avalon's market impact strategy and was at a new price reflective of the current interplay of buyers and sellers in the market. Pearson's "evidence" of artificial mispricing in the stock market is that the stock went down after Avalon sold more than 90,000 synthetic shares. Avalon's speculative option trading, which reversed its position into a short delta position, in itself is evidence that a significant risk transfer to the stock market was the actual reason for the subsequent stock price movement. In fact, at that time, if the options market makers had not provided irrational levels of liquidity, Avalon's would not have been able to execute a quantity in the options market that would have influenced excessive hedging or hedging at all by options market participants. Any payment of a liquidity premium to equity market makers by options market makers to hedge stock exposures does not result in artificial price movement.
- d. At 1:08:14 PM, Avalon started to exit its long stock position, which is equivalent to further increasing the risk of its already short position using a market impact strategy, which again is validated by the response of market participants in the stock market where a period of price discovery resulted in both opposing and non-opposing price movement as Avalon continued to increase a net short position by exiting stock inventory. This period of market impact lasted more than twenty minutes, until roughly 1:30 PM where Avalon maintained and increased a highly speculative short position as it traded against diminishing contra-side liquidity. Pearson notes that toward the end of the sequence Avalon "liquidated its put position in two groups of trades at about 1:30:30 and 1:43:32 p.m., with both of

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<sup>42</sup> *Id.* para. 71, at 34.

the two sets of put trades occurring after Avalon had liquidated most of its equity position,”<sup>43</sup> again taking advantage of oversized liquidity in the options market.

- e. In my assessment, this example clearly shows that Avalon is engaged in a delta strategy which conducts market impact and liquidity arbitrage strategies. Avalon entered into highly speculative delta positions as it challenged both the stock and options market markets, seeking the upper and lower ends of an effective trading range defined by its equity trading and taking advantage of option market liquidity to reverse its delta position. While options market makers should have been focusing on capturing the liquidity premium for the oversize amount of liquidity they provided in synthetic stock exposure, they instead provided nearly frictionless exits for the degree of risk Avalon transferred to and from the options market. The options market makers also appear to have paid the liquidity premium to get out of the undesired risk that market makers are normally in the business of capturing.
- f. By focusing on the stock trading revenue, Pearson's analysis is misguided in assessing the performance of Avalon's net delta trading performance, which appears to be profitable for both long delta and short delta exposures. This notion discounts the mark-to-market profits associated with Avalon's stock trades that were locked in with option trades. Tellingly, Pearson emphasizes that “Avalon's put option trades earned positive trading revenues ... of \$54,840. ... In contrast, Avalon's equity trades were unprofitable, yielding trading revenue of negative \$29,707”<sup>44</sup> as if Avalon's delta trading was not conducted in a manner that took advantage of fungibility of delta exposures trading in both the stock and options markets. Irrespectively (and despite any such criticism), there is no evidence of any artificial impact on the stock in Pearson's analysis of this example.
- g. In my opinion of this example, Avalon functioned as a large speculative liquidity taker that was able to capture liquidity premium from options market makers that should have been captured by options market makers (and appears to have been captured to some degree by stock market makers, given the mean-reversion properties witnessed in the underlying) as it conducted a liquidity arbitrage trade. Furthermore, it is likely that if Avalon's trading had occurred over a longer time horizon, it would have been indistinguishable from activity typically conducted by large options trading desks that also take advantage of irrationally priced and sized liquidity in the options market and that are similarly active in the stock market with price impact.

113. Pearson's analysis is similarly misguided and does not add any additional supporting information with his example labeled “One-Directional Loop In VMW On November 26, 2012.”

- a. Pearson reflects on the price impact and volume of Avalon's short position in VMW where “[d]uring the period between 10:15:10 and 10:25:12 a.m. Avalon's net sales of 73,647 shares accounted for approximately 55.6% of the trading

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<sup>43</sup> *Id.* para. 74, at 34-35.

<sup>44</sup> *Id.* para. 75, at 35.

volume in VMW and the price (NBBO midpoint) of VMW fell from \$89.31 per share to \$88.62.”<sup>45</sup> Pearson thus validates the primary driver of the stock as aggressive short selling that had price impact and resulted in Avalon achieving a mark-to-market profits in its short position.

- b. Pearson then notes that “[B]etween 10:15:12 and 10:15:13 a.m., just as Avalon’s short equity position reached its maximum of 73,647 shares and the VMW price reached \$88.63, the trader purchased 2,864 VMW call options with strike prices of \$85 and \$87.5 on a total of 286,400 shares.”<sup>46</sup> Pearson thus demonstrates that Avalon exited its short delta position and entered into a net long delta position by accessing oversized liquidity available in the options market.
- c. Although Pearson claims that “Avalon’s short sales of VMW stock between 10:15:10 and 10:25:12 a.m. that contributed to the decline in the VMW stock price also contributed to Avalon being able to purchase the calls at artificially low prices,”<sup>47</sup> Pearson’s primary thesis for alleging artificial price impact is the execution of significant volume in the stock against natural contra-side interest, as Avalon built its speculative short position. At the time Avalon executed its options transaction, the price of VMW reflected the market impact of the speculative short selling, which challenged market prices and traded against diminishing liquidity. Not only is the price at VMW natural, but it would be unnatural for the price not to have been impacted after Avalon traded so much volume.
- d. Pearson then states that “[a]t around 10:25:17 a.m. ... then began buying more aggressively to cover its short equity position at about 10:38 a.m. By 10:45:34 a.m. Avalon had covered its short equity position and established a long position of 2,665 shares. At this time and one second later at 10:45:35 a.m. it sold most of its call position, and then finished selling its calls around 10:46:22”<sup>48</sup> which is consistent with the pattern in which Avalon exits risk and once again exemplifies Avalon’s access to mispriced oversized liquidity in the options market.
- e. Pearson concludes that “Avalon’s call trades garnered positive trading revenue ... for options trading revenue of \$192,790. This trading revenue can be largely attributed to Avalon’s stock trading. Avalon’s short selling of VMW stock contributed to artificially lowering VMW stock and call prices, permitting Avalon to purchased calls at beneficial prices ... Avalon’s equity trading was not profitable, as it yielded trading revenue of negative \$71,491.”<sup>49</sup> Again, Pearson highlights the negative equity value without considering that the delta trading was profitable by offsetting long delta versus short delta. Furthermore, although Avalon benefited from significant market impact in both options and stock market and did so at-risk from delta exposure, there is no evidence of artificial price impact and credible

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<sup>45</sup> *Id.* para. 76, at 35-36.

<sup>46</sup> *Id.* para. 77, at 36.

<sup>47</sup> *Id.*

<sup>48</sup> *Id.* para. 79, at 36.

<sup>49</sup> *Id.* para. 80, at 37.

evidence of legitimate price impact. Again, the entire sequence is consistent with my report.

114. Though more complex an example, Pearson’s analysis is similarly misguided and does not add any additional supporting information with his example labeled “Multi-Directional Loop In CL On August 15, 2012.”
- a. Pearson notes that Avalon “accumulated a short position of 14,366 shares” and from “10:11:18 and 10:13:58 a.m. the CL price (NBBO midpoint) fell from \$105.965 per share to \$105.845.”<sup>50</sup> Note however that this short position was executed with bona fide orders that had legitimate price impact through Avalon’s market impact strategy.
  - b. Pearson then states that “[a]t 10:13:58 a.m., just as Avalon’s short stock position reached its maximum size of 14,366 shares, Avalon purchased 900 CL call options on a total of 990,000 shares of CL stock at a call price of \$6.4 per share – an artificially low price resulting from Avalon’s equity trading.”<sup>51</sup> As with the previous example, Pearson mistakenly assigns artificial price impact to trading down with bona fide orders to accumulate a speculative position in the stock. If the stock price had not changed, the stock price would have been more “unnatural” in light of such activity. At this point, Avalon also accessed mispriced oversized options liquidity through trading with bona fide orders.
  - c. Pearson continues: “At 10:14:25 a.m., Avalon began buying CL stock, covered its short position, and continued buying to establish a long position.”<sup>52</sup> Pearson misinterprets the primary net risk exposures of Avalon’s delta trading strategy. When considering Avalon’s trading from a net delta perspective, it had covered its short already and was building a speculative long position in the delta at the time noted.
  - d. “After driving up the stock price, Avalon sold the 900 calls at an average price of \$6.669 per share. Avalon then sold 2,376 shares of CL stock between 10:19:04 and 10:20:22 a.m.”<sup>53</sup> Comparable to previous examples, here Avalon locks in a profit in its options position by accessing oversized and mispriced options market liquidity and reduces its stock position.
  - e. “The increase in the CL stock price due to Avalon’s buying also caused put option prices to be artificially lower because put option prices are negatively related to their underlying stock prices.”<sup>54</sup> Once again, Avalon used bona fide orders to execute in the stock market with no artificial price impact.
  - f. “At 10:23:58 a.m., just as the stock price reached \$106.41 per share, Avalon purchased 288 put options with a strike price of 110 on a total of 28,800 shares of stock at a price of \$4 per share, benefitting from the lower put option prices it had

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<sup>50</sup> *Id.* para. 81, at 37-38.

<sup>51</sup> *Id.* para. 82, at 38.

<sup>52</sup> *Id.*

<sup>53</sup> *Id.*

<sup>54</sup> *Id.* para. 83, at 38-39.

caused through its CL stock purchases.”<sup>55</sup> At this point, Avalon puts on speculative short position using legitimate bona fide orders, accessing oversized options market liquidity.

- g. “The CL stock price declined immediately after 10:23:58 a.m., likely caused by option market maker delta hedging and Avalon’s sale of 4,334 CL shares between 10:24:27 and 10:24:52 a.m. After 10:24:52 a.m. the CL price slowly drifted down, and Avalon resumed selling stock at about 10:51:11 a.m., brought its stock position down to zero and then continued (short) selling, establishing a short position of 4,875 shares by 11:00:09 a.m.”<sup>56</sup> This merely demonstrates that Avalon established a large speculative net short position with market impact and sold delta in both the options and stock market.
- h. “Just before that, at 11:00:08 a.m., it sold 300 puts (the 288 it purchased at 10:23:58 a.m. plus 12 more) on a total of 30,000 shares at a price of \$4.65 per share, and then finally brought its stock position back to zero and bought back the 12 puts at 11:01:05 a.m. at a put price of \$4.75 per share, closing out its options position.”<sup>57</sup> This is essentially a description of Avalon’s decision to close out its net short delta position for a profit by accessing oversized options market liquidity.
- i. Pearson concludes that “Avalon’s put transactions during this Cross-Market Loop yielded positive trading revenue ... for a total trading revenue of \$18,600. Avalon’s equity trading was not profitable, as it yielded trading revenue of negative \$25,296.”<sup>58</sup> This series of transaction is no different from the other examples in terms of being misinterpreted. Pearson again highlights the negative stock trading performance, while ignoring the fact that mark-to-market stock profits were locked in with options trades. In summary, there is nothing in Pearson’s narrative that contradicts a more accurate assessment that Avalon is conducting a liquidity arbitrage strategy in the options market in combination with a market impact strategy in the stock market, in which large speculative position are trading with legitimate price impact and without any evidence of artificial pricing or non-bona fide order use.

*Pearson’s analysis fails to characterize Avalon’s strategy as primarily a “delta” trading strategy that conducts liquidity arbitrage of stock vs. synthetic stock available in the options markets*

115. Pearson makes the claim that Avalon’s cross-market strategy is neither a legitimate stock trading or option trading strategy<sup>59</sup> and repeatedly evaluates options and stock performance separately, drawing a number of speculative conclusions. He does so despite significant evidence in his own report which is backed by Nitzov’s testimony that

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<sup>55</sup> *Id.* para. 83, at 39.

<sup>56</sup> *Id.* para. 84, at 39.

<sup>57</sup> *Id.*

<sup>58</sup> *Id.* para. 85, at 39.

<sup>59</sup> *See id.* (“[T]here is no legitimate economic rationale to this trading, because the trading is profitable only because the trader is able to trade options at artificial price levels created by the stock trading.”).

the strategy is trading stock risk exposures in the options vs. the stock market, a strategy class typically referred to as trading “delta”. The most common form of delta trading is the “delta sweep” strategy, where one trades mispriced options to arbitrage the executable value of the underlying in both stock and option markets. To capture the mispricing in a delta sweep strategy,<sup>60</sup> one typically trades stock vs. options, offsetting the risk in the options trades with stock trades (or vice-versa), with an emphasis on in-the-money options or stock-synthetic option positions. Nitzov himself characterized Avalon’s trading a delta sweep, but as noted earlier, it is more accurately represented as a delta strategy that conducts liquidity arbitrage across options and equities markets. To assess any form of delta strategy, one should look at the increase and decrease of delta exposure (actual stock exposure or synthetic stock exposure in options) as fungible and offsetting, as well as conducted at particular reference points in the underlying.

116. The fact that Avalon appeared to focus on in-the-money options,<sup>61</sup> for which delta is large and which approximate a synthetic stock position, provides further evidence Avalon made a decision to pursue a delta strategy. Considered in this light, Pearson’s framework is misguided and his failure to characterize the strategy as integrated allows him to draw misguided conclusion about the performance of stock and options performance when isolated as separate activity.<sup>62</sup>

117. While both Pearson and Nitzov appear to recognize the existence of delta transfer between stock and options markets and Nitzov specifically admits that options market makers quote delta liquidity in the option market,<sup>63</sup> neither one comes to the basic conclusion that Avalon’s cross market strategy is arbitraging the two markets by extracting a liquidity premium which exploits counterparties that are unwilling to bear risks that they should not be exposing themselves to in the marketplace by posting oversized liquidity. Instead, both Pearson and Nitzov frame trading losses due to liquidity costs and legitimate price impact as market manipulation and artificial price impact. Both seek to incorrectly classify aggressive speculative trading and risk warehousing that execute trades against real counterparties as creating artificial price impact. Neither Pearson nor Nitzov recognize large speculative traders that challenge the market as being central to the functioning of the marketplace. Likewise, neither appears to realize that the price movement associated with Avalon’s cross market strategy is in fact driven by

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<sup>60</sup> In fact, Nitzov used this exact term, “delta sweep,” to describe Avalon’s trading. Deposition of Marin Nitzov, at 95-96 (Apr. 3, 2018).

<sup>61</sup> Pearson Report, para. 20, at 8-9 (“Most of Avalon’s option trading involved in-the-money options; the Cross-Market Strategy exploited the sensitivity of these options to changes in underlying stock prices.”)

<sup>62</sup> See *id.* para. 93, at 43 (“I next consider whether the Cross-Market Strategy is primarily a stock trading strategy, with the options being used to hedge the stock trades. This possibility is ruled out by the fact that the stock trades, considered in isolation, are not profitable in general.”); *id.* para. 94, at 43-44 (“I also consider whether the Cross-Market Strategy is primarily an options trading strategy, and that the stock positions were intended to hedge the options positions in a practice known as delta hedging. This is not the case, however, because Avalon’s stock trades were executed prior to the options trades, that is, before Avalon knew the sizes of the options positions it would be able to establish.”).

<sup>63</sup> See, e.g., Deposition of Marin Nitzov, at 104 (Apr. 3, 2018) (“Lek Securities began aggressively selling delta to Citadel and others in AMZN options . . .”).

the actual response and buy /sell interest in the market that is reacting to Avalon's speculative positioning.

118. Pearson observes that “[t]he trader typically loses money on the stock transactions, but he generally makes sufficient gains on the options transactions to more than make up for the stock losses.”<sup>64</sup> However, Pearson’s observation fails to consider that the stock transaction are paired with offsetting options trades to lock in profits and reverse position at the ends of Avalon’s trading range and that the stock trades cannot be evaluated as a single standalone strategy despite an intent to challenge prices with market impact in the stock trading. In other words, the stock and options trading do in fact realize profits when looked at as series of delta trades at different reference prices.

119. Pearson’s emphasis on negative performance in Avalon’s stock trading<sup>65</sup> as a evidence of otherwise uneconomic activity attempts to inflate the significance of an artifact of the Avalon strategy that is commonly observed in strategies with an options and stock component. The negative performance of one leg (stock or options) is common in a variety of options market making strategies that incorporate an offsetting leg in one market vs. the other. Examples might include positive performance of stock hedging for quoting algorithms with negative stock hedging performance for delta sweep strategies. The criticism of Pearson’s focus on stock performance is not to discount the intent for market impact (and price discovery) in Avalon’s stock trading, but to note that Pearson’s view that the independent P&L of the stock trading is evidence of non-economic activity is a thoroughly mistaken concept. Regardless, Avalon’s tendency to trade its market impact strategy within the trading range with stock and to execute its liquidity arbitrage trades in the options at the end of the trading range where it reverses position provides some explanatory basis for the performance numbers.

120. Pearson essentially admits that Avalon’s activity in the stock market and risk transfer activity between options markets gives it superior information, which is consistent with the argument that Avalon’s market impact strategy has a primary function of testing liquidity limits and buy-sell interest. Tellingly, Pearson notes that Avalon had an advantage over market makers who “experienced losses from trading with another market participant who had superior information about market prices”<sup>66</sup> Although Pearson makes the claim that Avalon’s superior information was “artificially impacting stock prices,” the market impact and liquidity arbitrage components of Avalon’s cross-market strategy is a much more accurate characterization.

*Pearson’s analysis introduces biased statistical measures and his “but-for” analysis is based on invalid and contradictory assumptions*

121. The statistical properties regarding the success of market impact strategies can provide the appearance of and a positive bias in returns that shows persistent price impact, because large positions are not built by the trader when he encounters negative

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<sup>64</sup> Pearson Report, para. 25, at 13.

<sup>65</sup> See *id.* Exh. 4.

<sup>66</sup> *Id.* para. 102, at 48.

returns. Pearson arrives at far-reaching conclusions about Avalon's trading without acknowledging the inherent biases in the strategy itself and does not include any examples of trading in which the trader chose not to pursue a position build-up due to the encountered resistance. It is problematic to make conclusions about a trader's strategy without considering the cases where the trader chose not to continue aggressing against the market. Instead, Pearson only purports to analyze the successful market impact sequences where large positions were built by the trader, which is a classic example of introducing selection bias / survivorship bias<sup>67</sup> into his analysis.

122. Furthermore, Pearson does not look at each actual trade to determine whether or not the price impact was artificial, nor does he define artificial impact for actual trades. In my assessment, the primary explanation for price impact witnessed in the samples is that there is a lack of contra-side liquidity and that the trader iteratively demonstrates that continued aggressive trading further exposes the lack of contra-side liquidity. Such notions, which are evident in the trading sequences and obvious starting points for explanatory mechanism, are absent from Pearson's analysis and the summary statistics on which he bases his conclusion of artificial price impact.
123. Pearson pursues an even more problematic analysis when he attempts to compare the performance of Avalon's cross-market strategy to the "but-for" case<sup>68</sup> where the trader did not trade stock until after it had put on its options position. The primary assumption he bases his calculation on is that that Avalon could have crossed the spread in the options market prior to its stock trading and that this would have had no market impact on the stock price and that Avalon would have ended up closing the options position at a higher price and realize the loss. In fact, Pearson assumes that in such a scenario that the evolution of the options and stock market price would actually evolve in an identical manner to Avalon's actual trading. This notion of Avalon executing a large options position that would somehow be absorbed by the market without any market impact and lead to identical price evolution and exit prices associated with Avalon's actual trading sequence (which are alleged to take place at artificially inflated prices in the opposing direction of expected options market impact) is not only contradictory to the allegations of the complaint and common sense, but also to the market impact arguments Pearson and Nitzov have made to stress the importance of options market maker hedging activity in response to options trades.
124. My personal opinion is that Avalon would *not* have lost hundreds of thousands dollars (or over a million dollars) for the sampled loops had it traded the options positions at the start of the sequence prior to the stock trading. With the assumption that Avalon's counterparties risk-managed their options positions through delta-hedging before Avalon exited the options position, Avalon could have made a much smaller loss or even a gain if its market impact strategy was conducted after the options traded. In other words, Avalon would have likely benefited from mispriced options liquidity as a liquidity arbitrageur in some capacity regardless of the sequence of stock and options trading. Note, however, that it is equally uncertain whether Avalon would have booked a material profit given that

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<sup>67</sup> See, e.g., *Survivorship Bias*, Wikipedia, [https://en.wikipedia.org/wiki/Survivorship\\_bias](https://en.wikipedia.org/wiki/Survivorship_bias) (last visited May 10, 2018).

<sup>68</sup> *Id.* paras. 65-67, at 31-32.

that it would *not* have traded at resistance points in the stock that were discovered through its stock trading. Furthermore, it is not certain where the stock price would have stabilized after the initial options position had been built or at the end of the sequence when the options position was closed out. Most certainly, the market prices would *not* have stabilized at either Avalon's *actual* exit prices or the options prices at the time Avalon began to exit its stock position in the actual trading system, which are the two benchmark prices Pearson uses for his but-for calculations.

125. The two versions of Pearson's "but-for" analysis are equally invalid and do not represent any conceivable trading event that could possibly be expected to occur in any alternative trading scenarios. At best, Pearson's but-for analysis is simply erroneous due to calculations based on non-credible assumptions of executable prices. At worst, Pearson's "but-for" analysis presents inflated damage estimates by choosing two convenient benchmark scenarios that utilize non-credible execution assumptions to make illusory loss claims of roughly \$440 thousand and \$1.6 million, respectively.

### **Opinions Concerning the Interaction Between Avalon's Strategies and Options Market Making Strategies**

126. A pivotal observation is that Avalon's cross-market trading strategy leverage long-standing and well-known flaws in the options market making business and options market structure where options market makers provide more liquidity than they are willing to hold at margins which do not cover the costs of hedging and risk management. The oversized liquidity available in the options market is frequently exploited by large institutional options traders in a manner similar to Avalon.
127. Options market makers are: (a) failing to price the liquidity premium associated with hedging costs into their quoted spreads, (b) quoting on too many venues, which exposes them to instantaneous and otherwise avoidable "sweep" risk, (c) entering into exchange market making commitments to provide quoted levels of liquidity that are not rational, (d) quoting oversized orders on pro-rata exchange for quantities they do not desire to trade in full, (e) aggressively hedging in a manner than seeks to take liquidity that other market makers are expected to access and which has adverse impact on competitor market making hedging costs, and (f) not optimizing exchange-provided mechanism for reducing instantaneous risk exposures. It is only by offsetting these deficiencies with market making revenue largely derived from retail options order flow, often trading with the assistance of exchange payment for order flow arrangements and market maker and specialist participation rights, that options market makers have been able to maintain irrational levels of quoted sizes in their market making strategies for nearly two decades.
128. The failure of market makers to work with exchange to create alternative market structure mechanisms that would result in the correction of a liquidity arbitrage is the primary reason strategies such as Avalon's cross-market strategy continue to be profitable and that institutional flow desks are able to exploit options market liquidity in a similar fashion to the detriment of options market makers. Furthermore, by not

correcting these systemic flaws, options market makers are likely to contribute to distortions / disruptions in securities markets through the continued provision of irrationally priced liquidity that result in unhedgeable and undesired risks.

129. Pearson states that “[o]ption market makers may have . . . responded by quoting smaller quantities of options for purchase or sale.”<sup>69</sup> However, quoting smaller quantities is not necessarily an indication of worsened market quality but rather a response to the underlying flaw in the options marketplace caused by oversized liquidity.

### **Opinions Concerning the Allegations Against Avalon**

130. There is no evidence in the data sample I have reviewed that the orders were not bona fide. More specifically, these orders were aggressive and/or marketable and available for interaction with other traders for a sufficient period of time. Logically, Avalon cannot be punished because other market participants chose to trade against Avalon’s aggressive trading and may have been exposed to short-term mark-to-market losses or actual losses as Avalon pursued its speculative strategy.
131. Trading strategies evident in the sample which involve bona fide orders intended to trade against buy/sell interest in the market in both the equities and options markets. Irrespective of an intent to challenge market prices with market impact, and I am not aware of a valid approach of describing and/or interpreting such orders as deceptive. Moreover, such strategies lack the essential characteristic of market manipulation, the existence / intent of artificial price impact.
132. Although I have not looked at more extensive data samples beyond what Pearson has provided in his report, which may contain activity that deviates from the topics addressed in this report, Pearson’s analysis cannot be used as a basis for establishing that any of Avalon’s cross-market trading was manipulative. The methodology does not allow drawing definite conclusions (especially with respect to proving that most or any transactions result in artificial price impact). Furthermore, his examples suggest that his analysis is misguided because the examples he highlights do not demonstrate manipulative activities. Apparently, Pearson had not utilized an enhanced market dataset / time series for options orders and transactions in his analysis, which further questions the validity of his conclusions about artificial pricing in these instruments.
133. Rather than an independent force leading to artificial pricing, the market impact of Avalon’s trading activity was a result of and a reaction to legitimate trading interest done with bona fide orders in the equities and options market, ultimately contributing to price discovery. Avalon’s exploratory trading strategies and market impact strategies primarily served to assess buy and sell interest, as well as to challenge the price levels in the market.
134. Avalon is not creating artificial prices or inaccurate supply / demand. Exposing the lack of sell interest in the market does not cause artificial buy interest to arise, nor does it cause sell interest to decrease. However, natural buyers may choose to respond to the exposure of a lack of sell interest with buy orders that result in real (non-artificial) price

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<sup>69</sup> *Id.* para. 103, at 49.

impact. Furthermore, natural sellers may choose to respond to the exposure of a lack of sell interest by canceling their sell orders and trying to sell at a more favorable price, activity, which also results in real (non-artificial) price impact.

135. Avalon's activity serves to challenge and exposes real buy and sell interest in the market itself, which Avalon uses to iteratively to determine entry and exit points for speculation position entry and exit in both stock and options markets.

136. Furthermore, it must be emphasized that the equity and options market makers that traded against Avalon were not deceived. Avalon's orders and executions were transparent in communicating what transactions Avalon intended to execute and were executed against bona fide contra-side liquidity in the stock and options markets.

## Conclusions

137. Avalon's cross-market trading strategy incorporates a mix of market impact and liquidity arbitrage strategies.

138. Avalon created neither false liquidity nor artificial market impact. Instead, it consistently demonstrated the lack of buy and sell interest at particular levels in the market and then took speculative positions at sensible price points exploiting oversize liquidity available in options market at irrationally priced levels.

139. As an overarching observation based on my analysis of the provided data, Avalon's trading activity:

- a. does not constitute market manipulation more generally because it does not produce an artificial price impact nor does it contain a deceptive element in its trading;
- b. does not amount to a species of market manipulation within the meaning of the term as typically used in the securities industry; and
- c. does not violate any laws or regulations specifically referenced by the SEC.

Date: May 11, 2018



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Haim Bodek

## **Exhibit A**

### **Haim Bodek**

11 Sea Beach Drive • Stamford, CT 06902 • (203) 359-2625  
[haim@haimbodek.com](mailto:haim@haimbodek.com) • <http://www.haimbodek.com>

#### ***Summary***

Haim Bodek is a Managing Principal of Decimus Capital Markets, LLC, a tactical consulting and strategic advisory firm focused on high frequency trading and market structure in equities, derivatives, FX, and cryptoassets. Decimus Capital Markets, LLC provides a wide range of regulatory consulting and expert services, including those relating to expert testimony in litigation and interaction with regulatory agencies. Mr. Bodek was formerly a founder and Chief Executive Officer of Trading Machines LLC, an independent high frequency options trading firm. Prior to his tenure at Trading Machines, Mr. Bodek was a Managing Director and Joint Global Head of Electronic Volatility Trading at UBS and a Vice President at The Hull Group/Goldman Sachs. He is an electronic trading executive and algorithmic trading strategist with 20 years of experience in the automated trading space.

Mr. Bodek is widely recognized as a leading expert in U.S. equities market structure, specializing in the regulation of high frequency trading and trading venues, as well as a wide range of trading practices. As reported by the *Wall Street Journal* and elsewhere, Mr. Bodek has actively assisted the SEC in several highly-technical investigations that resulted in substantial monetary fines, including record-setting fines imposed on the New York Stock Exchange and Direct Edge, and significant changes in practices of certain trading venues, including admissions of inaccurate disclosure. Moreover, Mr. Bodek is a well-known expert in litigation, who has provided expert reports, testimonial services, and confidential consulting services in numerous engagements, which included *Klein v. TD Ameritrade* and *United States v. Taub*.

Mr. Bodek is the author of two books on market structure regulation, *The Problem of HFT: Collected Writings on High Frequency Trading & Stock Market Structure Reform* released in January 2013, and *The Market Structure Crisis: Electronic Stock Trading, High Frequency Trading, and Dark Pools* released in November 2015.

Mr. Bodek earned a B.A. in Mathematics and Cognitive Science from the University of Rochester. He formerly held the Series 3, 4, 7, 24, 55, 63 and 65 registrations.

#### ***Expertise***

Algorithmic and Systematic Trading Strategy • Automated Liquidity Sourcing and Provisioning • Options Market Making/Electronic Volatility Trading • Market Structure and Market Microstructure • Large-Scale Electronic Trading Systems Architecture • High Frequency Trading Strategies and High Frequency Options Trading Strategies • Electronic Trading Risk Controls • Best Practices for Low-Latency and Co-Location • Exchange Special Order Types/Order Matching Engine Features • Broker-Dealer Formation/ Operation • Order Flow Routing/ Internalization/Payment for Order Flow • REG NMS • REG SHO

#### ***Highlights***

- Conducted a comprehensive review of special order type functionality for all U.S. equities exchanges that provided regulators a blueprint for exchange regulatory reforms implemented by the SEC over the 2012-2014 period

- As a whistleblower, provided information to the SEC in connection with enforcement actions that have resulted in substantial fines imposed on key market players and changes in their practices
- Founded Trading Machines LLC, a high frequency options trading firm that executed upwards of ½ percent of the U.S. options market, using minimal risk capital during a period of heavy industry compression
- Headed the Electronic Volatility Trading (“EVT”) business at UBS that captured a significant market share in the global options market making space (roughly 5% of U.S. equity options market alone)
- Instrumental in negotiating an exclusive seven-year option order routing arrangement between UBS and Charles Schwab & Co. and designed and oversaw the implementation of its associated options order router
- Comprehensive expertise in 25+ markets globally, including market structure, API details, special order types properties, as well as regulatory, compliance and membership obligations
- Executive sponsorship and technical oversight of four major electronic trading builds, each of which has captured significant market share in U.S. equity options markets
- Over a decade of experience with electronic market structural change, including direct assistance to governmental agencies resulting in U.S. equity market structure regulatory reforms and enforcement actions

## ***Experience***

### ***Decimus Capital Markets, LLC, Stamford, CT***

#### **Founder, Managing Principal**

***July 2011 — Present***

Founded Decimus Capital Markets, LLC (“DCM”), a tactical consulting and strategic advisory firm that assists hedge funds and proprietary trading firms in optimizing execution through broker relationships, order flow arrangements, and electronic trading systems. DCM also provides consulting services and research products that focus on market structure, electronic execution, and market regulation/compliance. DCM offers a wide range of regulatory consulting and expert services, including those relating to expert testimony in litigation and interaction with regulatory agencies. Notable research accomplishments include a multi-year review of special order type functionality for all U.S. equities exchanges and a comprehensive review of market structure litigation in U.S. equities from 2011-2016.

Representative engagements as an expert include:

- *SEC v. Lek Securities*: currently serving as a testifying expert for one of the defendants in connection with allegations of market manipulation; analyzing trading strategies and specific series of transactions that have been alleged to be manipulative
- *Klein v. TD Ameritrade*: currently serving as a lead testifying expert for the plaintiff in a class action against a large retail brokerage in connection with alleged violations of the duty of best execution and corresponding harm to investors; produced expert reports and rebuttal reports with a unique approach to identification and measurement of economic harm; court testimony / deposition; extensive use of data, including tick-by-tick historical data
- *United States v. Taub*: currently serving as a lead testifying expert for the defendant in a criminal case, as well as the related civil and in rem proceedings, in connection with allegations of market manipulation; produced an expert report challenging the allegations and specific examples of purported illegal transactions; extensive use of data, including tick-by-tick historical data
- *Kluger v. United States*: served as an expert of record for the plaintiff in a lawsuit challenging a criminal conviction; provided an expert declaration about the nature and technical details of electronic trading and order matching engines

- *Confidential*: served as a consulting expert for the plaintiff in a class action against several exchanges in connection with disclosure practices; advised on framing the complaint and the relevant allegations
- *Confidential*: served as a consulting expert for the plaintiff in a class action against a broker-dealer in connection with order handling practices; advised on technical details of the complaint, calculation of damages, and settlement negotiations

***Trading Machines, LLC, Stamford, CT***

**Founder, Chief Executive Officer/Chief Compliance Officer** *September 2007 — March 2011*

Founded Trading Machines LLC, a high frequency options trading firm that executed upwards of ½ percent of the U.S. options market, using minimal risk capital during a period of heavy industry compression. Notable technical accomplishments include a signal-based options autohitter / delta sweeper, a single-side options quoter adapted for each market, a signal-based “sweep event” hedger, a post-only hedger adapted for each equity market, stock microprice logic/pricefeed filtering, and real-time adverse selection/slippage metrics.

***UBS Securities, LLC, Stamford, CT***

**Managing Director, Electronic Volatility Trading**

**Executive Director, Electronic Volatility Trading**

**Director, Electronic Volatility Trading**

*March 2003 — August 2007*

January 2006 — August 2007

January 2004 — January 2006

March 2003 — January 2004

Joint Global Head of the Electronic Volatility Trading business unit, a global options market making desk encompassing 25+ equity and equity derivatives markets with net trading revenue of \$75M in 2007 and roughly 5% U.S. options market share. Co-chair of Automated Derivatives Strategies, a unit consisting of 70+ technical and quantitative staff tasked with deploying EVT platform into all equity derivatives desks globally (e.g. warrants, flow desks). Negotiated and specified 7-year exclusive options order routing agreement with Schwab and designed its requisite options order router. Notable technical accomplishments include the first “dynamic sizing” bulk-message quoter introduced into the U.S. options market, an embedded auto-hitting/posting strategy utilizing quote messages, bulk-quoting prioritization and throttling logic, an electronic trading risk control framework, customized algorithms for price improvement auctions, and a “point of impact” delta hedger.

***Sixfold Technologies, LLC, Chicago, IL***

**Founder and CEO** June 2002 — March 2003

*June 2002 — March 2003*

Founded Sixfold Technologies, LLC, an early-stage startup providing of low-level software and hardware infrastructure products for large-scale analytical and scientific computing. Its first prototype product was a PXE network boot server appliance.

***The Hull Group/Goldman Sachs, Chicago, IL***

**Vice-President, Equities Division, Goldman Sachs**

**Associate, Equities Division, Goldman Sachs**

**Financial Engineer, The Hull Group**

*September 1997 — June 2002*

December 2000 — June 2002

September 1999 — December 2000

September 1997 — September 1999

Sole financial engineer, primary quantitative programmer, and speed specialist dedicated to all aspects of electronic trading execution for options markets. Notable technical accomplishments a specialized

autohitting engine for Eurex that used a “polling” pricefeed, a bulk-message quoter implemented for the ISE launch, and combination auto-hitting/posting strategy for Kospi options utilizing limit orders.

**Magnify, Inc, Chicago, IL**  
**Senior Member of Technical Staff**  
**Member of Technical Staff**

**February 1996 — September 1997**  
February 1997 — September 1997  
February 1996 — February 1997

Designed and developed machine learning library for the PATTERN data mining product, the center point of which was an assemble-based implementation of Breiman’s CART algorithm. Successfully completed Phase I and Phase II pilots with Visa International, resulting in production use of PATTERN for real-time credit card fraud detection.

**VictorMaxx Technologies, Inc., Deerfield, IL**  
**Developer Support and Relations**

**October 1995 — February 1996**  
October 1995 — February 1996

Responsible for software development to support virtual reality head-mounted display.

## ***Publications***

H. Bodek, forthcoming. “A Case Study in Regulatory Arbitrage and Information Asymmetry: High Frequency Trading and the Post Only Intermarket Sweep Order.” In *Global Algorithmic Capital Markets: High Frequency Trading, Dark Pools, and Regulatory Challenges*, edited W. Matli. Oxford University Press.

H. Bodek and S. Dolgoplov, 2015. “The Market Structure Crisis: Electronic Stock Exchanges, High Frequency Trading, and Dark Pools” Decimus Capital Markets, LLC.

H. Bodek, 2013. “The Problem of HFT: Collected Writings on High Frequency Trading & Stock Market Structure Reform.” Decimus Capital Markets, LLC.

H. Bodek, R. L. Grossman, and I. Pulleyn, 1997. “The Data Mining and Analysis of Packet Data for Detecting Network Intrusions.” In *Proceedings of First International Conference on the Practical Application of Knowledge Discovery and Data Mining*.

R. L. Grossman, H. Bodek, D. Northcutt, and V. Poor, 1996. “Data Mining and Tree-Based Optimization.” In *Proceedings of the Second International Conference on Knowledge Discovery & Data Mining*, edited E. Simoudis, J. Han, and U. Fayyad. Menlo Park, CA: AAAI Press/MIT Press.

## ***Education***

B.A. in Mathematics and Cognitive Science, University of Rochester, 1995

## ***Qualifications***

Series 3, 4, 7, 24, 55, 63, 65 (lapsed, requires re-registration)

## **Exhibit B**

### **Reviewed Materials:**

Complaint, SEC v. Lek Sec. Corp., No. 1:17-cv-01789-DLC (S.D.N.Y. Mar. 10, 2017), <https://www.sec.gov/litigation/complaints/2017/comp-pr2017-63.pdf>

Expert Report of Neil D. Pearson, Ph.D. (Mar. 16, 2018) (including supplements / materials)

Deposition of Marin Nitzov (Apr. 3, 2018)

Deposition of Gene DeMaio (Apr. 11, 2018)

### **Information About Prior Depositions, Court Testimony, and Declarations Within the Last Four Years:**

*Klein v. TD Ameritrade*, 8:14-cv-00396 (D. Neb.)

*Kluger v. United States*, 2:14-cv-06236 (D.N.J.)

### **Information About Publications Within the Last Ten Years:**

H. Bodek, forthcoming. “A Case Study in Regulatory Arbitrage and Information Asymmetry: High Frequency Trading and the Post Only Intermarket Sweep Order.” In *Global Algorithmic Capital Markets: High Frequency Trading, Dark Pools, and Regulatory Challenges*, edited W. Mattli. Oxford University Press.

H. Bodek and S. Dolgoplov, 2015. “The Market Structure Crisis: Electronic Stock Exchanges, High Frequency Trading, and Dark Pools” Decimus Capital Markets, LLC.

H. Bodek, 2013. “The Problem of HFT: Collected Writings on High Frequency Trading & Stock Market Structure Reform.” Decimus Capital Markets, LLC.



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## **INTRODUCTION**

1. I, Ronald Filler, have been retained by the Law Office of Steven Barentzen and the Law Office of James Wines, on behalf of Vali Management Partners dba Avalon FA Ltd. (“Avalon”) and Nathan Fayyer (collectively, the “Defendants”) to provide my expert opinion relating to trading activities called “layering” or “spoofing” and “cross market manipulation,” by the U.S. Securities and Exchange Commission (“SEC”) in its action against the Defendants and others in the Southern District of New York. While the SEC’s Complaint is against the Defendants and others, the Defendants had opened hundreds of sub-accounts for individual traders (“Individual Traders”) at LEK Securities, a registered broker-dealer, to allow these Individual Traders to achieve lower fees and costs. It was these Individual Traders, acting as independent contractors, who placed the orders at issue in this case. The SEC has not named any of these Individual Traders as parties to this case or taken the testimony of any of the Individual Traders even though they, and not the Defendants, placed each of the orders at issue in this case.

2. As detailed below, based on my review of the documents and testimony provided to me, it is my opinion that the alleged violations raised in the SEC’s Complaint are vague in concept and application and that the SEC and its experts have selectively identified a small percentage of the tens of millions of orders placed by the Individual Traders. More importantly, as noted below, its primary expert, Professor Terrence Hendershott, could not and did not identify a single example of “layering” in any of the orders placed by the Individual Traders and that any such analysis was beyond his capabilities.<sup>1</sup> He also conceded that he could not determine whether any of the orders placed by the Individual Traders artificially impacted the market nor could he find any false market information injected from any such orders.<sup>2</sup> These allegations form the basis of the SEC’s Complaint, yet the opinion of its primary expert does not support these allegations.

3. The opinions stated in this Report are based upon an independent examination of the documents and the applicable laws, regulations and cases that I have reviewed and analyzed as of the date of this Report. Exhibit B to this Report and the citations in the footntes below contain a listing of various documents and information that I considered in this matter. If needed, I may prepare graphic or illustrative exhibits to use at trial based on the documents and information relied upon and my analysis of those documents and information, and I also may use documents and exhibits submitted by other experts for Defendants or other parties in this action.

4. My review of the materials is ongoing. I therefore expressly reserve the right to, and may, supplement or even modify my opinions as set forth in this Report based on additional information and other developments, including the reports and testimony of other expert witnesses used in this matter.

## **QUALIFICATIONS OF PROFESSOR FILLER**

5. I am a Professor of Law and the Director of the Financial Services Institute at New York Law School (“NYLS”) and have served in this capacity since July 1, 2008. I currently teach,

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<sup>1</sup> Deposition Transcript of Terrence Hendershott (the “Hendershott Tr.”) at 33, 36, 38, and 240.

<sup>2</sup> Hendershott Tr. at 369-71.

or have taught, a number of financial law related courses at NYLS, including, among others, “Securities Regulation”, “Derivatives Market Regulation”, “Regulation of Broker-Dealers and Futures Commission Merchants”, “Financial Services Seminar and Workshop”, “Regulatory Policy” and “Advanced Research Seminar.” Each of these courses involves a discussion and analysis of the laws and regulations applicable to all financial firms required to be registered with the SEC and/or the Commodity Futures Trading Commission (“CFTC”), regulations adopted by industry self-regulatory organizations, such as the Financial Industry Regulatory Authority (“FINRA”), the National Futures Association (“NFA”) and the various U.S. securities and futures exchanges, proprietary trading firms, the trading strategies employed in today’s markets, market manipulation concepts such as spoofing, layering and cross market manipulations, electronic and algorithmic trading concepts, asset managers, such as investment advisers (“IAs”) registered with the SEC pursuant to the Investment Advisers Act of 1940 (“Advisers Act”), and the various collective investment funds that these advisory firms manage, ranging from investment companies (e.g., mutual funds) registered with the SEC pursuant to the Investment Company Act of 1940 (“IC Act”), hedge funds, foreign funds, such as Master-Feeder Funds, and individual managed accounts. I have taught some of these courses at four different U.S. law schools in the capacity of an Adjunct Professor during the period of 1977 through 2007.

6. Following my graduation from the George Washington University School of Law in 1973, my first attorney position was as a staff attorney with the Division of Investment Management at the SEC in its Washington, D.C. headquarters. This Division at the SEC has primary responsibility to regulate investment companies, commonly known as mutual funds, pursuant to the IC Act, and IAs pursuant to the Advisers Act. During my employment with the SEC, I also received an L.L.M. in Taxation degree from the Georgetown University Law Center. In 1976, I moved to Chicago to join the law firm of Abramson & Fox where I was first introduced to the futures industry. At this law firm, I was involved in the preparation of numerous documents, transactions and trading strategies involving a variety of financial firms and their filings with the SEC, the CFTC and exchanges.

7. I later became Associate Counsel and then the Director of Managed Accounts at ContiCommodity Services (“Conti”), which was a wholly-owned subsidiary of Continental Grain Company. In my capacity as the Director of Managed Accounts, I was principally responsible for complying with the applicable laws and regulations and issues relating to registration, reporting, disclosures and trade practices involving brokerage firms and asset managers. At the time, Conti was probably the largest U.S. futures commission merchant (“FCM”) and was a large broker-dealer (“BD”). At Conti, I held the Series 3 and 7 registration licenses. I left Conti to form my own FCM and BD, Filler, Weiner, Zaner & Associates (“FWZ”). At FWZ, I held many securities and futures registrations and licenses, including Series 3, 7, 8, 24, 27 and 63. FWZ was registered as both a FCM and as a BD and provided a variety of futures and securities related services, including execution and clearing services primarily for retail futures customers and the establishment of commodity pools that were either registered with the SEC and the respective states or qualified for exemptions from such registration. FWZ conducted due diligence on a number of third party asset managers and then selected those asset managers to serve as the advisory firm for both funds and individual managed accounts. I was a Managing Partner at FWZ.

8. In 1985, I left FWZ to become a partner with Vedder, Price, Kaufman & Kammholz (“VPKK”), a large Chicago-based law firm, where I represented a number of FCMs, BDs, floor brokers, proprietary trading firms, hedge funds, investment companies, investment advisers and other futures and securities industry professionals. At VPKK, I later became the Chair of its Corporate Practice Area and a member of its Executive Committee.

9. In 1993, I left VPKK to join Lehman Brothers Inc. in New York where I was a Managing Director on the business side with responsibility for various activities connected with its global futures and FX businesses. In particular, I had responsibility over its futures client services area, the use and investment of futures customer assets, both from a U.S. and a non-U.S. perspective, exchange floor execution activities, global clearing arrangements, various aspects of its electronic trading platforms, establishing and providing other important services and activities involving derivatives. I also dealt with risk margin levels, proprietary trading firms, hedge funds and large investment advisory firms, several of which had hundreds of billions of dollars under management, investment companies, ERISA plans, and state and foreign governments. At Lehman Brothers, I maintained several industry registrations and licenses, including Series 3, 7, 9/10, 24 and 63. I also provided legal and compliance services for Lehman Brothers for its global futures-related activities. I left Lehman Brothers in April 2008 to join the faculty of New York Law School. During my 15 years at Lehman Brothers, I was a member of several futures and securities exchanges, including the Chicago Board of Trade, the Chicago Mercantile Exchange, the Philadelphia Stock Exchange, the New York Mercantile Exchange and the Commodity Exchange and served on several committees at these exchanges.

10. Throughout my 35+ years in the futures and securities industries, I have also served on numerous governmental and industry boards of directors and advisory committees, including the following:

- A. Member, Board of Directors (2010 to present) and of the Executive Committee (2014 to present), National Futures Association (“NFA”) which is the futures industry self-regulatory organization. I currently serve as a Public Director. I have also served as a member of its Membership Committee, Governance Advisory Committee and its Special Committee on Customer Protection.
- B. Member, Board of Directors and Chair of the Regulatory Oversight Committee (“ROC”) of Swap-Ex, a swaps execution facility owned by the State Street Corporation (2013 to the present). I currently serve as a Public Director.
- C. Member of the Board of Directors of Bcause, a crypto-currency company that will become registered as an exchange and clearing house with the CFTC. I serve as a Public Director (2018 to present)
- D. Member, Board of Directors, of Global Clearing Services, a company offering collateral management and liquidity to clearing houses and their clearing member firms (2013 to the present).

- E. Member, Board of Directors, NYSE Liffe US, a futures exchange owned in part by NYSE Euronext (2011 through 2014). I also served as a Public Director of this exchange and as a member of its ROC.
  - F. Member, CME Clearing House Risk Advisory Committee (2006-2008).
  - G. Member, Risk Advisory Committee, New York Portfolio Clearing (2011 to 2013).
  - H. Chair (2012) and Member (2004-2008), CFTC Global Markets Advisory Committee.
  - I. Member, Board of Directors of the Clearing Corporation (2005-2007)
  - J. Vice Chairman of Broker-Tec Clearing Corporation (2002-2003).
  - K. Member, Board of Directors of the Futures Industry Association (1983-1985 and 2008-2010).
  - L. Member of the Executive Committee of the FIA Law & Compliance Division (1980-present); formerly, President (1998-2000).
  - M. Member of the Barings Task Force Study (1996).
  - N. I have also served as a Moderator or Panelist at several hundred industry and government-sponsored conferences and programs held globally throughout my career. Each year, I typically speak at 20+ programs involving various aspects of the securities and futures industries, asset management, brokerage firms, customer asset protections, the impact of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (the “Dodd-Frank Act”) on the financial services industry and regulatory reforms now being considered by the U.S. Congress and the various federal regulatory agencies.
11. My CV is set forth in Exhibit A. I have authored several articles that are noted in my CV.
12. I am being compensated at a fixed amount of \$20,000 for this Expert Report, \$20,000 for any Deposition preparation and/or testimony, and approximately \$20,000 for any trial and/or preparation and testimony for my work on this case. My compensation is not contingent on the conclusions set forth in this Report or on the ultimate resolution of this case.

## **BACKGROUND TO OPINIONS IN THIS EXPERT REPORT**

### **I. THE FINANCIAL MARKETS**

13. The U.S. equities markets are subject to the Securities Exchange Act of 1934 (“1934 Act”) and numerous SEC regulations and are comprised of numerous individual exchanges,

including most notably, NASDAQ and the New York Stock Exchange (“NYSE”).<sup>3</sup> These laws and regulations play a critical role in providing important protections to the markets themselves and the investors who trade on these markets. These exchanges receive orders routed to them for execution by member firms like Lek Securities Corporation (“Lek”), one of the other named defendants in this case. The highest priced visible order(s) to purchase a security along with the lowest priced visible order(s) to sell that security across all exchanges comprise the National Best Bid and Offer (“NBBO”). The National Best Bid at any given time constitutes the highest price that any resting visible limit order(s) across all exchanges is currently offered to buy (pay) for that security. The National Best Offer (also referred to as the “Ask”) is the lowest price that any resting visible limit order(s) is willing to sell that security. The difference between the best bid and the best offer is called the “spread.” The NBBO is also referred to generally as the “market” for a security, while the prices between the NBBO are referred to as the “inside.”

14. “Market” orders are orders to immediately buy (or sell) at the best offer (or bid). Such orders “pay” the spread for immediacy and certainty of execution. However, the delay between order entry and execution, known as “latency,” might see the market move away to a price less favorable to a market order – a result known as “slippage.” Slippage is one of the most significant costs to traders. Retail customers and other long term investors often have to pay the spread in order to execute their trades. Narrowing the spread thus typically lowers the cost of trading and is generally considered a public good to be encouraged.<sup>4</sup>

15. To mitigate such concerns, sophisticated traders often use “limit” orders. Traders placing limit orders set a specific “limit price” and size at which they are willing to trade. A visible limit order to buy, for example, that is priced higher than the current best bid and lower than the best offer, would become the new best bid price and could narrow the spread. A visible limit to buy priced at the same price as the best bid would add to the displayed size of the best bid. Visible limit orders priced away from the inside market comprise what is referred to as the “limit order book” – *i.e.* resting open orders to purchase or sell a security at prices inferior to the NBBO. Limit orders comprise a large percentage of all orders entered on the securities markets. A limit order posted in the order book is only good until cancelled by the trader. There is no minimum resting time for limit orders and all market participants understand that a limit order may be cancelled at any time.<sup>5</sup>

16. “Liquidity” describes the degree to which a security can be quickly acquired (or sold) without significantly affecting the market price for that security. Market orders and marketable limit orders – *i.e.* orders to buy (sell) priced at or higher (lower) than the best offer

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<sup>3</sup> The U.S. equity markets also include several other independent exchanges, tens of alternative trading systems and hundreds of broker-dealers that internalize their customers’ trades by executing against their own inventory. *See* <https://www.sec.gov/news/statement/us-equity-market-structure.html>.

<sup>4</sup> *See, e.g.,* Hendershott Tr. at 282 (Q: “[D]ecreasing spreads is generally considered a good thing. Right?” A: “Generally – well so right. You would want to narrow the spreads where the trades actually execute at those prices.”)

<sup>5</sup> *See, e.g.,* Hendershott Tr. at 379 (agreeing that “traders are entitled to cancel orders at any time” and that there “is no minimum resting time on the U.S. equity exchanges.”)

(bid) – will immediately execute against those resting limit orders (and any better or equally priced hidden orders). Orders that execute against resting limit orders are considered to be “taking” liquidity. Resting limit orders that are executed against are considered to be “providing” or “making” liquidity. Certain exchanges assess per share fees or pay per share rebates based on whether an executed order took or provided liquidity. Higher liquidity typically reduces the cost of trading and is thus generally encouraged as a public good.<sup>6</sup>

17. “Market making” refers to a trading strategy where a trader places multiple resting limit orders on both sides of the market (e.g., placing bids and offers in the same security) with the intent to capture the spread and/or the rebates associated with providing liquidity that are typically paid by the exchanges or which may result in lower exchange fees. The market maker hopes ideally to buy low and sell high (or sell short high and cover low). While some markets have designated market makers who are obligated to continually post two-sided markets, many market participants engage in ad hoc market making trading strategies by placing multiple orders on both sides of the market for short periods of time. Market making is a significant source of liquidity in the equity markets, and as such, is something to be encouraged as a contributor to the efficient functioning of those markets.<sup>7</sup>

18. The SEC has described market making strategies as follows:

“Passive market making involves the submission of non-marketable orders (bids and offers) that provide liquidity to the marketplace at specified prices. While the proprietary firm engaging in passive market making may sometimes take liquidity if necessary to liquidate a position rapidly, the primary sources of profits are from earning the spread by buying at the bid and selling at the offer and capturing any liquidity rebates offered by trading centers to liquidity-supplying orders. If the proprietary firm is layering the book with multiple bids and offers at different prices and sizes, this strategy can generate an enormous volume of orders and high cancellation rates of 90% or more. The orders also may have an extremely short duration before they are cancelled if not executed, often of a second or less.”<sup>8</sup>

19. Professor Hendershott agreed that placing orders on both sides of the market and cancelling those orders as they become unmarketable is consistent with legitimate market making.<sup>9</sup>

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<sup>6</sup> See, e.g., Hendershott Tr. at 283 (“Increased liquidity we generally think of as improving welfare, decreasing transaction costs, making people be able to share risk better.”)

<sup>7</sup> See, e.g., Hendershott Tr. at 50 (agreeing that “legitimate market making activity” is something to be “encouraged, not discouraged,” because “we think of the function of markets to produce liquidity.”)

<sup>8</sup> SEC Release No. 34-61358, 17 C.F.R. 242 at 48-49.

<sup>9</sup> Expert Report of Terrence Hendershott (the “Hendershott Report”) at 9 n.15; Hendershott Tr. at 224-27.

20. The trading activity challenged in this case is indistinguishable from the legitimate market making strategy that the SEC and Professor Hendershott find to be perfectly legal and beneficial to the market.

## II. GROWTH OF ELECTRONIC TRADING

21. Historically, trading on securities exchanges took place on exchange trading floors, such as the NYSE. The exchange specialist historically played a key role in executing orders to buy or sell shares. Such exchange trading executions often involved several minutes to execute and report filled orders to customers and to process the orders.

22. Thus, this process took time; speed was not as important then as it is now. The exchange trading floors' systems' slow executions also exposed traders to a market risk inherent in latency delays and slippage.

23. Computerized trading platforms began appearing in the securities markets during the last two decades of the twentieth century. These electronic platforms provided order-matching services that proved to be an efficient alternative to the exchange trading floor via the specialist. In recent decades, most exchange floor trading has virtually ceased and has been replaced by electronic trading platforms operated by the exchanges.

24. An order is executed through an electronic trading platform where buyers and sellers are matched by algorithmic formulas that generally make these matches based on time and price priority<sup>10</sup> High frequency trading firms (“HFTs”) employ computerized technology and algorithms that allow the origination, transmission and execution of their orders in times measured in fractions of a second, “a thousand times faster than you can blink your eyes.”<sup>11</sup> High speed trading reduces risks of “slippage” in prices resulting from delays in order entry and execution, i.e., “latency.”<sup>12</sup>

25. In a recent Second Circuit case, the Court noted that “High frequency trading firms use computers to create and operate algorithms, and by using those algorithms and technology, execute trades faster than anyone else -- making pennies on millions and millions of trades executed in milliseconds.”<sup>13</sup>

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<sup>10</sup> See Jerry W. Markham & Daniel J. Harty, *For Whom the Bell Tolls: The Demise of Exchange Trading Floors and the Growth of ECNs*, 33 J. CORP. L. 865 (Summer 2008) (describing that transformation).

<sup>11</sup> Jerry W. Markham, *High Speed Trading on Stock and Commodity Markets—From Courier Pigeons to Computers*, 52 SAN DIEGO L. REV. 555, 562 (2015) (“*High Speed Trading*”).

<sup>12</sup> Irene Aldridge, *HIGH-FREQUENCY TRADING: A PRACTICAL GUIDE TO ALGORITHMIC STRATEGIES AND TRADING SYSTEMS*, 43–44 (2d ed. 2013); *Goldstein v. Mortenson*, 113 S.W.3d 769, 773 (Tex. App. 2003) (“The time expended in placing phone calls allowed market positions . . . to change, often resulting in serious losses . . . . The negative effect resulting from such a delay is known in the industry as ‘slippage.’”).

<sup>13</sup> *Myun-Uk Choi et al. v. Tower Research Capital LLC et. al.*, Case No. 170-648-cv (2d. Cir. March 29, 2018).

26. HFTs minimize latency and slippage by the entry of their orders through high-speed data transmission lines and devices. HFTs pay high prices to place servers containing their order entry algorithms in the same facilities that house the exchanges' matching engines – a set up known as “co-location.” Those servers are then connected, using proprietary high-speed data transmission lines, to market data feeds purchased directly from the exchanges and other market centers (“direct feeds”). One HFT trader spent \$300 million to build a high-speed data line between New Jersey and Chicago in order to reduce order latency by three milliseconds. A millisecond is one thousandth of a second. Another fiber optic project of a HFT sought to cut five milliseconds off order entry times between London and New York at a cost of a projected \$500 million. Microwave transmissions were even faster and efforts are underway to reduce latency through laser communications.<sup>14</sup>

27. The HFTs efforts to reduce latency had remarkable success. “Public data from one exchange group, for example, indicates that round trip trade times on its trading platform fell from 127 milliseconds in 2004 to 4.2 milliseconds in 2011.”<sup>15</sup> “Another exchange group reported in 2010 that its average blended transaction time in futures and OTC markets was 1.25 milliseconds.”<sup>16</sup> In 2014, one exchange determined that 11 percent of all 2014 observable orders lasted less than one millisecond.<sup>17</sup> “In today’s electronic financial markets, a single investor can execute more than 10,000 trades a second, meaning more than 1,000 trades can happen in the blink of an eye.”<sup>18</sup>

28. Thus, today, the securities markets are driven by HFTs that trade on electronic markets. HFTs enter and execute or cancel orders within fractions of a seconds, many times faster than you can blink your eye. Although as much as ninety percent of all HFT orders are cancelled after they are placed in the market, but before their actual execution, the SEC in this case has brought an enforcement action against certain orders that are indistinguishable from legitimate market making activity. As noted below, in the few examples noted in its Complaint, the SEC acknowledged that some of the orders were executed 52 seconds or more apart and other orders were executed 30 or more minutes apart. When HFTs place orders in less than milliseconds, the alleged orders placed by the Defendants cannot be deemed to be illegal orders. Everyone in the market has had plenty of opportunity to hit their original orders before the Defendants placed their subsequent orders that allegedly constituted the fraud proffered by the SEC in its Complaint. The orders challenged by the SEC in this case were not placed by order entry algorithms co-located with the exchange matching engines. Rather, they were high-latency orders placed by the Individual Traders, human beings on the other side of the world. The complaining counterparties,

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<sup>14</sup> *High Speed Trading*, at 561 n. 14.

<sup>15</sup> CFTC, “Concept Release on Risk Controls and System Safeguards for Automated Trading Environments,” 78 Fed. Reg. 56,542, 56,546 (Sept. 12, 2013) (footnote omitted).

<sup>16</sup> *Id.* (footnote omitted).

<sup>17</sup> Equedia, *How Fast is High-Frequency Trading? Faster Than You Think*, available at <http://www.equedia.com/how-fast-is-high-frequency-trading/> (accessed on March 4, 2018).

<sup>18</sup> *High-Frequency Traders Need a Speed Limit*, BloombergView, available at <http://www.bloomberglview.com/articles/2015-01-25/high-frequency-traders-need-a-speed-limit> (accessed on March 4, 2018).

however, appear to be mostly, if not entirely, HFTs capable of trading and placing orders in milliseconds. The orders at issue were instantaneously accessible to these high frequency machines the moment they arrived at the exchanges.

29. As Professor Hendershott himself concedes:

Q: Do you agree that an open order in the marketplace is at risk of execution?

A: An order could – could execute between the time the exchange receives it and when it cancels, so yes.

Q: And the short duration of an open order does not eliminate execution risk. Right?

A: . . . [Y]es, if it's in place, it can execute.

Q: . . . [E]ven if it's for milliseconds that an order is open . . . for those milliseconds it faces execution risk, right?

A: So orders are – can execute as long as they are in place.

. . .

Q: And so even at millisecond, one one-thousand of a second, an order was open for only one one-thousand of a second, is still subject to execution risk, right?

A: I think that is consistent with my answer just then and before, yes.<sup>19</sup>

30. Any suggestion that the Individual Traders trading in Avalon's account could have canceled orders using electronic messages sent from China and the Ukraine before the co-located machines employed by HFT could interact with them is simply untrue.<sup>20</sup> Moreover, to the best of my knowledge, none of these Individual Traders used these high frequency algorithms when placing their orders at issue in this case.

### III. ORDER ENTRY

31. Professor Hendershott's Report improperly infers intent to manipulate from the fact that when the Individual Traders placed orders on both side of the market, not all of those orders were executed before cancellation.<sup>21</sup> Under Professor Hendershott's analysis, order cancellation within 60 seconds is the act from which an Individual Trader's fraudulent intent can supposedly be inferred.<sup>22</sup>

32. However, Professor Hendershott ignores the fact that the SEC has found that over

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<sup>19</sup> Hendershott Tr. at 340-41, 342.

<sup>20</sup> See Hendershott Tr. at 347.

<sup>21</sup> See, e.g., Hendershott Report at 6; *see also* Hendershott Tr. at 233 (stating that the evidence of the traders' intent not to execute order is that "orders don't execute").

<sup>22</sup> See Hendershott Report at 8-9 and at 9 n.15 (explaining that it is the cancellation ratio requirement in his analysis that supposedly distinguishes "layering" from otherwise legitimate market making strategies).

95% of all orders entered on the U.S. equity markets are canceled without execution.<sup>23</sup> A study by the SEC also found that approximately 46% of those cancellations occurred within one second and that over 23% of those cancellations occurred within 50 milliseconds; *i.e.* 5 one-hundredth of a second.<sup>24</sup> Fast cancellations of resting limit orders is a hallmark of the current U.S. equities market and not an indication of fraudulent intent.

33. The SEC has also found that fast cancellations do not protect resting limit orders from execution risk.<sup>25</sup> The data showed that “the vast majority of quotes can be accessed by at least some market participants before they are canceled. The data does not show a market that is currently dominated by quotes that are canceled so fast that they cannot be accessed.”<sup>26</sup> In other words, the Individual Traders could not possibly have cancelled their orders fast enough to avoid execution risk as suggested by the SEC’s theory. Rather, as noted above, an order is instantaneously subjected to execution risk the moment it arrives at the exchange.

34. The SEC has also found that order disposition varies dramatically depending on the price of a limit order relative to the NBBO.<sup>27</sup> The majority of all orders sent to exchanges are price away from the inside market, but only a small minority of those orders are executed.<sup>28</sup> Orders priced better than, at or near the inside had a significantly greater chance of being executed.<sup>29</sup> Still, even orders priced better than the NBBO only had a cancel-to-execution ratio of 4.6:1.<sup>30</sup> Orders priced at the NBBO had a cancel-to-execution ratio of 9.8:1 and orders priced within 50 basis points of the NBBO had a cancel-to-execution ratio of 79:1.<sup>31</sup> Orders priced away from the inside had a cancel-to-execution ratio of 117:1.<sup>32</sup> Professor Hendershott would have the jury infer manipulative intent from a cancel-to-execution ratio of just 3:1 – *i.e.* a rate lower than any observed by the SEC in the market.

35. The SEC also found that there was an inverse relationship between order price relative to the NBBO and the speed of ensuing trades or cancellations.<sup>33</sup> The SEC found that approximately 75% of cancellations for orders price better than or at the NBBO occurred within 5 seconds.<sup>34</sup> Whereas approximately 50% of cancellations for orders placed away from the NBBO occurred within 5 seconds. Professor Hendershott, by contrast, questions so-called “layering

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<sup>23</sup> See, e.g., Equity Market Speed Relative to Order Placement, March 19, 2014 (available at <https://www.sec.gov/marketstructure/research/highlight-2014-02.html#.WuDUiGYITUI>); The Speed of Equity Markets October 9, 2013 (available at <https://www.sec.gov/marketstructure/research/highlight-2013-05.html#.WuDigWYITUI>).

<sup>24</sup> Speed of Equity Markets, see note 23, *supra*.

<sup>25</sup> See *id.*

<sup>26</sup> *Id.*

<sup>27</sup> See Equity Market Speed Relative to Order Placement, see note 23, *supra*.

<sup>28</sup> *Id.*

<sup>29</sup> See *id.*

<sup>30</sup> *Id.*

<sup>31</sup> *Id.*

<sup>32</sup> *Id.*

<sup>33</sup> *Id.*

<sup>34</sup> *Id.*

loops” with an average duration of more than 15 seconds.<sup>35</sup>

#### IV. “LAYERING” IS NOT PROHIBITED BY ANY APPLICABLE LAW, RULE OR REGULATION

36. As noted above, the U.S. securities markets are subject to the 1934 Act, numerous SEC regulations and the rules adopted by FINRA and by the exchanges on which such securities are traded. These laws and regulations play a critical role in providing important protections to the markets themselves and to the investors who trade on them. They also inform market participants of the bounds of acceptable behavior. It is important to note that, as of this writing, there is no law, rule or regulation governing trading in the U.S. equities market that defines or proscribes by name “layering.”

37. To be sure, market manipulation is proscribed under federal securities laws; but no law, rule or regulation equates so-called “layering” with market manipulation punishable under those laws.

38. Part of the problem with the SEC’s attempt to conflate the term “layering” with manipulation, is who, until very recently, “layering” referred to the entirely legitimate act of placing multiple orders at multiple price points on both sides of the market as part of passive market making strategy. For example, as noted above, the SEC has previously endorsed market making as entailing “**layering the book** with multiple bids and offers at different prices and sizes.”<sup>36</sup>

39. Likewise, in a 2010 roundtable panel discussion hosted by the CFTC, one of the witnesses that has been designated by the SEC, Adam Nunes of Hudson River Trading Group, explained why legitimate market making strategies involve lots of cancellations:

“On the equities market where you may be trading across, you know, a dozen or well over that venues, and you’re **layering the book** to provide liquidity across multiple venues, you could have one hundred or hundreds of bids and offers out and as you’re adjusting your position based on related products moving, based on that product moving, based on your risk position, you can end up with a relatively low order to execution or relatively high order to execution ratio, you know, for legitimate reasons just because you have a lot of risk out there and a lot of orders out there because as a liquidity provider, you don’t know where the next order’s going.”<sup>37</sup>

40. In his deposition in this action, Mr. Nunes – a professional with almost twenty years’ experience in the securities industry – affirmed that his statement made in 2010, “was at a

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<sup>35</sup> See, SEC Document Production Bates Stamped z-006568204 (average loop duration for “layering loops” equal to 15.5 seconds).

<sup>36</sup> SEC Release No. 34-61358, 17 C.F.R. 242 at 49 (emphasis added).

<sup>37</sup> CFTC Staff Roundtable on Disruptive Trading Practices, at 32-33 (2010) (emphasis added).

time before the term ‘layering’ was generally used to describe a manipulative market activity.”<sup>38</sup> Instead, he testified that the common use of the term “layering” in the industry was to refer to “sending bona fide orders to buy and sell at multiple price levels and across multiple trading venues.”<sup>39</sup> I note that this is consistent with Avalon principal Nathan Fayer’s testimony that he understood “layering” to refer to “placing orders on both sides of the market.”<sup>40</sup>

41. Another term sometimes used to describe trading activity similar to “layering” is “spoofing.” That term is equally vague. “Spoofing” was made illegal in the commodities market as part of the Dodd-Frank Act in 2010.<sup>41</sup> But prior to then the term was undefined. For example, spoofing had historically been associated with a drinking game, which “involved guessing how many coins the other player held in a closed fist.”<sup>42</sup> In financial markets, “spoofing” has been associated with fraud schemes under the federal securities laws involving emails with fake addresses that were purportedly discussing insider or other market sensitive information. The sender of these “spoofed” emails would then profit from market reactions to the false information.<sup>43</sup> The term spoofing was also later applied to “auto-execution” fraud in the securities markets involving a practice called “layering, an activity that was not then based on order cancellations and was unrelated to any trading activity in securities.”<sup>44</sup>

42. The SEC has never defined “layering” or “spoofing” in any detailed manner. When LEK Securities, in an attempt to be in compliance, sought advice or assistance from exchanges and FINRA as to how it could be in proper compliance yet never received any specific advice. Query how can the SEC bring such charges against the Defendants when those concepts are not known to the industry or to its traders?<sup>45</sup> Proper notice and explanation must be given by any

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<sup>38</sup> Deposition Transcript Adam Nunes, April 6, 2018 (“Nunes Tr.”) at 209.

<sup>39</sup> *Id.* at 209-10.

<sup>40</sup> Deposition Transcript of Nathan Fayer, February 15, 2018 (the “Fayer Tr.”) at 167.

<sup>41</sup> See Amicus Brief filed with the U.S. Supreme Court in *United States v. Michael Coscia* (Docket 17-1099), co-authored by Professor Filler.

<sup>42</sup> Ken Follett, JACKDAWS 302 (2002) (electronic version) (describing this game). *See also*, Benjamin L. Schwartz. *Solution of a Set of Games*. 66 AM. MATH. MONTHLY, 693 (1959) (describing this game).

<sup>43</sup> Jerry W. Markham, LAW ENFORCEMENT AND THE HISTORY OF FINANCIAL MARKET MANIPULATION 334-335 (M.E. Sharpe 2014) (hereinafter “LAW ENFORCEMENT”).

<sup>44</sup> This practice was described by the SEC in a footnote *In the Matter of Yoshikawa*, 2006 SEC LEXIS 948 n. 36 S.E.C. (2006) that is less than elucidating:

‘Auto-execution manipulation’ is also commonly referred to as ‘spoofing’ . . . . See, e.g. Ian Fishman and Laurence Fishman, Exchange Act Rel. No. 40115 (June 24, 1998), 67 SEC Docket 1107 (order accepting offer of settlement and finding violations of Section 10(b) and Rule 10b-5 where respondents entered 100-share limit orders to alter the NBBO [National Best Bid or Offer], followed with larger limit orders at the new NBBO, then entered a new 100-share limit order to change the NBBO again, following again with a larger limit order taking advantage of the second new NBBO respondents had created);

<sup>45</sup> See also Sections III to V of Roger Begelman’s Expert Report, starting at page 5.

regulator so the industry can be in proper compliance. Otherwise, any such second guessing can only harm the market and not protect it as the SEC has alleged in this case.

43. Moreover, Avalon was not a broker-dealer registered with the SEC. It was not a FINRA member firm or a member of any exchange. Its principal, Nathan Fayer, was also not registered with the SEC, was not associated with any member firm, and did not hold any securities licenses. Mr. Fayer was neither a lawyer or a trader.<sup>46</sup> It is unreasonable to expect Avalon or Mr. Fayer to understand the nuisances of the regulators' concern for so-called "layering," especially when there is no such prohibition under the federal securities laws.

44. The record shows that Lek made repeated attempts to have regulators define "layering" so to enable Lek to comply with regulatory concerns.<sup>47</sup> Those efforts were rebuffed by the SEC's regulators who refused to provide any detailed or practical definition of layering. Nevertheless, as detailed in the Expert Report of Roger S. Begelman submitted by Lek in this matter, Lek put in place stringent compliance, surveillance and risk controls related to "layering" which Mr. Begelman has opined "were: (1) consistent with a compliance framework to prevent potential manipulative trading; (2) not in conflict with communications from regulators and exchanges; and (3) consistent with industry standards for reasonable controls to manage risks."<sup>48</sup>

45. As Mr. Begelman noted, it is difficult for a sophisticated broker dealer, such as Lek, to determine what is "layering" and to implement methods to detect and prevent such trading. It would be extremely difficult, if not impossible, for Avalon or Mr. Fayer to detect any such trading activity by the Individual Traders and, in my opinion, it was reasonable and not inconsistent with industry standards for Avalon and Mr. Fayer to rely on Lek's extensive automated and human compliance procedures detailed in the Begelman Report to prevent orders that would violate any laws, rules or regulations from reaching the marketplace in compliance with the SEC market access rule.<sup>49</sup>

46. Traders play a key role in today's marketplace and must clearly understand whether the trades that they engage in are legal or manipulative. The threat of regulatory action based on ill-defined concepts makes it untenable for traders to engage in many legitimate trading strategies useful to market liquidity and efficiency. This uncertainty subjects traders to the risk of second-guessing by regulators and prosecutors singling out trades among hundreds of millions of canceled orders that are in fact legitimate open market transactions. This confusion hurts the market as traders will engage in less trading, which could result in negative impacts on the market including greater price spreads which clearly is not in the best interests of the markets.

47. Vague and uncertain prohibitions against order cancellations will also inhibit efficient price discovery. This is because traders will be unable to determine the wholly uncertain line of when a cancellation instruction becomes illegal "layering" or "spoofing" in the mind of a regulator or a prosecutor. Market efficiency depends on traders to be allowed to trade without fear

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<sup>46</sup> Declaration of Nathan Fayer, at ¶¶ 2,3.

<sup>47</sup> See also Sections III to V of Roger Begelman's Expert Report, starting at page 5.

<sup>48</sup> Expert Report of Roger Begelman at 3.

<sup>49</sup> *Id.* at ¶¶ 33-56.

of after the fact determinations of their intent in markets where speed and cancellations are essential to their trading plans and market efficiency.

48. Other regulators agree that layering is not a common concept and is quite difficult to figure out.<sup>50</sup> FINRA has also just recently interpreted its concerns on layering.<sup>51</sup> This clearly shows that this major industry regulator is just now attempting to place greater emphasis on this type of trading activity. Proper notice and explanation must be given by any regulator so the industry can be in proper compliance. Otherwise, any such second guessing can only harm the market and not protect it as the SEC has alleged in this case.

## **V. TRADING IS A COMPETITION AND TRADERS MUST CONCEAL THEIR TRUE INTENTIONS IN ORDER TO BE SUCCESSFUL**

49. The SEC in its Complaint, and Professor Hendershott in his report, ignore that illusions of market demand and the concealment of actual trading strategies of market participants has been an integral part of trading markets since their inception. This is not a moral issue. To the contrary, in considering application of the open market trade doctrine, it necessary to understand that trading is a competition and that concealment of actual trading strategies is an integral part of that competition, as is the case for nearly every other form of competition.

50. In football, concealment of the actual strategy for each play is critical to success, and include such things as “statue of liberty” and “pass-action” plays, and “quarterback sneaks.” In volleyball, the setter tries to fool opponents on where the ball will be placed for return. Baseball pitchers disguise their pitches to fool batters. Hockey players try to deceive the goalie as to where the puck will be sent, and on and on.

51. Trading in financial markets is no less a competition. As Professor Thomas A. Hieronymus noted some years ago:

[T]rading is a contact sport played by competitive people who place a high value on winning. A futures market is not a scholarly seminar in which learned men debate what is, and arrive at, an equilibrium price; it is a game in which businessmen compete, with money at hazard, to establish a market price that works. Competition is sometimes a vicious business but it works

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<sup>50</sup> In a recent speech, FINRA President Robert Cook, a highly respected securities lawyer and official, commented that trying to establish layering is like “searching for that proverbial needle in the haystack”. Cook, “Equity Market Surveillance Today and the Path Ahead” (Sept. 20, 2017) (available at <https://www.finra.org/newsroom/speeches/092017-equity-market-surveillance-today-and-path-ahead>).

<sup>51</sup> It was not until April 2016 that FINRA issued “cross market report cards” attempting for the first time to identify for member firms like Lek instances of “layering” and “spoofing.” See “FINRA Issues First Cross-Market Report Cards Covering Spoofing and Layering” (available at <https://www.finra.org/newsroom/2016/finra-issues-first-cross-market-report-cards-covering-spoofing-and-layering>).

well.<sup>52</sup>

52. Traders “disguise their intentions like secret agents.”<sup>53</sup> As a part of that competition, active traders try to mask their trading from other market participants, particularly HFTs. This is because a popular HFT strategy is “liquidity detection,” which employs algorithms to take advantage of other traders by detecting and predicting their trading plans or practices based on prior activity.<sup>54</sup> Active traders, therefore, seek to avoid trading in sizes, amounts or frequencies that can be detected by HFTs.<sup>55</sup>

53. As the CFTC has noted, “order shredding” is a popular deception or illusion used to disguise from and deceive other traders concerning the entry of large orders:

For example, buy-side firms (such as mutual funds and pension funds) may use automated systems and execution algorithms to “shred” one or more large orders (called ‘parent orders’) into a series of smaller trades (‘child orders’) to be executed over time. . . . In addition to automated execution, ATSs may also operate market-making programs; opportunistic, cross-asset and cross-market arbitrage programs; and a number of other strategies.<sup>56</sup>

54. Professor Hendershott agreed that “traders don’t have to disclose everything about – they don’t have to necessarily disclose their future intentions, or their future trading.”<sup>57</sup>

55. The entry of limit orders by HFTs is also necessarily coupled with the intent to cancel those orders. That is, if the order is not executed at the limit price or better, the trader intends to cancel the order before its execution and often within fractions of a second. Such orders have long been used in the markets, albeit at slower speeds, and are common industry custom and practice.

56. As another example, orders entered by the same trader on the opposite side of the market at the same price results in the automatic cancellation of the first set of orders. Still other traders “ping” the market by sending out orders they intend to cancel if not executed immediately.

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<sup>52</sup> *Thomas Hieronymus, ECONOMICS OF FUTURES TRADING FOR COMMERCIAL AND PERSONAL PROFIT* 327-328 (1977).

<sup>53</sup> *William L. Silber, VOLCKER* 289 (2012).

<sup>54</sup> *Irene Aldridge, High-Frequency Trading: A Practical Guide to Algorithmic Strategies and Trading Systems* 17 (2d ed. 2013).

<sup>55</sup> “Investors submitting large volume orders for . . . futures and options may wish to conceal the full size of their order to avoid anticipatory action from other market participants.” Interactive Brokers, *Iceberg/Reserve Orders*, available at <https://www.interactivebrokers.com/en/?f=%2Fen%2Ftrading%2Forders%2Ficeberg.php> (accessed on March 4, 2018).

<sup>56</sup> CFTC, *Concept Release on Risk Controls and System Safeguards for Automated Trading Environments*, 78 Fed. Reg. 56,542, 56,544 (proposed Sept. 12, 2013) (footnote omitted)

<sup>57</sup> Hendershott Tr. at 324.

This allows price discovery and permits traders to determine the price at which liquidity may be present. These order cancellation practices serve as a price discovery function, not fraud.

57. “Hidden” or “Reserve” orders are limit orders in which none or only a portion of the size the trader is willing to execute is displayed to the market. These order types, which were approved by the SEC and are widely available and used prolifically on the various exchanges literally enable traders to mislead the market as their true supply or demand.

58. Still other traders may show interest on one side of the market in order to deceive other traders as to their true market objectives. This practice has been common to the organized trading markets since their inception, and is a reflection of trading skill not fraud.<sup>58</sup>

### **REBUTTAL TO PROFESSOR HENDERSHOTT’S EXPERT OPINIONS**

59. Professor Hendershott’s Report does not identify even a single example of so-called ‘layering.’ Instead, Professor Hendershott created a set of selection criteria and declared that a small percentage of the Individual Traders’ orders and trades – less than 5% of Avalon’s total equity trading volume – were “consistent with” so-called “layering loops.” “Layering loops” is a neither a legal or academic term recognized in the industry, but rather, a term Professor Hendershott made up and then circuitously defined as any orders meeting his arbitrary criteria.<sup>59</sup>

60. Importantly, Professor Hendershott does not contend that any one of the over 675,000 so-called “layering loops” identified by his criteria actually constitutes an instance of “layering” as alleged in the SEC’s complaint:

A: We – so I don’t have – I don’t reach opinions about individual loops in general. I look at the pattern of evidence across all of them. So I don’t have an opinion about this particular loop, just like I don’t have any opinion about most of the other loops . . . .

Q: So using your layering expertise, I would like you to bring it to bear and explain to me whether or not in that expert opinion you think that this is an example of layering and, if so, why.

A: So you want me to reach an opinion about any individual loop?

Q: Yes.

A: It’s very difficult to reach an opinion about any individual loop . . . I don’t have an opinion about the specifics of most of the loops. It’s what’s – the systematic pattern of evidence in the data. So you asked me, do I have an opinion about this loop now. Do I have an opinion about other loops?

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<sup>58</sup> See e.g., LAW ENFORCEMENT, *supra*, n. 7, at 388 (describing the trading acumen of Nathan Rothschild in the 1820s in first entering sell orders in the market in order to disguise and deceive other traders from discovering the fact that that he actually was intending subsequently to engage in large purchases).

<sup>59</sup> See Hendershott Tr. at 22 (Q: “[W]hen you say it’s ‘consistent with layering,’ all you mean is that it meets the criteria in your report. Is that correct?” A: “It meets the criteria.”).

No, I don't.<sup>60</sup>

61. Regardless, the issue in this case is not whether any orders or trades constitute “layering.” As noted above there is no prohibition on “layering” in the equities’ markets. Rather, the issue is whether there is sufficient evidence to demonstrate that the Individual Traders engaged in manipulation as proscribed by the federal securities laws and rules and the caselaw interpreting those statutory prohibitions. It is my opinion that the SEC and Professor Hendershott have not demonstrated or proved the existence of such evidence.

## I. THERE IS NO EVIDENCE OF PRICE IMPACT

62. For an order to be considered manipulative under the federal securities laws, the “critical question” is whether it “artificially affects a security’s price in a deceptive manner.”<sup>61</sup> The criteria used by Professor Hendershott to identify so-called “layering loops” does not require any showing of price impact.<sup>62</sup> Indeed, Professor Hendershott conceded that orders that have zero price impact, and which thus by definition could not be manipulative, could nonetheless be identified as “layering loops” under his analysis.<sup>63</sup>

63. In two of the four examples from Professor Hendershott’s initial report<sup>64</sup> the orders identified as manipulative demonstrably had no impact on the price of the security. In both examples of trading in Grupo Televisa on August 12, 2015, the NBBO remained at the same prices during the entire time the supposed manipulative orders were placed and canceled, and the Individual Trader’s contra-side orders were executed.<sup>65</sup>

64. It is my understanding that the SEC has not provided market price data to Professor Hendershott for the vast majority of the so-called “layering loops” identified by his analysis.<sup>66</sup>

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<sup>60</sup> Hendershott Tr. at 431; *see also id.* at 36, 38 (“They look like layering. Is any individual one, that’s what’s hard to know.”); at 33 (“So any individual example is not really what my opinion is based on.”)

<sup>61</sup> *ATSI Communications v. Shaar Fund*, 493 F.3d 87, 100 (2d. Cir. 2007).

<sup>62</sup> *See* Hendershott Tr. at 58 (Q: “Is having any particular impact on price one of the five criteria that you used to identify so-called ‘layering loops?’” A: “So, no, it is not part of the criteria that I identify, the 675,00 layering loops.”).

<sup>63</sup> *Id.* at 59-60 (Q: “Again, sir, under your analysis, a trade – orders could have no impact on price, and yet still meet your criteria. Correct?” A: “They could meet the initial criteria, yes.” . . . Q: “And that’s because again, you’re not requiring, for the identification of something as a ‘layering loop,’ that it have any particular impact on price. Correct?” A: “Right.”).

<sup>64</sup> Hendershott Report at 16-18, Exs. 8a and 8b.

<sup>65</sup> *See* SEC Document Production Bates Stamped z-006568206; *see also* Hendershott Tr. at 71-72 (Q: “[T]hat indicates to you, sir, that these loud orders, so-called loud orders in this – these two TV examples from your report, did not have any impact on price. Correct?” A: “The best bid and – the national best bid and offer didn’t change, correct.”), at 74 (Q: “[I]s there any evidence of downward pressure?” A: “No”), at 75 (“The prices didn’t move . . . I’ll agree, the prices didn’t move.”)

<sup>66</sup> Hendershott Tr. at 59-60, Report Ex. 5.

Without that data, it would be impossible for Professor Hendershott to determine whether any of the orders in those loops had the requisite manipulative price impact so as to constitute a violation of the federal securities laws.<sup>67</sup> Indeed, small-sized orders such as the ones that Defendants are alleged to have engaged in typically do not move the underlying price of the security. Normally, such price movements occur only with large-sized orders.

65. Exhibit 5 to Professor Hendershott's initial report is what he describes as a "simple" price impact analysis on a small portion of the identified "layering loops."<sup>68</sup> In his Report, Professor Hendershott conceded that this simplistic analysis only confirmed the natural tendency of price movements to coincide with order imbalances.<sup>69</sup> It does not, for example, identify the supposed price impact of any of the specific orders challenged by the SEC as would be necessary to determine if those orders were manipulative.

66. Nonetheless, the analysis summarized in Exhibit 5 to Professor Hendershott's initial report shows that the orders identified as so-called "layering loops" by Professor Hendershott's criteria had a slightly *less price impact* than the orders that did not meet the "layering loops" criteria.<sup>70</sup> In other words, Professor Hendershott concluded that "layering loops" had an insignificant, albeit slightly less, price impact than the Avalon orders deemed consistent with legitimate market making.<sup>71</sup> This evidence directly refutes the proposition that the orders at issue had any manipulative price impact.

67. In today's modern markets, price movements in highly liquid stocks often occur in pennies or even a penny in a millisecond or even microsecond (one millionth of a second) increments as thousands of orders compete to achieve disparate trading objectives through varying

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<sup>67</sup> Professor Hendershott has previously recognized that something called a "vector auto-regression ("VAR") analysis" as the standard industry method for confirming that observed price impacts are not the result of such external market factors. *See* Hendershott Tr. at 103-04, 108, 154; Professor Hendershott's Declaration in the *Sarao* Case at 107. Mr. Hendershott inexplicably did not perform a VAR analysis in this case. *See* Hendershott Tr. at 103-104, 108, 154. This is so even though the only previous time that Mr. Hendershott testified regarding so-called "layering," he performed a VAR analysis (*id.* at 108); and the paper written by Mr. Hendershott that purports to review the price impact of limit orders featured a VAR analysis (*id.* at 154; Brogaard and Hendershott, "Price Discovery Without Trading: Evidence From Limit Orders" at 31 (Sept. 2015)). The paper cited in Mr. Hendershott's report for the proposition that limit orders can impact price also included a VAR analysis (Report at 5, n.4); as did a more recent follow-up paper by the same authors (Hendershott Tr. at 163; Hautsch and Huang, "Limit Order Flow, Market Impact and Optimal Order Sizes: Evidence from NASDAQ TotalView-ITCH Data" (Aug. 2011)).

<sup>68</sup> Hendershott Tr. at 108-113.

<sup>69</sup> Hendershott Report at 12; *see also* Hendershott Tr. at 100.

<sup>70</sup> *See* SEC Document Production z-06568207; Hendershott Tr. 114-16 (Q: "[T]his report [z-06568207], which is part of your analysis, says, concludes, that the nonlayering loops have a price impact that is slightly greater than the loops that you've identified as layering. Correct?" A: "So, yes.").

<sup>71</sup> *Id.*

strategies. Professor Hendershott conceded that “activities of other traders in the market” could contribute to any observed price movement around the orders placed in the Avalon account.<sup>72</sup> Nonetheless, Professor Hendershott’s analysis makes no attempt to account for these external market factors.<sup>73</sup>

## II. THERE IS NO EVIDENCE OF FALSE INFORMATION INJECTED INTO THE MARKETPLACE

68. “[T]he essential element of claim for manipulation under the federal securities laws “is that *inaccurate* information is being injected into the marketplace.”<sup>74</sup> Open market orders to purchase or sell securities, such as those at issue in this matter, without more cannot satisfy this requirement.<sup>75</sup>

69. “Wash sales” are an example of traditional market manipulation. In that scheme, a trader controlling two or more separate accounts executes trades in illiquid securities between those accounts to give the false impression of legitimate trading activity. Those fake trades inject misinformation into the marketplace because they create the false appearance that there are unaffiliated buyers and sellers in the market trading at those volumes and prices when, in fact, no beneficial ownership is changing hands and none of the risks associated with legitimate trading are being incurred.

70. Neither the SEC nor Professor Hendershott has identified what false information was supposedly injected in the marketplace by any of the Individual Traders with respect to orders at issue in this case.<sup>76</sup> When asked to identify the false information conveyed by the activity in two of the four examples from his initial report, Professor Hendershott demurred:

Q: And so my question is, looking at the TV examples [from your Report], you cannot tell me – you cannot point to any false information that was injected into the marketplace by the Avalon trader?

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<sup>72</sup> Hendershott Tr. at 89 (Q: “[W]hat other sort of external market factors other than Avalon’s quote and trading activity may have conceivably had an impact on price for any of these layering loops?” A: “So there would be the activities of other traders in the market. There could be – and those activities could be based on a whole variety of different things.”).

<sup>73</sup> *Id.* at 96 (“did I include variables about other market participants . . . the answer is no”); at 89 (Q: “Does your analysis take any of that activity by other traders in the market into consideration?” A: “So if the question is did I include specific variables that attempt to measure that, no.”); at 87-88 (Q: “Your analysis does not take into account any of the activity – quote activity away from the inside best bid and offer in determining whether or not that activity had any impact on observable price movements.” A: “[T]he answer is no. . . . [D]id I use that data. The answer is no.”).

<sup>74</sup> *GFL Advantage Fund v. Colkitt*, 272 F.3d 189, 205 (3d Cir. 2001) (emphasis in original); *see also*, *ATSI*, 493 F.3d at 100 (“courts generally ask whether a transaction sends a false pricing signal to the market.”).

<sup>75</sup> *ATSI*, 493 F.3d at 101.

<sup>76</sup> Hendershott Tr. at 369.

A: So the analysis is not based on individual loops. So it's based on – so, no.<sup>77</sup>

71. In my opinion, the open market orders placed by the Individual Traders through the Avalon account were not deceptive and did not convey any false information to the marketplace. On the contrary, they were actual orders that conveyed the same information that all legitimate orders convey – a willingness to buy or sell a certain quantity of securities at a certain price. There was nothing fake or false about these orders, which faced the legitimate risk of being executed from the instant they were posted to an exchange.<sup>78</sup>

72. Professor Hendershott's attempt to create an analogy between the so-called "layering" at issue here and shill bidders in rigged auctions<sup>79</sup> highlights the flaw in his analysis. Hendershott Report at ¶13. A shill bidder works in concert with the auctioneer – that is the fraudulent information concealed from the auction participants. The shill places phony bids knowing that he does not have to actually pay for the item should he not be outbid. Like the fake trades in a wash sale scheme, the shill's non bona fide bids are protected from any economic risk through his collusion with the fraudulent auctioneer. There is no comparable collusion alleged in this case. There is no undisclosed secret arrangement that protects the contested orders. Each of the challenged orders entered by the Individual Traders were subject to real economic risk of being executed by unaffiliated market participants. That those unaffiliated market participants chose, on their own, not to execute those orders, does not, in hindsight, make those legitimate open-market orders fraudulent.

73. In the examples cited by the SEC in its Complaint and by Professor Hendershott in his Report, the challenged orders exhibited the beneficial characteristics generally associated with legitimate market making.<sup>80</sup> In each, it appears that the contested orders increased available liquidity while almost always narrowing the spread. As previously noted, both of these are to be encouraged as they reduce the cost of trading for long-term investors.

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<sup>77</sup> Hendershott Tr. at 369-71.

<sup>78</sup> See, e.g., *In re Olympia Brewing Co. Sec. Litig.*, 613 F. Supp. 1286, 1296 (N.D. Ill. 1985) (“Where the trading volume and price simply reflect supply and demand based on accurate market information, this is lawful market behavior, not market manipulation.”); *Cohen v. Stevanovich*, 722 F. Supp. 2d 416, 424 (describing manipulation as giving the false appearance of actual trades without assuming any risk); *Yoshikawa v. SEC*, 192 F.3d 1209, 1220 (9<sup>th</sup> Cir. 1999) (critical question is whether defendant's trades were “genuine, bona fide trades in which the economic consequences of ownership were meant to fall upon the buyer's account.”).

<sup>79</sup> See Hendershott Report at 6.

<sup>80</sup> See, e.g., Hendershott Tr. at 288-291 (discussing the two CERN examples from pages 15-16 of his Report and agreeing that the contested orders “narrow[ed] the spread” and “provid[ed] liquidity”).

74. It is the supposed purpose of Professor Hendershott's criteria to distinguish his so-called "layering loops" from legitimate market making strategies.<sup>81</sup> Professor Hendershott claims that his third criteria – that three times more "quite side" shares execute than "loud side" shares – differentiates so-called "layering loops" from legitimate market making strategies.<sup>82</sup> "Whether or not a so-called 'loop' is designated layering or not layering [thus] depends on whether or not unaffiliated market participants execute Avalon traders' 'loud-side' orders in sufficient quantities."<sup>83</sup> The factors determinative of whether or not orders are "layering," according to Professor Hendershott, are events out of the Individual Traders' control that cannot be determined until after the fact. According to Professor Hendershott's flawed theory, traders intent on engaging in legitimate market making commit fraudulent manipulations in violation of federal securities laws when, in hindsight, other market participants over which they have no control decide to execute more of their orders on one side of the market than on the other:

Q: So I'm an Avalon trader. I'm engaged in what I believe to be legitimate market making activity, I'm on both sides of the market. I have a 2-for-1 order imbalance. And then as a result of say, news, right, the market moves in a certain direction and . . . a bunch of my quite-side orders get executed, but none of my loud-side orders get executed. And so now suddenly I have committed layering. Correct?

A: So that example, and the hypothetical you posed, so, yes, that could meet the criteria of layering. . . .

Q: [I]n that hypothetical I described . . . the Avalon trader doesn't have the intent to layer, but regardless of his intent, because of external market forces he could be deemed later by your analysis to have committed layering. Correct?

A: So that loop could meet the layering criteria, yes.<sup>84</sup>

75. Thus, under Professor Hendershott's theory of liability, the Individual Traders could only know whether they were engaged in unlawful market manipulation after the fact when they can see how the market reacted to their orders.<sup>85</sup> The only way to avoid possible liability under this enforcement paradigm would be to not engage in legitimate market making – a strategy that the SEC and Professor Hendershott have endorsed as beneficial to the market.

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<sup>81</sup> Hendershott Tr. at 48 (Q: "[O]ne of the things that you're trying to accomplish with your criteria is to distinguish trading activity that's consistent with layering from activity that is legitimate market-making. Is that one of the goals of your criteria?" A: "Yes.").

<sup>82</sup> Hendershott Report at 9 n.15 ("Examining only Loops with Execution Imbalance also eliminates trading strategies such as market making that place similar orders on both sides of the market or have imbalanced orders submissions where the Loud-side orders and Quiet-side orders execute similarly or the Loud-side orders execute more frequently.")

<sup>83</sup> Hendershott Tr. at 235; *see also id.* at 227-28.

<sup>84</sup> Hendershott Tr. at 239-40.

<sup>85</sup> *See* Hendershott Tr. at 237 (Q: "God himself cannot know whether or not there is an execution imbalance of 3 to 1 until after the executions take place. Correct?" A: "[Y]es.").

### III. THERE IS NO EVIDENCE OF TRADER INTENT

76. Another key element in a claim of market manipulation is that of scienter, or intent to defraud.<sup>86</sup> However, the SEC and Professor Hendershot appear to contend that it is enough to establish such fraudulent behavior merely if the actor canceled an otherwise legitimate order before its execution. The SEC's position ignores the fact that nearly every trader intends to cancel their limit orders before execution. For example, cancellation may be intended in advance of order entry if the market does not respond as predicted or where the order is entered to test market depth and liquidity. Traders are now left to guess when cancellations, which are essential to their business, are subject to enforcement actions, and maybe even criminalization. Such interpretations would create greater harm to the securities markets as limit orders dominate that industry so how does anyone know, after the fact, that a few of hundreds of thousands of orders are fraudulent whereas the vast majority of such limit orders that are cancelled are not.<sup>87</sup>

77. The trading activity at issue is not objectively distinguishable from legitimate market making, which the SEC recognizes entails canceling the majority of the Individual Traders' orders.<sup>88</sup> The SEC cannot "infer unlawful intent from lawful activity alone."<sup>89</sup>

78. Professor Hendershott has conceded that he has no knowledge regarding actual intent of any of the Individual Traders – he has not spoken to any of the Individual Traders or reviewed any transcripts of any interviews of any of those traders.<sup>90</sup> Indeed, Professor Hendershott admitted he has no idea what any of the Individual Traders intended:

Q: And as to any individual order or so-called loop identified by your analysis, you can't say whether or not the trader intended or did not intend to execute any particular order. Is that correct?

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<sup>86</sup> See, e.g., *Ernst & Ernst v. Hochfelder*, 425 U.S. 185, 193 (1976) (holding that there must be an intent to defraud and not mere negligence to establish a violation of an anti-fraud statute); *ATSI Communications*, 493 F.3d at 101 (holding that market manipulations requires *inter alia* scienter).

<sup>87</sup> See e.g. Deposition Transcript of Marin Nitzov (the "Nitzov Tr.") at 197-200 (explaining that market maker's quotes are still "bona fide" even though the market maker may not intend to execute all quoted orders because the market maker is "fully exposed to execute the full size of any single quote that is present in the market"); *Id.* at 221 (agreeing that market maker quotes are "bona fide" even though it was not the market maker's intent to execute all the posted size because they were nonetheless "fully actionable by any market participant").

<sup>88</sup> SEC Release No. 34-61358, 17 C.F.R. 242 at 49.

<sup>89</sup> *GFL Advantage Fund v. Colkitt*, 272 F.3d, 189, 207 (3d Cir. 2001); followed and adopted by *ATSI Communications v. Shaar Fund*, 493 F.3d 87, 101 (2d Cir. 2007); see also *United States v. Mulheren*, 938 F.2d 364, 368 (2d Cir. 1991) (expressing "misgivings about the government's view of the law" that otherwise legitimate "open market" transactions could constitute manipulation under Section 10(b)).

<sup>90</sup> Hendershott Tr. at 354-56 (Q: "[Y]ou haven't spoken to any Avalon traders. Right?" A: "I have not." Q: "Or read any transcripts of interviews or depositions of any Avalon traders?" A: "I don't believe I have seen any, no.").

A: So yes, that is correct.<sup>91</sup>

79. If anything, the examples cited by the SEC and Professor Hendershott evidence an intent by those Individual Traders to execute the challenged orders. In each, the limit orders the SEC and Professor Hendershott characterize as “non bona fide” were almost all priced better than, at or near the NBBO, where the SEC data detailed above shows they were most likely to be executed.<sup>92</sup> In my opinion, the Individual Traders placing orders priced better than, at or near the NBBO evidenced an objective intent to have those orders executed.

80. Professor Hendershott agreed that aggressively pricing your orders at or near the inside evidences a traders’ intent to execute:

How would traders make their orders more likely to execute? So they make them more likely to execute by making them visible, by making them at better prices . . . . I agree that orders on the inside are more likely to execute.<sup>93</sup>

#### IV. THERE IS NO EVIDENCE OF MANIPULATIVE ACTS

81. To prove a market manipulation in a violation of the federal securities laws the SEC must also produce evidence of a manipulative act, *i.e.* some improper conduct done to deceive the marketplace.<sup>94</sup> Here all the SEC and Professor Hendershott have shown is that the Individual Traders placed legitimate open market orders not all of which executed and were subsequently canceled. The SEC has not alleged and I have seen no evidence to suggest that either Avalon or any of the Individual Traders were doing anything to prevent those orders from being executed.

82. Professor Hendershott admitted that he was not aware of anything that the Individual Traders were doing to prevent their orders from being executed.<sup>95</sup> As noted above, Professor Hendershott listed three things that traders could do to cause their orders to be *more likely* to be executed – make the orders visible, priced aggressively and routed to active

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<sup>91</sup> Hendershott Tr. at 374-75; *see also* at 421-22 (“So in any individual loop, I don’t know what people’s intents are.”).

<sup>92</sup> *See* Compl. at ¶¶ 43-47; Hendershott Report at 15-18 and Exs. 7a, 7b, 8a, 8b; Hendershott Second Suppl. Report, Exs. 18, 19, 20a, and 20b. Indeed, Professor Hendershott and other academics have observed that limit orders priced one or more price levels away from the NBBO have a negligible impact on market price.<sup>92</sup> This finding caused Professor Hendershott to opine that “If you were thinking about ‘spoofing’ . . . it looks like any spoofing you’d have to do – right, you place an order and you want it to have a price impact – would have to occur at the best price.”<sup>92</sup>

<sup>93</sup> Hendershott Tr. at 329, 331.

<sup>94</sup> *See, e.g. ATSI*, 493 F.3d at 101.

<sup>95</sup> Hendershott Tr. at 228 (Q: “[A]re you aware of anything that the Avalon traders were doing to prevent the execution of their loud orders?” A: “No.”); at 336 (Q: “[I]t doesn’t appear to be he is doing anything to prevent the execution of his loud orders, right? A: “[N]othing jumps out.”)

exchanges.<sup>96</sup> He then conceded that the Individual Traders did all three of those things in the examples cited in his Report.<sup>97</sup>

83. This can be contrasted with the behavior challenged in another case in which Professor Hendershott provide expert testimony, *CFTC v. Nav Sarao Futures Limited PLC*, 1:15-cv-03398 (N.D. Ill.) (“*Sarao*”). The Defendant in Sarao was accused of manipulating the futures market using a layering algorithm that placed large orders away from the inside market. In that case, Professor Hendershott opined that Mr. Sarao’s orders were non bona fide because they were placed well away from the inside price where they were unlikely to be executed, and then as prices moved, his algorithm automatically modified those orders to continually maintain their distance from the inside so as to prevent their execution.<sup>98</sup>

84. Here, Professor Hendershott has conceded that there was no evidence that the Individual Traders were doing anything to prevent their orders from being executed and that, instead, his opinion that those orders are non bona fide is simply that the “orders don’t execute.”<sup>99</sup>

85. However, as noted above, the SEC has found that the vast majority of orders placed at or near the inside – *i.e.* the orders with the best chance of execution – nonetheless go unexecuted and are quickly canceled.<sup>100</sup>

86. The high cancellation rates observed by the SEC reflect that fact that traders routinely intend to cancel trades before their execution for a broad range of legitimate reasons. For example, a trader (or an algorithm) placing an order intends to cancel that order if the market does not react in the manner that the trader (or algorithm) predicted. Likewise a traders (or algorithms) engaged in a two-sided strategy will intend cancel their orders as new information is conveyed by the market either through execution(s), nonexecution(s), price changes and/or inventory changes. These high cancellation rates were recognized by the SEC as the predictable result of legitimate market making and cannot form the basis for any reasonable inference of fraudulent intent and cannot, without more, constitute manipulative acts.

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<sup>96</sup> *Id.* at 329.

<sup>97</sup> *Id.* at 330-37.

<sup>98</sup> *CFTC v. Nav Sarao Futures Limited PLC*, 1:15-cv-03398, Appendix to Plaintiff’s Motion for a Statutory Restraining Order Containing Declarations and Exhibits – Declaration of Terrence Hendershott (“Hendershott Sarao Decl.”) at 104-05; Hendershott Tr. at 232.

<sup>99</sup> Hendershott Tr. at 233 (Q: “And is there any evidence in this case that Avalon was doing anything similar to prevent their loud orders from being executed?” A: “If the question is did they do some sort of dynamic layering technique, which is what we’re talking about on Sarao, I don’t have any evidence that that is exactly what they are doing. The evidence that is there is that the loud orders don’t execute.”); *see also id.* at 228 (Q: “[A]re you aware of anything the Avalon traders were doing to prevent the execution of their loud orders?” A: “No.”), at 336 (Q: “And, again, it doesn’t appear to be [the trader] is doing anything to prevent the execution of his loud orders, right?” A: “[N]othing jumps out.”).

<sup>100</sup> *See* Equity Market Speed Relative to Order Placement.

87. Moreover, it is well known that higher latency orders like those placed through the Avalon account are systematically precluded from being executed by competition from HFTs deploying a parasitic strategy sometimes referred to as “quote matching.” Quote matching machines respond to orders that improve the NBBO by immediately quoting a new order at an improved price to maintain priority within the queue. These machines attempt to monopolize the inside market to capture the spread and rebates earned trading with less patient and usually less informed order flow. They use the unexecuted higher latency orders, like Avalon’s, as a free option to stop gap any losses should the market move unexpectedly. As described by former SEC chief economist, Larry Harris:

Quote matchers profit by extracting option values from standing limit orders submitted by slower traders. They trade ahead of such orders by improving prices slightly or trading in another venue. If the prices then change in their favor, they profit. But if they expect prices to move against them, perhaps because of the prices of correlated securities or indices have changed, they immediately exit their positions by trading with standing limit orders. The traders [like Avalon] who issue the standing limit orders thus fail to trade when they wish they had, and trade when they wish they had not.<sup>101</sup>

88. Professor Hendershott also described how this low-latency algorithmic trading strategy could prohibit the execution of the Individual Traders’ orders:

Obviously, speed is important for queue position. You know if you enforce time priority in a queue, getting there faster is helpful. So you want to be able to incorporate the public information as fast as possible. If you do it by your quotes or by your limit orders, well, you know this – it may allow you to offer better prices, which can actually lower trading costs for some people. But at the same time, if it’s only a few people who can process information really fast, in some sense there – you’re going to always have to trade with them. It’s hard for the natural buyer/seller to find each other. Because they are afraid they’re going to put their price out there but they’re never going to trade, because the high-frequency trader is always going to be in front of them in the queue. And then the only time that the high-frequency guy is going to pull out of the queue is when you don’t want to trade.<sup>102</sup>

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<sup>101</sup> Harris, “What To Do About High-Frequency Trading,” *Financial Analysis Journal*, at 7 (2013) (available at <https://www.cfapubs.org/doi/pdf/10.2469/faj.v69.n2.6>).

<sup>102</sup> Hendershott Tr. at 250-51.

89. Professor Hendershott’s analysis does nothing to dispel this or any of the other numerous innocent explanations for why the challenged orders went unexecuted. Given that nonexecution and cancellations is the overwhelming probable outcome for any order, one cannot rightly just assume that such cancellations constitute manipulate acts.

## V. AVALON’S ALLEGED PROFITS FROM MANIPULATIVE TRADING ARE MISCALCULATED

90. “Generally, disgorgement is a form of “[r]estitution measured by the defendant’s wrongful gain.”<sup>103</sup> Professor Hendershott’s faulty analysis grossly overstates the profits allegedly earned by Avalon as a result of the challenged trades.

91. First, as previously noted, Professor Hendershott has admitted that he cannot confirm whether any of the over 675,000 so-called “layering loops” identified by his criteria are actual examples of manipulative misconduct. Professor Hendershott tried to avoid having to defend individual “layering loops” identified by his analysis claiming that his opinion was a “probabilistic statement” about “patterns” and not an attempt to identify individual instances of alleged manipulation.<sup>104</sup> Yet, his revenue analysis counts as “wrongful” each of the so-called “layering loops” to arrive at a profit number that the SEC uses to support the amount its seeks in disgorgement. Professor Hendershott cannot have it both ways – having refused to opine that any individual “loop” is wrongful, he cannot baselessly assume they are all wrongful for purposes of calculating disgorgement.

92. Moreover, Professor Hendershott’s revenue calculation is fundamentally flawed in that it makes no attempt to isolate wrongful gains from those resulting from unrelated market forces. As noted above, Professor Hendershott was not given market pricing data for the vast majority of orders at issue and did not perform a valid price impact analysis on any of the individual contested orders. Professor Hendershott thus has no way of distinguishing profits made from allegedly manipulative price impacts versus profits earned through unrelated market movements.

93. For example, in the two TV examples cited in his initial report, all of the price movement captured by Professor Hendershott’s revenue calculations occurred before any of the so-called non bona fide orders were ever placed.<sup>105</sup> Thus, every single penny of the \$420 that Professor Hendershott attributed to those so-called “loops” was demonstrably generated by market

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<sup>103</sup> *Kokesh v. SEC*, 137 S.Ct. 1635, 1640 (2017) (citing Restatement (Third) of Restitution and Unjust Enrichment § 51, Comment a, p. 204 (2010)). In *Kokesh*, the Supreme Court held that “disgorgement” in SEC civil enforcement proceedings constituted a “penalty” for purposes of the 5-year statute of limitation under 28 U.S.C. § 2462. *Id.* at 1644. The *Kokesh* decision raises questions as to whether disgorgement is still an available remedy in SEC civil enforcement actions. In this Report I do not offer an opinion one way or the other on that purely legal question.

<sup>104</sup> Hendershott Tr. at 36, 38, 240, 431.

<sup>105</sup> Hendershott Tr. at 364-69 (Q: “Price movement happens before there are any loud orders in the market.” A: “Uh-huh.”); z-006568206.

factors unrelated to the orders that Professor Hendershott deemed wrongful and would not properly be subject to disgorgement.

94. Similarly, Professor Hendershott's revenue calculations determine trading profits by pairing off long and short positions established sometimes minutes, other times hours, apart from each other. During those intervening time periods it is not alleged that there are any manipulative orders in the market. Yet, Professor Hendershott's revenue calculations wrongly attribute any price movement during those intervening time periods to the alleged misconduct.

95. Because Professor Hendershott's revenue analysis does not distinguish between wrongful gains and those attributable to unrelated market movements, it cannot be properly used as a basis for disgorgement.

96. More fundamentally, Professor Hendershott and the SEC wrongly assume that Avalon retained all of the profits from these trades. On the contrary, Lek extracted substantial per share commissions and other fees from every trade executed through the Avalon account.<sup>106</sup> Any attempt to calculate Avalon's "wrongful gains" must subtract from any purported profit calculation the amounts paid to Lek in commissions and fees – money that Avalon never received.

97. Likewise all of trades at issue were executed by the Individual Traders - independent contractors who contractually retained the profits from those trades.<sup>107</sup> Per those contractual agreements Avalon was paid only a percentage of those profits – typically between 5% and 15%.<sup>108</sup> Thus any proper calculation of the wrongful gain earned on the contested trades would need to be reduced by approximately 85 to 95% to reflect the portion of those profits that were actual gains by Avalon.

### **REBUTTAL TO EXPERT REPORT OF NEIL PEARSON**

98. As to the allegations regarding so-called "cross market manipulation," it is quite common in the industry for traders to buy the underlying security and then trade puts and call options on that security.

99. In my opinion there is no basis for the SEC's and Professor Pearson's contentions that the equities trades entered into by the Individual Traders "artificially" moved the market for the corresponding options. The challenged trades are actual trades executed with willing unaffiliated market participants. There is no allegation of collusion, insider information or any other factors that would render these open market equity transactions between willing buyers and sellers somehow fraudulent.

100. That trades executed for a large quantities of shares on one side of the equity markets was accompanied by corresponding price movements is a fundamental demonstration of the interaction of supply and demand – not evidence of nefarious activity. As a trader purchases,

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<sup>106</sup> See Complaint at ¶ 78.

<sup>107</sup> Fayer Declaration at ¶¶ 4,5.

<sup>108</sup> *Id.*

for example, more and more shares of an underlying security those purchases exhaust the available supply at higher and higher price levels. The more shares the trader attempts to purchase the greater the per share price they can expect to have to pay in order to attain their total desired inventory. So long as shares are changing hands between unaffiliated market participants, as is the case here, there is nothing “artificial” about those resulting price movements. That movement is simply the reflection of actual increased demand (or supply) for that security.

101. Nor is there anything “artificial” about the corresponding movement in the prices for the options in those underlying securities. Options are derivatives.<sup>109</sup> Price changes in the underlying are the primary driver of changes in the prices of put and call options – especially those at or near the money like those at issue here.<sup>110</sup> Of course the prices of those options move when the prices of the underlying move. There is, however, a disconnect between the prices and size quoted in the options and those quoted in the equities markets in these examples that creates the opportunity for arbitrage.

102. Options market makers typically quote contracts amounting to significantly more share equivalents – *i.e.* “delta” – than is readily available in market for the underlying security.<sup>111</sup> The spread between the bid and the ask for options is typically larger than that for the underlying security.<sup>112</sup> This increased spread is referred to as the options market maker’s “edge” and is intended to compensate the option market maker for the risks associated with the generally greater size quoted on the options versus the equity markets.<sup>113</sup> A risk-averse options market maker seeking to remain delta neutral after executing an options transaction may need to trade through one or more price levels to establish the offsetting position in the equity market. The additional spread in the options market, if priced and sized efficiently, should adequately compensate the option market maker for that additional hedging cost.<sup>114</sup>

103. In the challenged transactions, the Individual Traders had tested the available liquidity in the equity markets and made the determination that spreads quoted in the corresponding options were too narrow (or, conversely, the quoted size was too large) and did not accurately reflect the true delta risk associated with those quotes. In the opinion of the Independent Traders, the options were inaccurately priced, which created a legitimate trading opportunity.

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<sup>109</sup> See, e.g., Deposition Transcript of Gene DeMaio at 360 (“The option is derivative. It’s pricing off the equity.”).

<sup>110</sup> See, e.g., Pearson Report at 7 (“changes in the price of call and put options are driven primarily by changes in the prices of their underlying stocks.”); Nitzov Tr. at 83 (the price of the underlying security is “a primary factor” in determining option prices).

<sup>111</sup> See, e.g. Nitzov Tr. at 198-199.

<sup>112</sup> See, e.g. Nitzov Tr. at

<sup>113</sup> See, e.g. Nitzov Tr. at 213-214 (“It’s my opinion that the spread of the options market exist to partially compensate options market participants for the levered nature of the security that is being traded against.”)

<sup>114</sup> See, e.g. Nitzov Tr. at 210-213 (describing the higher spreads observable in the options versus the equity markets).

104. Indeed, if the options had been properly priced, the Independent Traders strategy would not have worked. To explain, imagine this simple example from an efficient market with accurate pricing:

- 1) A trader buys 100,000 shares by buying 100 share lots from various market participants until he achieves his desired inventory
- 2) That buying pressure causes the trader to pay increasingly higher prices between \$100 and \$110 per share for a volume weighted average purchase price of \$105 per share
- 3) The trader can then offset that position by quickly selling 100,000 shares, again in 100 share lots to willing market participants
- 4) That selling pressure causes the trader to be paid decreasingly lower prices between \$110 and \$100 for a volume weighted average sales price of \$105 per share.

105. In this simple trading strategy, the price impact of the buying and selling pressure should offset in an efficient market without any intervening market factors and the trader would not expect to make any profit, but rather simply incur transaction costs.

106. You can recreate the delta equivalent of an equity position using options.<sup>115</sup> So to change the example above, a trader could:

- 1) Buy 100,000 shares – i.e. purchase delta – at a volume weighted average price of \$105 per share, and then
- 2) Sell 1000 calls (or buy 1000 puts) – i.e. sell delta to cover the position

107. In an efficient market in which the options are accurately priced, you would expect the trader when liquidating (or hedging) that position using the derivative options to again be paid a volume weight average price comparable to that spent establishing the delta long position, in this example \$105 per share. You would expect the trader to receive lower and lower prices selling the same amount of delta that he acquired in the equity market until the price per delta was approximately \$105 assuming no external market factors. In an efficient market, with accurate pricing, that would again not be profitable strategy as the purchase and sale prices would again offset and the trader would simply incur transaction fees.

108. If, however, the options are mispriced such that, for example, the trader could sell more delta at prices that did not accurately reflect delta risk, then the second strategy creates a profit opportunity. So, for example, if the trader in that example were able to sell 1000 calls at a weighted average price of \$107 instead of \$105, the trader has made a profit. That profit is not dependent on any “artificial” price movement in either the equity or the options markets. It is the

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<sup>115</sup> See, e.g. Nitzov Tr. at 84 (explaining that an investor wishing to be “long” Apple could establish that position by purchasing Apple stock or acquiring a comparable synthetic position in Apple options that would behave very similarly to owning shares of stock); *id.* at 103 (explaining “synthetic” positions).

result of inaccurate pricing in the options market that did not adequately account for the delta risk associated with the quoted size.<sup>116</sup>

109. It was the option market makers' failure to accurately price their options to account for the liquidity disparity quoted in options market and that available in underlying market that accounts for the profits earned on the trades challenged by the SEC and Professor Pearson.<sup>117</sup> There is nothing "artificial" about any of those prices. The option market makers voluntarily offered to trade those amounts of securities at those prices. That those quoted prices in hindsight were unprofitable for those market makers does not preclude the Independent Traders from executing against those quotes. Indeed, it is the legitimate goal of any trader to attempt to trade against prices believed to inaccurately reflect conditions in the market.<sup>118</sup> Such trading should ultimately eliminate market inefficiencies are lead to more accurate market pricing.<sup>119</sup>

110. In sum, I disagree that there is "no legitimate economic rational"<sup>120</sup> for the trading activity the SEC has labeled the "cross market strategy." The economic rational was to profit from the disconnect between the large amount of liquidity instantaneously available in the options market versus the limited liquidity available in the underlying equities markets. The prices quoted by the options market makers did not adequately factor in this delta hedging risk and created a legitimate arbitrage opportunity.

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<sup>116</sup> Nitzov Tr. at 82 (admitting that the so called cross market strategy was effective because "the total amount of delta that was available in the underlying market at the time of the sweep was insufficient to fully hedge the amount of risk that was transferred to the market making community"); *id* at 85 (describing the strategy as "accessing liquidity in the options market in a fashion that by far exceeded the amount of liquidity that's available in the equities market for options market participants to hedge the risk that was transferred to them").

<sup>117</sup> *See, e.g.*, DeMaio Tr. at 359-360 (acknowledging that options market makers may execute all of the deltas at the new price without regard to the slippage costs displayed in the equities market).

<sup>118</sup> Nitzov Tr. at 223 (Q: "[I]s arbitrage a bona fide reason for executing options trades, in your opinion?" A: "I believe that pursuing arbitrageable gains between options is a valid trading strategy.")

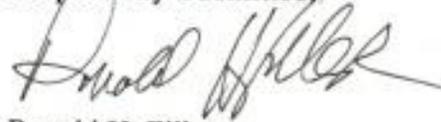
<sup>119</sup> *See, e.g.*, Nitzov Tr. at 109-10, 118 (describing how the so-called cross market strategy forced option market makers to widen their spreads and limit their size to properly account for delta hedging risk).

<sup>120</sup> Pearson Report at 6.

**CONCLUSION**

For these reasons, it is my expert opinion that the SEC has failed to prove that Defendants engaged in any manipulative or illegal conduct.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read "Ronald H. Filler", written in a cursive style.

Ronald H. Filler  
Professor of Law

**EXHIBIT A**  
**C.V. OF PROF. RONALD FILLER#**  
(INCLUDES LIST OF PUBLICATIONS OF PROF. FILLER)

**RONALD H. FILLER**  
**Professor of Law and Director of the Financial Services Law Institute**  
**New York Law School**  
**185 West Broadway, Room C-325**  
**New York, NY 10013**  
**Work: (212) 431-2812**  
**Cell: (973) 495-8609**  
**Work Email: ronald.filler@nyls.edu**  
**Home Email: rfiller48@gmail.com**

**Current Position** Professor of Law, Director of the Financial Services Law Institute and Program Director of the LL.M. in Financial Services Law, New York Law School, New York, NY (June 2008–Present). I teach courses on Securities Regulation, Derivatives Market Regulation, Regulation of Broker-Dealers and Futures Commission Merchants, Regulatory Policy and Financial Services Seminar.

**Career Summary** Managing Director and Director of Institutional Futures Administration, Capital Markets Prime Services Division, Lehman Brothers Inc., New York, New York (January 1993–May 2008)

Partner, Senior Futures Lawyer and Member of Executive Committee (1991–1993), Vedder Price Kaufman & Kammholz, Chicago, Illinois (1985–1993)

Managing Partner, Filler Weiner Zaner & Associates, a Futures Commission Merchant and Commodity Pool Operator, Chicago, Illinois (1980–1985)

Director of Managed Futures and Associate Counsel, ContiCommodity Services Inc., a Futures Commission Merchant, Chicago, Illinois (1977–1980)

Associate, Moses Gibbons Abramson & Fox, Chicago, Illinois (1976–1977)

Attorney, Division of Investment Management, U.S. Securities and Exchange Commission, Washington, DC (1973–1976)

**Other Teaching/  
Academic Experiences** Director and Founder of the Commodities Law Institute (1978–1995) at Chicago-Kent College of Law, Chicago, IL

Member of Board of Overseers (1980–Present), Member Advisory Committee of LL.M. in Financial Services Law (1985–1995) and Adjunct Professor of Law (1977–1993) at Chicago Kent College of Law, Chicago, IL, where I taught several courses on Futures Law and the Regulation of Brokerage Firms

Adjunct Professor of Law, University of Illinois College of Law, Champaign- Urbana, IL (Spring, 2008 and Spring, 2011) where I taught a Derivatives Law Regulation Course

Adjunct Professor of Law, New York Law School, New York, NY (2007), where I taught a Derivatives Market Regulation Course

## **Industry Leadership**

Adjunct Professor of Law, Brooklyn Law School, Brooklyn, NY (1993–1996), where I taught a Futures Derivatives Law Course

Member, Board of Directors (Public Director) of the National Futures Association (2010 to Present); Member, Executive Committee of the National Futures Association (2014–Present); Member, Board of Directors of the National Futures Association (1983–1985)

Member, Governance Advisory Committee of the National Futures Association (2012 to Present)

Member, Membership Committee, National Futures Association (2015–Present)

Member, Swap Advisory Committee of the National Futures Association (2011 to 2012)

Member, Special Committee for the Protection of Customer Funds of the National Futures Association (2012)

Chair, Special Committee on BRG Recommendations, National Futures Association (2013)

Member, Board of Directors, GCSA, LLC (2012 to Present), a company that provides insurance and collateral management to Clearinghouses around the globe

Member, Board of Directors (Public Director) of SWAP-EX, a swap execution facility (SEF) owned by State Street Bank (2013 to Present)

Chair, Regulatory Oversight Committee (ROC) of SWAP-EX (2013 to Present)

Chair, Nominating Committee of SWAP-EX (2013 to Present)

Member, Board of Directors (Public Director) of Bcause, which is applying to become an exchange and clearinghouse to trade and clear futures on Bitcoins (2018 to Present)

Chair and Member, Global Markets Advisory Committee (GMAC) of the U.S. Commodity Futures Trading Commission (2012 to 2013); Former Member of GMAC (2004–2008)

Consultant, Bates Group LLC (2015 to Present)

Member, NYSE Hearing Board and NYSE Acceptability Hearing Board (2014 to Present);

Vice-Chair, International Financial Products and Services Committee, ABA Section on International Law (2015 to Present)

Consultant, Allen & Overy in connection with its derivatives practice (2011 to 2013)

Member, Risk Advisory Committee of New York Portfolio Clearing (2011 to 2013)

President (1998–2000), Secretary (1995–1998) and Member of the Executive Committee (1980 to Present), FIA Law and Compliance Division

Member, Board of Trustees, The Clearing Corporation Charitable Foundation, a 501(c)(3) Organization (2007 to Present)

Member, Editorial Board of “Futures & Derivatives Law Report”, a Publication by The Journal on the Law of Investments & Risk management Products (1998–Present)

Member, Editorial Board of the NY Business Law Journal, a Publication of the Business Law Section of the New York State Bar Association (2011–Present)

Serves as Expert Witness on several major civil litigation and enforcement matters relating to Futures, OTC Derivatives, Capital Markets, Securities, Margins, Clearing Issues, Customer Asset Protections, Hedge Funds, Market Manipulations, Trading Activities, Mutual Funds, Asset Management, Events of Defaults, Bankruptcy Issues, Suitability Issues, Theories of Agency Liability, and Supervisory Responsibilities of Financial Firms. A list of the cases is set forth below.

Acts as a Consultant involving all aspects of futures, securities, derivatives and other investment products and the management, operation and administration of global financial services firms.

Provides consulting and training services to governmental regulators around the globe

Provides educational and training courses and programs on a variety of issues facing the global financial services industry.

Member, Board of Directors (Public Director) of NYSE LIFFE US, a subsidiary of NYSE EURONEXT (2010 to 2013)

Member, Regulatory Oversight Committee (ROC) of NYSE LIFFE US (2010 to 2013)

Member, Business Conduct Committee, New York Mercantile Exchange (2008–2011)

Member, Board of Directors, The Clearing Corporation (2005–2007)

Member, Clearing House Risk Advisory Committee, Chicago Mercantile Exchange (2006–2008)

Vice Chairman of BrokerTec Clearing Corporation (November 2002 – December 2003)

Chaired Rules Committee of the BrokerTec Futures Exchange and BrokerTec Clearing Corporation, which commenced trading in late 2001

Chaired FIA Survey on Electronic Trading (2001)

Member, NFA Nominating Committee (1997 and 2000)

Member, Barings Task Force Study organized by the Futures Industry Association (1996)

Member, Risk Management Committee of the Futures Industry Association (1995)

Elected as one of the Best Lawyers in Illinois (1991)

Rated, AV, Martindale Hubbell Law Directory (1990–1993)

Chairman, Futures Law Committee, Chicago Bar Association (1986)

Chair, Sub-Committee of Futures Commission Merchants of the Futures Regulation Committee of the American Bar Association (1985–1995)

Member, Board of Directors of the Futures Industry Association (1983–1985 and 2008–2010)

Member, Board of Directors of the Mid-America Commodity Exchange (1983–1985)

Served as Moderator or Panelist on over 300 industry panels sponsored by American Bar Association, the Asian Development Board, Chicago Bar Association, Chicago Kent College of Law, Futures Industry Association, Commodities Educational Institute, CFTC Program for International Regulators and other program sponsors (1978 to Present)

Author of numerous books, articles and papers on a variety of topics facing the U.S. and international futures, securities, derivatives and financial services industries. See List of Publications below.

Member of numerous industry advisory committees sponsored by the FIA Law and Compliance Division

Member, Chicago Board of Trade, Chicago Mercantile Exchange, New York Mercantile Exchange and other U.S. Exchanges (2003 – 2008)

President, Inverness Homeowners Association, Hamburg, NJ (2007 to 2017)

Treasurer, Crystal Springs Men’s Golf Association, Hamburg, NJ (2010 to 2014)

## **Publications**

Co-Author of a Casebook on the “Regulation of Derivative Financial Instruments (Swaps, Options and Futures)”, Published by West Academic (May 2014)

Co-Author of the Teacher’s Manual to “Regulation of Derivative Financial Instruments (Swaps, Options and Futures), Published by West Academic (May 2014)

Co-Author of Whistleblowers -- A Case Study in the Regulatory Cycle For Financial Services, to be published in the Brooklyn Journal of Law and Policy, Spring 2018

Co-Author of Ask the Professors – Will the Recent U.S. Supreme Court Case in *Salman* Result in More CFTC Enforcement Actions Charging Insider Trading? 37 Fut. & Deriv. L. Rep. (March 2017)

Commodity Pool Operators and Related CPO/CTA Rules Under the Dodd-Frank Act -- A Practice Note, to be published by Lexis Nexis (Winter 2016)

The Dodd-Frank Act: Requirements for Swap Dealers – A Checklist, to be published by Lexis Nexis (Winter 2016)

Final Internal Business Conduct (IBC) Rules for Swap Dealers Under the Dodd-Frank Act -- A Practice Note, to be published by Lexis Nexis (Winter 2016)

The Dodd-Frank Act: Derivatives Margin Collateral Rules -- A Practice Note, to be published by Lexis Nexis (Winter 2016)

Energy Derivatives -- Which Country (U.S. or U.K.) Provides The Best Customer Asset Protections to an Energy Trading Firm If Its Brokerage Firm/Counterparty Files for Bankruptcy? 37 Energy Law Journal 101 (Fall 2016)

When All Else Fails: The Evolution of Customer Asset Protections After Brokerage Bankruptcy, Financial History (Issue 118, Summer 2016) at 32-34, 38-39.

The 7<sup>th</sup> Circuit and Sentinel – Five Times a Charm, 36 Fut. & Deriv. L. Rep. 4 (April 2016)

My Thoughts and Reflections on the Fifth Anniversary of the Dodd-Frank Act and Other Current Matters, 35 Fut. Dev. L. Rep. 12 (July 2015)

Co-Author of The Flash Crash Case Against Sarao -- Will the CFTC Prevail? 35 Fut. & Deriv. L. Rep. 12 (June 2015)

Co-Author of Ask the Professors: What is the Impact of the Recent DC Court's Opinion in *SIFMA et al, v. CFTC* on the CFTC's Cross-Border Guidance?", 35 Fut. & Deriv. L. Rep. (October 2014)

Ask the Professor: Did the 7<sup>th</sup> Circuit Properly Rule in Sentinel II? 35 Fut. & Deriv. L. Rep. (April 2014)

Co-Author of Ask the Professors: Did the European Court of Justice Properly Rule by Dismissing the U.K.'s Attempt to Annul ESMA's Regulation Banning Short Selling? 34 Fut. & Deriv. L. Rep. 25 (March 2014)

Ask the Professor: How Will the Seventh Circuit Rule in Sentinel II? 33 Fut. & Deriv. L. Rep 21 (November 2013)

Ask the Professor: What Is the Impact on MF Global from The Recent UK Supreme Court Decision Involving Lehman Brothers International(Europe)? 32 Fut. & Deriv. L. Rep. 1 (April 2012)

Ask the Professor: "OMG! What Did MF Global Do?", 31 Fut. & Deriv. L. Rep. (November 2011)

Consumer Protection: How U.K. Client Money Rules Differ from U.S. Customer Segregated Rules When a Custodian Firm Fails to Treat Customer Property Properly, 24 Journal of Taxation and Regulation of Financial Institutions 25 (May/June 2011)

Ask the Professor: Portfolio Margining – How Will Dodd-Frank Impact Its Utilization? 30 Fut. & Deriv. L. Rep. 8 (November 2010)

Ask the Professor: What Is Margin and How Is It (Or Should Be) Determined? 29 Fut. & Deriv. L. Rep. 15 (March 2009)

Ask the Professor: Who Has, Or Who Should Have, Jurisdiction Over CDS Clearing? 29 Fut. & Deriv. L. Rep., 11 (January 2009)

Are Customer Segregated/Secured Amount Funds Properly Protected After Lehman? 28 Fut. & Deriv. L. Rep. 1 (November 2008)

Ask the Professor: Give-Ups After Griffin -- What Changes Are Needed Now? 19 Fut. & Deriv. L. Rep. 1 (March 1999)

**Education**

B.A. (Major, Political Science), University of Illinois Champaign-Urbana Campus (1970)

J.D. (with Honors), George Washington University Law School (1973)

LL.M. in Taxation, Georgetown University Law Center (1976)

## **EXHIBIT B**

### **DOCUMENTS REVIEWED AND CONSIDERED**

1. SEC COMPLAINT
2. EXPERT REPORTS OF PROFESSOR TERRENCE HENDERSHOTT AND EXHIBITS THERETO
3. TRANSCRIPT OF DEPOSITION OF PROFESSOR TERRENCE HENDERSHOTT, DATED MAY 9, 2017
4. DEFENDANT'S AVALON FA LTD.'S MEMORANDUM OF LAW IN SUPPORT OF FRE RULE 702 MOTION TO EXCLUDE TESTIMONY OF TERRENCE HENDERSHOTT, PREPARED BY COUNSEL FOR THE DEFENDANTS
5. DEFENDANT'S AVALON FA LTD.'S MEMORANDUM OF LAW IN FURTHER OPPOSITION TO PLAINTIFF'S MOTION FOR PRELIMINARY INJUNCTION, PREPARED BY COUNSEL OF THE DEFENDANTS
6. EXPERT REPORT OF ROGER BEGELMAN
7. EXPERT REPORT OF PROFESSOR NEIL PEARSON
8. DEPOSITION TRANSCRIPT OF ADAM NUNES
9. DEPOSITION TRANSCRIPT OF NATHAN FAYYER
10. DEPOSITION TRANSCRIPT OF GENE DEMAIO
11. DEPOSITION TRANSCRIPT OF MARIN NITZOV
12. DECLARATION OF NATHAN FAYYER
13. [HTTPS://WWW.SEC.GOV/NEWS/STATEMENT/US-EQUITY-MARKET-STRUCTURE.HTML](https://www.sec.gov/news/statement/us-equity-market-structure.html)
14. SEC RELEASE NO. 34-61358, 17 C.F.R. 242
15. JERRY W. MARKHAM & DANIEL J. HARTY, *FOR WHOM THE BELL TOLLS: THE DEMISE OF EXCHANGE TRADING FLOORS AND THE GROWTH OF ECNS*, 33 J. CORP. L. 865 (SUMMER 2008)

16. JERRY W. MARKHAM, *HIGH SPEED TRADING ON STOCK AND COMMODITY MARKETS—FROM COURIER PIGEONS TO COMPUTERS*, 52 SAN DIEGO L. REV. 555 (2015)
17. IRENE ALDRIDGE, *HIGH-FREQUENCY TRADING: A PRACTICAL GUIDE TO ALGORITHMIC STRATEGIES AND TRADING SYSTEMS* (2D ED. 2013)
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**UNITED STATES DISTRICT COURT  
SOUTHERN DISTRICT OF NEW YORK**

SECURITIES AND EXCHANGE COMMISSION,

Plaintiff,

v.

LEK SECURITIES CORPORATION, SAMUEL LEK,  
VALI MANAGEMENT PARTNERS d/b/a AVALON  
FA LTD, NATHAN FAYYER, and SERGEY  
PUSTELNIK a/k/a/ SERGE PUSTELNIK,

Defendants.

17-cv-01789 (DLC)

**Expert Report of Roger S. Begelman**

**March 16, 2018**

  
Roger S. Begelman

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## **I. INTRODUCTION**

### **A. Background and Experience**

1. I am a senior financial services compliance executive with 28 years of experience in surveillance and compliance in the securities industry. I held several senior compliance roles at Goldman Sachs from 1993 to my retirement in 2016.
2. From 2008 to 2016, I was a Managing Director and Co-Chief Compliance Officer of Goldman Sachs Bank USA. In that role, I created the compliance function for a newly formed wholesale bank organization, served as the primary liaison with regulators for all legal and compliance reviews, and oversaw the implementation of controls and surveillance procedures to comply with applicable regulations.
3. From 1993 to 2008, I served as Global Head of Control Rooms and Regulatory Reporting and Co-Head of the Compliance Surveillance and Strategy Group at Goldman Sachs, a registered broker-dealer. Among other duties, I was responsible for firm-wide development of compliance strategy and developed a proprietary surveillance architecture to capture, review and analyze trading activity for market manipulation, insider trading, information barrier breach and other improper activity.
4. Prior to working at Goldman Sachs, I worked as a Trial Counsel in the Market Surveillance Division of the New York Stock Exchange (“NYSE”) from 1988 to 1993. I conducted investigations of NYSE members and supervised a team of 70 investigators and analysts.
5. Prior to working in the securities industry, I was a Special U.S. Attorney in the U.S. Attorney’s Office for the Southern District of New York and an Assistant District Attorney in the Bronx District Attorney’s Office.
6. I hold Series 7, 8, 14 and 24 securities licenses. I am a former member of the Securities Industry and Financial Markets Association (“SIFMA”) Supervisory and Self-Regulation Committee, and a former member of the New York Stock Exchange Hearing Panel Board. I have also been a speaker and panelist at SIFMA and IASCO Conferences, addressing various compliance issues.

7. I graduated from the University of Vermont with a Bachelor of Arts degree in Political Science in 1978 and from New York Law School in 1981, and I am admitted to the New York State Bar.
8. My resume is included as **Attachment 1** to this report. I have no publications during the last ten years and have not testified as an expert witness at trial, arbitration and/or deposition in the last four years. My hourly billing rate on this matter is \$1000. My compensation is not dependent on the outcome of this matter.

**B. Retention and Assignment**

9. Counsel for Lek Securities Corporation (“Lek”) and Samuel Lek (“Mr. Lek” and together, the “Lek Defendants”) retained me to review certain materials related to this matter and, based upon those materials and my 28 years of experience in surveillance and compliance in the securities industry, provide an opinion on Lek’s compliance, surveillance, and risk controls related to “layering” from 2012 through 2016.
10. As detailed below, I conclude, based on my 28 years of experience in surveillance and compliance in the securities industry and an analysis of the documents I have been provided, that Lek’s compliance, surveillance, and risk controls related to “layering” from 2012 through 2016 were:
  - (1) consistent with a compliance framework to prevent potential manipulative trading;
  - (2) not in conflict with communications from regulators and exchanges; and
  - (3) consistent with industry standards for reasonable controls to manage risks.

**C. Information Considered**

11. **Attachment 2** to this Report contains a listing of various documents and information considered in this matter. If needed, I may prepare graphic or illustrative exhibits to use at trial based on the documents and information relied upon and my analysis of those documents and information.

12. The opinions and analysis in this Report are based on currently available documents and information. Accordingly, if additional information becomes available, I may supplement or amend my opinion.

## II. THE SECURITIES INDUSTRY AND LEK

13. Industry and regulatory standards for the supervision and compliance obligations on a broker-dealer, such as Lek, are based on a reasonableness standard. Broker-dealers are not obligated to catch every potential violation. Instead, they are expected to have reasonable methods of surveillance. In line with these obligations, the SEC adopted Rule 15c3-5, the Market Access Rule, in 2010. The Rule requires a broker-dealer to “establish, document, and maintain a system of risk management controls and supervisory procedures *reasonably* designed to manage the financial, regulatory, and other risks” of its business.<sup>1</sup>
14. Lek is a broker-dealer providing execution and clearing services to its customers. Lek does not itself engage in any proprietary trading or provide any trading advice or research to its customers.
15. The rise of algorithmic and computer-assisted trading has accelerated the markets and exponentially increased the number of orders entering the marketplace, including in fractions of a second.
16. During the relevant period Lek had more than one thousand customers, one of which was Defendant Avalon FA Ltd. (“Avalon”). Avalon organized its traders into individual subaccounts. In total, during the relevant period, Avalon had several thousand subaccounts (or traders), and it is my understanding that several hundred of Avalon’s subaccounts were active in any given quarter. The volume of orders from Lek’s customers was considerable. Lek processed approximately 1 million orders per day in total from all its customers.<sup>2</sup> Avalon’s trading was a subset of this trading, and

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<sup>1</sup> 17 C.F.R. § 240.15c3-5(b). (emphasis added)

<sup>2</sup> Letter from Andrew Shapiro to John Roussel, *Re: Matter # 20140412641*, dated April 14, 2015, Lek\_Def\_0319244 at 2.

of that subset, it is alleged that “trading consistent with layering . . . made up less than 5% of Avalon’s trading volume.”<sup>3</sup>

17. Samuel Lek serves as Lek’s Chief Compliance Officer overseeing this considerable activity. Lek, like most modern broker-dealers, utilizes automated systems to support its compliance, supervision and surveillance efforts. Lek developed and has implemented automated controls through its proprietary Q6 system that checks orders prior to their entry into the market.
18. In addition, Lek’s automated systems produce dozens of exception reports on a daily basis to identify trading activity that may require additional review.<sup>4</sup>
19. Finally, Lek’s compliance personnel, including Mr. Lek, perform *post hoc* reviews of trading activity.<sup>5</sup>

**III. DETERMINING WHAT LAYERING IS AND METHODS OF APPROPRIATE SURVEILLANCE ARE DIFFICULT TASKS FOR A BROKER-DEALER**

20. “Layering” is a relatively recently articulated theory of manipulation. In my experience, distinguishing manipulative trading that may turn on the intent of the trader—such as layering—from ordinary and acceptable trading is exceptionally difficult, particularly for an executing, non-proprietary trading broker-dealer like Lek. From my analysis of the materials provided to me, broker-dealers attempting to monitor for potential layering have received little guidance from regulators concerning what constitutes layering and how to detect it. Further, layering itself has been defined differently by different regulators, and without any specificity.
21. One of the earliest references to layering by a regulator is a September 2010 News Release concerning Trillium Brokerage Services, LLC, in which the Financial Industry Regulatory Authority (“FINRA”) wrote the following:

Trillium . . . entered numerous *layered*, non-bona fide market moving orders to generate selling or buying interest in specific stocks. By entering the non-bona fide orders, often in substantial size relative to a stock’s

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<sup>3</sup> See Expert Report of Terrence Hendershott, Ph.D., dated April 3, 2017, Dkt. No. 88-1 at ¶ 11(d).

<sup>4</sup> Reports available through the ExceptionReport Program, dated June 30, 2016, Lek\_Def\_0455449.

<sup>5</sup> Transcript of the Deposition of Samuel Lek on Feb. 27, 2018 (“Lek Dep. Tr.”) at 272:18-273:9; 282:5-17.

overall legitimate pending order volume, Trillium created a false appearance of buy- or sell-side pressure . . . . Trillium’s trading conduct was designed to improperly bait unsuspecting market participants into executing trades at illegitimately high or low prices for the advantage of Trillium’s traders.<sup>6</sup>

22. In the release, FINRA described layering as an “*abusive momentum ignition strategy*[],” another relatively new and yet to be specifically defined term.<sup>7</sup> In reviewing FINRA’s description of a “layering” strategy, one would most likely be drawn to orders in securities that are large enough to move the market. As a general function, orders that are big enough to move a single side of the market tend to be in less liquid securities, as the lack of liquidity increases the chances of a bid or ask order significantly impacting the prevailing spread.
23. In addition, the above description references non-bona fide orders, which FINRA described as orders the trader does not intend to be executed, but rather intends for them to artificially induce other traders to believe there was actual interest in trading the security. As I will discuss further below, divining intent is a very difficult task. The President of FINRA, Robert Cook, recently characterized looking for “layering” as “searching for the proverbial needle in a haystack.”<sup>8</sup> That difficult task for FINRA, with all its resources, staff, and expertise, is considerably more difficult for a compliance professional at a broker-dealer—particularly an agent broker-dealer, *i.e.*, one that typically has limited knowledge of a trading client’s proprietary strategies—when reviewing trading activity by a customer.
24. As a consequence, one would assume that non-bona fide orders would not be immediately executable at the time of entry—that is, would not tighten the prevailing spread. An order placed within the prevailing spread, is by definition, the best order then placed on the market. In typical circumstances, such an order would have the

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<sup>6</sup> FINRA News Release regarding Trillium, dated Sept. 13, 2010, FINRA-SEC-LEK\_00011897 at 1. While the quoted language constitutes language provided by FINRA, it is simply guidance.

<sup>7</sup> *Id.*

<sup>8</sup> Robert W. Cook, *Equity Market Surveillance Today and the Path Ahead*, dated Sept. 20, 2017, FINRA-SEC-LEK\_00011885 at 5.

highest likelihood of being filled, and, as a result, the placing of such an order would typically be inconsistent with the intent for that order would not be executed.

25. In January of 2012, in FINRA's letter of annual regulatory and examination priorities, "momentum ignition strategies" and layering in particular were addressed again:

Examples of this activity include layering strategies where a market participant places a bona fide order on one side of the market and simultaneously "layers" non-bona fide orders on the other side of the market (typically above the offer or below the bid) in an attempt to bait other market participants to react to the non-bona fide orders and trade with the bona fide order on the other side of the market. (Citing *Trillium Brokerage Services, LLC*, FINRA Letter of Acceptance, Waiver and Consent, No. 20070076782-01 (August 5, 2010)) FINRA has observed several variations of this strategy in terms of number, price and size of the non-bona fide orders, but the essential purpose behind these orders remains the same, to bait others to trade at higher or lower prices.<sup>9</sup>

26. In developing surveillance to attempt to identify potential layering, this guidance suggests that a broker-dealer should focus on orders that induce others to trade. Obviously, this is extremely difficult to ascertain as high frequency trading activities are using programs or algorithms that are generated by, and potentially dependent on, any number of market factors, including liquidity, volatility, activity in related securities, and not simply the price of open orders.
27. An additional difficulty is determining whether the sequence of orders is important to the strategy and how to differentiate it from completely acceptable day trading, market making, or other two-sided trading strategies. There is no foolproof way to monitor for such activity and determine, with certainty, when a trader may hope that an order is not executed. One logical way to surveil for this activity would be to examine instances where there are a high number of orders on one side of the market, an execution takes place on the contra side, followed by post-execution cancellation of the remaining orders.

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<sup>9</sup> FINRA 2012 Annual Letter, dated Jan. 31, 2012, FINRA-SEC-LEK\_00012041 at 13.

28. In late September 2012, the Securities and Exchange Commission, in release No. 67924, issued cease-and-desist proceedings against Hold Brothers On-Line Investment Services, *et al.* (“Hold Brothers”).<sup>10</sup> The release is important because—unlike some previous settlements, such as *Trillium*—it describes the pattern of trades at issue that could constitute layering:

Such traders induced algorithms to trade in a particular security by placing and then cancelling layers of orders in that security, creating fluctuations in the national best bid or offer of that security, increasing order book depth, and using the non-bona fide orders to send false signals regarding the demand for such security, which the algorithms misinterpreted as reflecting sincere demand.<sup>11</sup>

29. The recitation of the facts indicated that there were 11 “layered” non-bona fide orders placed in the market which acted as a misinterpreted inducement by another algorithm to trade. Operating in two exchanges, the trader placed an order on one side of the market, and then 11 orders on the other side of the market in quick succession. When the first order was executed, the trader cancelled the 11 orders on the other side of the market. The entire process from first order being placed until last order being cancelled took less than 800 milliseconds.<sup>12</sup>
30. One major open question from the Hold Brothers settlement is that the main respondents, Hold Brothers (or Steve Hold) had ownership interests in the offending trading entities, Demonstrate, LLC and Trade Alpha, LLC. As a consequence of that ownership interest, getting to an understanding of the intent to deceive other algorithms can be properly inferred, as Hold Brothers would have knowledge and control over the trading entities, whereas an electronic access broker-dealer simply acting as agent, such as Lek, would not have access to that information and instead is dependent on pattern recognition analysis.
31. When reviewing activity for potential layering, a surveillance system may also review activity across equity markets—a very difficult task in my experience. To demonstrate

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<sup>10</sup> *In re Hold Bros. On-Line Inv. Serv., LLC*, Release No. 67924, dated Sept. 25, 2012. While the quoted language constitutes language provided by the SEC, it is simply guidance.

<sup>11</sup> *Id.* ¶ 23.

<sup>12</sup> *Id.* ¶¶ 24-26.

the complexity of monitoring for activity across markets, one can look to the simpler case of wash sales. In wash sale situations, a trader will put in a buy order and a sell order priced in a way that they will interact, execute and have the potential of creating the artificial appearance of activity and/or interest in a particular security. In the case of wash sales, the National Securities Clearing Corporation (“NSCC”) can provide clearing and trade capture information to surveil for the improper process. However, in a potential layering scheme, monitoring is much more complex because the trades are at different prices and wash sale alerts would not be generated.

32. A surveillance system must also differentiate between legitimate activity and layering. In my experience, understanding how the trading activity is happening at the time of the alleged manipulative activity enables the analyst to better discern whether the activity is legitimate. Many legitimate and lawful trading strategies involve placing orders on both sides of the market. And most orders—over 95%—are canceled prior to execution, so simply looking for two-sided markets that also involve canceled orders would not be particularly informative.<sup>13</sup>

#### **IV. LEK’S COMPLIANCE, SURVEILLANCE, AND RISK CONTROLS WERE CONSISTENT WITH A COMPLIANCE FRAMEWORK TO PREVENT POTENTIAL MANIPULATIVE TRADING**

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33. As described in the Lek Securities Risk Control System Manual (“Manual”)<sup>14</sup>—incorporated by reference in its Written Supervisory Procedures (“WSP”)<sup>15</sup>—“ROX terminals and FIX engines are where customer orders enter the Lek securities trading systems. . . . Hence they constitute the ideal location for risk monitoring and this is where the majority of our controls are located.”<sup>16</sup> Lek’s Q6 controls include “(1) fat finger checks; (2) credit controls; (3) operational risk controls, and (4) compliance controls.”<sup>17</sup> The “[c]ompliance controls are designed to prevent an order that would

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<sup>13</sup> See *Trade to Order Volume Ratios*, SEC Data Highlight 2013-01 (Oct. 9, 2013) available at <https://www.sec.gov/marketstructure/research/highlight-2013-01.html>.

<sup>14</sup> The Manual is also sometimes identified or referred to as the Automated Risk Controls document.

<sup>15</sup> See e.g., WPS, dated Dec. 16, 2014, Lek\_Def\_0445787 §§ 6.3.2, 14.44, 17.10.2.2; WSP, dated Mar. 12, 2015, Lek\_Def\_0446269 (same); WSP, dated Jan. 14, 2016, Lek\_Def\_0447809 (same).

<sup>16</sup> Manual, dated March 28, 2013, Lek\_Def\_0229656 at 1; Manual, dated April 2014, Lek\_Def\_0445229 at 1; Manual, dated July 2016, Lek\_Def\_0445256 at 1.

<sup>17</sup> Manual, dated April 2014, Lek\_Def\_0445229 at 2; Manual, dated July 2016, Lek\_Def\_0445256 at 3.

violate securities' laws or regulations.”<sup>18</sup> For the purpose of this report, I focus on the compliance controls and in particular Lek's “Q6” technology as it relates to layering.

34. In my experience, when new types of potentially manipulative activity are identified by regulators, broker-dealers typically undertake an incremental process of adjusting their compliance regime in response to the identified regulator concern. Consistent with that approach, shortly after the release of and in direct response to the Hold Brothers order, Lek made its top priority the design and development of a new front-end control to block potential layering activity in the then-existing Q6 system.<sup>19</sup>
35. As noted in an internal memo, this new control looked for core elements of what regulators generally described as “layering,” (1) a two-sided pattern as opposed to a single-sided entry; and (2) the difference between the number of orders on both sides of the market. Specifically, orders without a significant or large difference would be acceptable, while orders creating any larger difference would be blocked.<sup>20</sup>
36. On February 1, 2013, Lek activated the controls whereby at no time could there be more than 10 orders on one side of the market when there was an order on the contra side as well.<sup>21</sup> The nature of the control was at the top account or parent account rather than at an individual trader or subaccount level. In practice, however, the control appeared to be overly restrictive for a client, such as Avalon, with hundreds of active traders with differing strategies. Avalon's many traders could inadvertently “step on” each other, triggering the imbalance controls and restricting legitimate strategies.<sup>22</sup>
37. Two weeks after implementation and after apparent lengthy internal deliberation, Lek decided to add an additional control at the sub-account level and revise the order

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<sup>18</sup> Manual, dated March 28, 2013, Lek\_Def\_0229656 at 2; Manual, dated April 2014, Lek\_Def\_0445229 at 2; Manual, dated July 2016, Lek\_Def\_0445256 at 3.

<sup>19</sup> Lek's President Nicolas Louis described the effort to develop and implement the Q6 layering controls as the “top priority” at the time. Transcript of the Deposition of Nicolas Louis on March 9, 2018, (“Louis Dep. Tr.”) at 101:11-16.

<sup>20</sup> *MEMORANDUM – Q6 Layering Detection*, dated Jan. 28, 2013, Lek\_Def\_0254920.

<sup>21</sup> See Lek\_Def\_0590091-AVALON.N2B.TXT. The initial limit was apparently based on the Hold Brothers order in which the trader, operating in two exchanges, placed an order on one side of the market and then 11 orders on the other side of the market in quick succession.

<sup>22</sup> Lek also expressed a willingness to limit the control for trading strategies wholly separate from layering. See, e.g., Email from Nicolas Louis to Andrew Shapiro, *FW: Q6 Explanation*, dated Jan. 30, 2013, Lek\_Def\_0225677. In addition to the overly restrictive nature of the control on Avalon's sub-accounts, Avalon also provided a reasonable explanation of how its trading strategies were not manipulative. *Memorandum from Avalon*, dated Feb. 5, 2013, Z-006033952 at 2.

imbalance limit at the parent level. In my experience, revisions and updates to compliance programs—particularly newly-created programs designed to address newly-identified potentially manipulative behavior—are common in the securities industry as compliance professionals see the new programs in action. Lek’s decision to alter the focus of the control to the sub-account, rather than the parent account level, was consistent with a compliance framework to prevent potential manipulative trading as it would be more effective in preventing individual traders from being able to engage in “layering.” At the same time as the sub-account specific control was put in place as set to 20,<sup>23</sup> Lek increased the overall limit for all of the hundreds of Avalon subaccounts to 100.<sup>24</sup>

38. Lek continued to update and revise its system over the following months, which, in my experience, is common when a broker-dealer designs and implements a new control. In March 2013, Lek added a more restrictive by-exchange control with a limit of 10 orders per subaccount per exchange<sup>25</sup> and 30 orders for all of Avalon’s subaccounts per exchange.<sup>26</sup> In July 2013, Lek reduced both the sub account and parent levels, placing the subaccount total limit at 10 and the subaccount per exchange limit at 5,<sup>27</sup> while at the same time setting the limit for all Avalon subaccounts at 50 and the limit by exchange for all Avalon subaccounts at 25.<sup>28</sup> In October 2013, Lek slightly modified the controls again, setting the subaccount limit to 12 and the by exchange subaccount limit to 7,<sup>29</sup> while changing the by exchange limit for all of Avalon to 30.<sup>30</sup>
39. In my experience, no front end control or back end surveillance or review is fool proof. Not surprisingly, as Lek continued to develop its controls, additional inquiries came in from various regulators. The requests often sought explanations of trading in a particular name or names. As an agent, Lek does not provide clients with trading strategies or advice, rather the client employs their own proprietary trading strategy.

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<sup>23</sup> See, e.g., Lek\_Def\_0590091-038\_001R.N2E.TXT.

<sup>24</sup> See Lek\_Def\_0590091-AVALON.N2E.TXT

<sup>25</sup> See, e.g., Lek\_Def\_0590091-038\_001R.N3M.TXT.

<sup>26</sup> See Lek\_Def\_0590091-AVALON.N3M.TXT.

<sup>27</sup> See, e.g., Lek\_Def\_0590091-038\_001R.N7P.TXT.

<sup>28</sup> See Lek\_Def\_0590091-AVALON.N7U.TXT

<sup>29</sup> See, e.g., Lek\_Def\_0590091-038\_001R.NA7.TXT.

<sup>30</sup> See Lek\_Def\_0590091-AVALON.NA7.TXT.

Although specifics as to particular trading strategies are closely guarded, Lek sought information directly from clients on the manner and strategy implemented on several occasions.<sup>31</sup> The information Avalon generally provided was that its traders were focused on making markets in numerous securities, with the requisite capture of spread, for small but numerous gains. Despite the plausibly reasonable explanations, Mr. Lek nonetheless reviewed a variety of Avalon's trading to understand the nature of the trading in question and to determine if the activity was appropriate.<sup>32</sup>

40. For example, Mr. Lek developed a trade review tool that enabled him to reconstruct the limit order book, so that he could replicate the timing and sequence of orders entered and cancelled.<sup>33</sup> Going beyond the pre-trade controls of Q6, the reconstruct order book program allowed Mr. Lek to undertake more detailed reviews of trading data.
41. As was my experience while at Goldman Sachs, and as is customary and appropriate in a securities compliance function, decisions of the legitimacy of the activity in question was not simply assumed, but had undergone a series of controls and reviews. While no system can identify or eliminate every instance of manipulative trading, the Q6 system along with the back-end reviews of trading were, in my experience, consistent with a compliance framework to prevent potential manipulative trading.

**V. LEK'S COMPLIANCE, SURVEILLANCE, AND RISK CONTROLS WERE NOT IN CONFLICT WITH COMMUNICATIONS FROM REGULATORS AND EXCHANGES**

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**A. Lek Received Little Guidance From Regulators Regarding Its Layering Controls**

42. In my experience, interactions with regulators are a frequent occurrence for compliance professionals in the securities industries. It is interesting to note that, on a number of occasions, senior staff at Lek described the Q6 system to regulators with a view toward obtaining some input on the system and its efficacy. For example, in response to written regulatory inquires on its controls, Lek provided detailed summaries on the

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<sup>31</sup> See, e.g., Letter from Samuel Lek to Andy Gordon, *Information Request Matter ID: BYX 20130491*, dated April 2, 2013, Z-005791851 at 1-2; Lek\_Def\_0268161.

<sup>32</sup> Lek Dep. Tr. 272:18-273:9.

<sup>33</sup> *Id.* at 276:23-282:17; see, e.g., Lek\_Def\_0449014; Lek\_Def\_0590089; Lek\_Def\_0590090.

thought process behind and workings of its Q6 Layering system. In addition, Lek made in-person presentations to FINRA and the SEC in which it demonstrated its Q6 Layering System in 2013, 2014 and 2015.<sup>34</sup>

43. In many of these interactions with regulators, Lek specifically requested feedback and guidance on the specific parameters to which it should set its Q6 controls:

Requests to BATS:

- “So we look at the delta of orders. If you have one buy, right, then we deduct that from the number of sells and we set a maximum number for that. The question is what should that number be.”<sup>35</sup>
- “[W]e agree with the fact that the guy's on both sides of the market, right, but listen, we need to come up with some - we have the technical controls in place, right, to limit the number of orders that anyone can put in. We just need to understand what that number needs to be.”<sup>36</sup>
- “[C]ross-market we allow 10 orders. But we can set that number anywhere you want.”<sup>37</sup>
- “Hopefully these reductions in order limits will result in a parallel reduction of alerts on your end, but that remains to be seen. If you are still seeing alerts after we make these changes, we would truly appreciate you letting us know in the manner you did today so that we can immediately revisit this matter. If you have any suggestions at this point, we would welcome those as well.”<sup>38</sup>
- “As you know the Firm's controls are configurable. We appreciate your past conversations regarding our compliance mechanisms and we welcome any additional

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<sup>34</sup> See, e.g., *Q6 Risk Monitoring System*, dated August 22, 2013, Lek\_Def\_0301955; *Risk Controls for Broker Dealers*, dated Sept. 11, 2013, Lek\_Def\_0266343; *Risk Controls for Broker Dealers*, dated Oct. 29, 2013, Z-006566678; *Risk Controls For Broker Dealers*, dated July 9, 2014, Lek\_Def\_0294589; *Risk Controls for Broker Dealers*, dated March 19, 2015, Lek\_Def\_0590277.

<sup>35</sup> Transcript of call with BATS dated July 24, 2013, Z-007025078 at 7:10-13.

<sup>36</sup> *Id.* at 9:18-23.

<sup>37</sup> *Id.* at 4:16-17.

<sup>38</sup> Email from Jeffrey Brandt to Andy Gordon and Jeff Connell, *Today's Discussion / Layering Alerts*, dated July 24, 2013, Z-003643602, at 1.

input from you regarding our controls and specifically with our delta configurations.”<sup>39</sup>

Requests to FINRA:

- “LSC constantly seeks to improve its systems and controls. As a result, its systems are much better today than they were in the past, and, while LSC is not aware of any shortcomings or deficiencies - indeed LSC believes that its controls rank among the very best in the industry - LSC fully expects that its systems in the years to come will be better than they are today. If, however, FINRA has any specific suggestions as to how LSC could improve its surveillance or other controls (with respect to surveilling for wash sales, layering, and spoofing, or otherwise), we and LSC would welcome any suggestions.”<sup>40</sup>

Requests to Direct Edge:

- “I mean, how many orders should they be allowed to have on one side of the market, if they have an order on the other side of the market? That’s what I can control, here. . . . Tell me how many orders I should allow on one side of the market, if they have another order on the other side of the market? That's all I can control.”<sup>41</sup>
- “I would very much appreciate it, because I’m not against you. I’m on your side, but I can’t work with, ‘You have to stop manipulation,’ because we are already stopping manipulation as far as I can tell, and if we are unsuccessful in doing that, then you have to tell me -- please tell me, you don’t have to do anything. I beg of you that you tell me what it is, right, that you consider wrong, and we will stop it whether we agree with it or not.”<sup>42</sup>

44. Despite the repeated requests, neither FINRA nor any exchange provided any specific guidance on whether or how the Q6 layering check was insufficient or could be improved. When Lek received anything more than silence in response to these

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<sup>39</sup> Letter from Andrew Shapiro to Frank Eichhorn, *Re: Matter \$ 2015-118*, dated August 27, 2015, Z-003643417, at 2.

<sup>40</sup> Letter from Howard Schiffman to Susan Tubbs, *Re: Lek Securities Corporation’s Risk Management Controls*, dated Sept. 6, 2013, Z-000000010 at 5.

<sup>41</sup> Transcript of call with Direct Edge, Z-007024874 at 13:23-14:1, 14:16-19.

<sup>42</sup> *Id.* at 16:20-17:3.

requests, they were told “I’m not going to tell you how to do your job”<sup>43</sup> and deciding on the limits was “a determination you guys are going to have to make.”<sup>44</sup>

45. Based on my experience, recommendations as to changes in controls, such as a simple indication that a limit may be too large, are not unreasonable and not uncommon. As I have experienced in my own career as a compliance professional, such guidance often occurs during audits. In conjunction with annual audits of Lek, FINRA made several recommendations over the course of years. For instance, in its 2014 audit, FINRA directed Lek to perform a comprehensive review to ensure it had properly notified FINRA of all correspondent clearing relationships, perform and document its analysis in determining credit limits for each customer, and ensure it has evidence to substantiate the “deemed to own” designation for “fail to deliver” positions.<sup>45</sup> In its 2015 audit, FINRA directed Lek to update the firm’s policy to clearly indicate the rationale for a particular financial reporting inconsistency.<sup>46</sup> In its 2016 audit, FINRA directed Lek to centralize the process of identifying, tracking, and resolving of daily margin calls and conduct funding and liquidity stress testing simulating particular conditions identified by FINRA.<sup>47</sup>
46. Notwithstanding the suggestions and guidance on subjects, FINRA never audited Lek’s surveillance system or anti-layering controls or provided guidance on them, even though layering was routinely mentioned in the annual priorities letters to members.
47. While FINRA made ongoing Rule 8210 requests for documents and information related to Avalon’s trading and Lek’s controls, these documents do not indicate that FINRA has concluded that any violation has occurred or provide guidance to Lek on how to surveil for or prevent potential layering. In fact, they typically state that:

This inquiry should not be construed as an indication that  
the Staff has determined that any violations of FINRA

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<sup>43</sup> *Id.* at 14:13-14.

<sup>44</sup> Transcript of call with BATS dated July 24, 2013, Z-007025078 at 7:14-15.

<sup>45</sup> Exit Meeting Report for the Examination of Lek Securities Corporation, dated July 2, 2015, Lek\_Def\_0424808 at 2, 3, and 6.

<sup>46</sup> Exit Meeting Report for the Examination of Lek Securities Corporation, dated March 24, 2016, Lek\_Def\_0590319, at 10.

<sup>47</sup> Exit Meeting Report for the Examination of Lek Securities Corporation, dated June 22, 2017, Lek\_Def\_0590243 at 12-13.

Rules or federal securities laws have occurred, or as a reflection upon the merits of the securities involved or upon any person who effected transactions in such securities.<sup>48</sup>

48. Wells notices, while not dispositive as to any violation, can provide insight into current FINRA thinking, but the Wells notices to Lek provided, at best, mixed messages. A Wells notice provides a target an opportunity to respond. In my experience, it is customary in the industry for the issuing regulator, after receiving the target's response, to either (1) swiftly file an action, (2) enter into settlement negotiations or (3) based upon the points offered in the target's response, reconsider the recommendations in the Wells notice.
49. After each Wells notice related to Lek's controls and layering, FINRA neither swiftly brought an action, nor offered a settlement. Instead, within weeks after each Wells notice related to potential layering, FINRA submitted a new 8210 request seeking additional materials.<sup>49</sup> Neither FINRA nor the SEC took action to file an enforcement proceeding against Lek until almost 3 years after FINRA's first Wells notice and almost 2 years after FINRA's second Wells notice. The SEC never issued a Wells notice before filing this case, which in my experience, is unusual. Neither FINRA nor the exchanges filed any actions against Lek regarding Avalon until after the SEC had already filed this case.
50. Under the circumstances, with no additional input from FINRA or other exchanges as to what its settings should be, my experience leads me to conclude that the settings put in place in Lek's Q6 Layering Controls were not in conflict with regulator and exchange communications.

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<sup>48</sup> Letter from Jessica Adams to Lek Securities Corporation, *Re: Matter ID No. 20110297130*, dated September 29, 2014, Z-004181025; *see also* Letter from Timothy Rogers to Samuel Lek, *Re: STAR No. 20120346115*, dated Nov. 5, 2012, Z-005806055 at 2; Letter from Timothy Rogers to Andrew Shapiro, *Re: STAR No. 20130364847*, dated April 10, 2013, Z-002036333 at 2.

<sup>49</sup> FINRA's first Wells notice was sent on July 11, 2014 (Z-002037013). Lek responded on September 5, 2014 (Z-005410469), and then FINRA issued a new Rule 8210 request on Sept. 29, 2014 (Z-004181025). FINRA's supplemental Wells notice was sent on June 9, 2015 (Lek\_Def\_0590114). Lek responded on July 31, 2015 (Z-006906386), and then FINRA issued a new Rule 8210 request on Aug. 18, 2015 (Lek\_Def\_0590235).

## **B. When Regulators Finally Provided Guidance, Lek Took Decisive Action**

51. Early in 2016, FINRA developed a new Cross Market Report to assist broker-dealers with monitoring for trading behaviors that may be designed to manipulate the market, in particular layering and spoofing. Then FINRA CEO Richard Ketchum stated: “We expect that the firms will use the data to enhance their own surveillance and move swiftly to cut off potential market manipulation.”<sup>50</sup> The release went on to quote the then Head of Market Regulation Tom Gira:

“Most firms attempt to surveil and review for manipulation, but bad actors look to mask their activity by trading across multiple markets or firms, which for any individual firm may be hard to detect . . . . We are leveraging our cross-market data and employing sophisticated automated surveillance technology to flag suspicious trading patterns so that firms can add that data to their own surveillance and supervisory processes and take appropriate action to address the activity even before FINRA can complete a formal investigation.”<sup>51</sup>

52. Mr. Gira’s statement provides several notable observations about the then state of surveillance among FINRA member firms. First, he acknowledged that most—but not all—member firms attempt to surveil and review for manipulation. Second, he acknowledged that bad actors masking of their activity across multiple markets makes such activity “hard to detect” for “any individual firm.” Finally, he acknowledged the clear advantage FINRA had due to its access to cross-market data and the great advantage this information could have to assist firms in “their own surveillance and supervisory process.” Indeed, FINRA’s issuance of the Cross Market Reports to all member firms suggests that surveillance of layering was something with which all broker dealers needed guidance and assistance.

53. FINRA explicitly expected broker-dealers to make use of the data it was providing in the Cross Market Reports, and in my experience, diligent compliance professionals take advantage of such guidance. Lek personnel inquired about the specific parameters of the Report Card during the first FINRA conference call on the topic. However,

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<sup>50</sup> FINRA News Release regarding Cross-Market Report Cards, dated April 28, 2016, FINRA-SEC-LEK\_00011893 at 1.

<sup>51</sup> *Id.* It is important to remember that FINRA’s release is, as always, merely guidance.

FINRA refused to provide that information.<sup>52</sup> Nevertheless, upon receiving the Report and the identified potential manipulative trading identified as “layering exceptions” therein, Lek immediately analyzed the data to determine what controls would ensure that any potential layering manipulation would be blocked.<sup>53</sup> Lek hypothesized that a new restriction preventing a trader from entering more than 4 orders on one side of the market at any time would eliminate any potential manipulative layering activity.<sup>54</sup> Lek implemented that restriction and tested it on the trading groups that appeared in the reports in greatest frequency.<sup>55</sup> In the following months, the firm saw a significant drop in the number of layering exceptions for Lek customers on the FINRA reports. Lek expanded the controls to other sub-accounts that appeared on subsequent report cards, dramatically reducing its numbers further.<sup>56</sup> As a result of its efforts, the number of potential layering exceptions dropped by 83% in the six months following the issuance of the first monthly report,<sup>57</sup> and Lek virtually eliminated any layering exceptions from the report in 2017.<sup>58</sup>

54. Lek’s utilization of the Cross Market Report cards to block potentially manipulative trading was, in my experience, precisely the sort of action that a compliance department should undertake in such circumstances.

## **VI. LEK’S CONTROLS WERE CONSISTENT WITH INDUSTRY STANDARDS FOR REASONABLE MANAGEMENT OF RISKS**

55. At no point during my 28 year experience in surveillance and compliance in the securities industry has the SEC or any other regulator required perfection from broker-dealers’ compliance and supervision systems. To the contrary, the industry standard requires broker-dealers to adhere to a standard of reasonableness when managing risks, including risks of potential manipulative trading by customers. In my experience,

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<sup>52</sup> Louis Dep. Tr. at 189:8:13.

<sup>53</sup> See Memorandum re Analysis of March 2016 Report Card, dated May 2, 2016, Lek\_Def\_0587089.

<sup>54</sup> *Id.* at 4, 10.

<sup>55</sup> See Memorandum re Action on March 2016 Report Card, dated May 2, 2016, Lek\_Def\_0587101.

<sup>56</sup> See Memorandum re Analysis of May 2016 Report Card, dated July 6, 2016, Lek\_Def\_0587105; Memorandum re Analysis of June 2016 Report Card, dated August 16, 2016, Lek\_Def\_0587085.

<sup>57</sup> Compare FINRA Potential Manipulation Report for Lek, September 2016, FINRA-SEC-LEK\_00013194 with FINRA Potential Manipulation Report for Lek, March 2016, FINRA-SEC-LEK\_00013187.

<sup>58</sup> See FINRA Potential Manipulation Report for Lek, November 2017, FINRA-SEC-LEK\_00013205 (351 exceptions in July, no exceptions in August, September, or October, and 265 exceptions in November).

Lek—as a broker-dealer, and an agent broker-dealer at that—is not required or expected to prevent every improper trade, but to utilize reasonable controls to prevent improper trading.

56. Based upon my experience, Lek’s compliance, surveillance, and risk controls were consistent with the industry standard. The Q6 layering controls were in accordance with the minimal guidance provided by regulators on a novel concept of manipulation. Consistent with my experience with other broker-dealers, Lek appropriately adjusted and added to these controls over time. In addition, Mr. Lek employed the reconstruct order book program to undertake more detailed reviews of trading data when necessary or appropriate. When provided information from FINRA’s “sophisticated automated surveillance technology,” Lek took swift action. Lek’s controls were consistent with what my expectations for an agent broker-dealer in surveilling for a novel form of potential manipulative activity.

**SUMMARY**

Accomplished Senior Financial Services Compliance Executive with leadership expertise in Commercial Banking and Broker/Dealer businesses. Recognized as a trusted advisor to business executives with a commercially responsible and balanced approach to reputational and regulatory risk management; deep experience in developing and implementing strategic solutions in a global regulatory environment. Proven ability to build multi-faceted global teams and build consensus with stakeholders. Foundational experience as a regulator and prosecutor.

**PROFESSIONAL EXPERIENCE****GOLDMAN SACHS, New York, NY****1993 – 2016****Managing Director****Co-Chief Compliance Officer; GS Bank USA (2008 – 2016)**

Selected by senior management to create a compliance function for newly created wholesale bank organization. The primary liaison with new regulators (Federal Reserve Board of NY, Department of Financial Services) for all bank legal and compliance reviews. Designed and implemented controls and surveillances to meet newly applicable regulations. Sole support for Bank's Agency Lending Business.

- Created and implemented Bank compliance infrastructure for newly created wholesale bank. Developed Bank Risk Management Program including business level risk assessments, and control establishment/upgrade.
- Implemented a ground up infrastructure for new regulatory requirements, including Reg W, 23A and 23B (Affiliates); Reg O (Insider Lending); Reg B (Equal Credit); Community Reinvestment Act; Reg D (Reserve Requirements); Reg Y (Anti-Tying); Consumer Rules and Regulations.
- Developed control technology to monitor over 14,000 affiliates and created new surveillances to evaluate regulatory requirements on all trades with the Bank.
- Created and Implemented Bank regulatory eligibility process for all corporate lending originated by the Bank
- Created and implemented extensive training program for all firm individuals that would have interactions with the Bank. Included training on swap eligibility, transacting with affiliates, requirements under equal credit, bank lending eligibility.
- Primary compliance contact for structuring of large complicated transactions to ensure that multi product offerings meet all regulatory requirements.
- Primary compliance officer for Agency Lending Business.

**Global Head, Control Rooms and Regulatory Reporting****Co-Head Compliance Surveillance and Strategy Group (1993 – 2008)**

Responsible for firm wide development of Compliance strategy, policy and systems for global control rooms, regulatory reporting, and surveillance systems. Led over seventy staff members in London, Tokyo, Hong Kong, Australia, New York, and Salt Lake City.

- Designed and implemented global Control Room system providing tracking of information flows to capture material non-public information on transactions and principal investments
- Advised global internal client base on regulatory and reputational risks. Senior counsel on insider trading issues, information barriers, materiality and confidential information
- Advised on all facets of Investment Banking activity, including M&A, Leveraged Finance, Bank debt origination and trading
- Counseled Sales on trading and regulatory rules and represented the firm on issues with SRO's and the SEC
- Developed proprietary surveillance architecture to capture, review and analyze trading activity for insider trading, information barrier breach, market manipulation. Automatically recognizes deviation from established trading patterns and other activities, triggering high quality exception reviews
- Managed multi-faceted surveillance team comprised of transaction surveillance, anti-money laundering and electronic communication surveillance. New structure promotes informed, comprehensive analysis and investigation on global scale

**PROFESSIONAL EXPERIENCE (continued)**

**THE NEW YORK STOCK EXCHANGE, New York, NY**

**1988 - 1993**

**Trial Counsel, Market Surveillance Division**

Provided legal counsel to senior management and staff on '33 and '34 Act matters and other relevant securities laws, including technical rules governing NYSE specialists, traders, and market makers for equities and options.

- Supervised 70 investigators and analysts in data collection and review for extensive case load
- Conducted inquiries of NYSE Members and their employees for referral to Enforcement Division
- Directed case preparation for referral to the SEC, the NYSE's Enforcement Division and other self-regulatory organizations

**OTHER RELEVANT EXPERIENCE**

**UNITED STATES ATTORNEY'S OFFICE, SOUTHERN DISTRICT OF NEW YORK**

**Special Assistant United States Attorney**

**BRONX DISTRICT ATTORNEY'S OFFICE**

**Assistant District Attorney**

**EDUCATION**

JD, New York Law School, New York, NY

Admitted to the New York State Bar

B.A., Political Science, University of Vermont, Burlington, VT

**CERTIFICATION**

Series 7, 8, 14, 24; NYSE Specialist Examination

**INDUSTRY AND COMMUNITY INVOLVEMENT**

Member, SIFMA Supervisory and Self-Regulation Committee

Member, New York Stock Exchange Hearing Panel Board

Speaker and Panelist at SIFMA, IASCO Conferences on various compliance issues

Chair of the Board, BronxWorks

Chairman Emeritus of the Board, Camphill Foundation

Documents Considered

Cboe\_00000272 - Cboe\_00000277  
 FINRA-SEC-LEK\_00011883 - FINRA-SEC-LEK\_00011883  
 FINRA-SEC-LEK\_00011884 - FINRA-SEC-LEK\_00011884  
 FINRA-SEC-LEK\_00011885 - FINRA-SEC-LEK\_00011892  
 FINRA-SEC-LEK\_00011893 - FINRA-SEC-LEK\_00011894  
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 FINRA-SEC-LEK\_00011897 - FINRA-SEC-LEK\_00011898  
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 FINRA-SEC-LEK\_00011960 - FINRA-SEC-LEK\_00011965  
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 FINRA-SEC-LEK\_00012012 - FINRA-SEC-LEK\_00012027  
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Dkt. No. 88-1

Dkt. No. 89

Dkt. No. 96

Transcript of Deposition of Andrew Shapiro on January 31, 2018

Transcript of Deposition of Nicolas Louis on March 9, 2018

Transcript of Deposition of Samuel Lek on February 28, 2018

Transcript of Testimony of Andrew Shapiro on August 19, 2014

Transcript of Testimony of Andrew Shapiro on March 13, 2013

Transcript of Testimony of Jeffrey Brandt on January 22, 2015

Transcript of Testimony of Nicolas Louis on December 13, 2013

Transcript of Testimony of Nicolas Louis on December 8, 2015

Transcript of Testimony of Nicolas Louis on October 22, 2013

Transcript of Testimony of Samuel Lek on December 18, 2013

Transcript of Testimony of Samuel Lek on December 19, 2013

Transcript of Testimony of Samuel Lek on March 14, 2013

Transcript of Testimony of Samuel Lek on November 15, 2013

Transcript of Testimony of Samuel Lek on October 28, 2014

Transcript of Testimony of Samuel Lek on September 23, 2014

Transcript of Testimony of Samuel Lek on September 24, 2014

**UNITED STATES DISTRICT COURT  
SOUTHERN DISTRICT OF NEW YORK**

SECURITIES AND EXCHANGE COMMISSION,

Plaintiff,

v.

LEK SECURITIES CORPORATION, SAMUEL LEK,  
VALI MANAGEMENT PARTNERS d/b/a AVALON  
FA LTD, NATHAN FAYYER, and SERGEY  
PUSTELNIK a/k/a/ SERGE PUSTELNIK,

Defendants.

17-cv-01789 (DLC)

**Rebuttal Expert Report of Alan G. Grigoletto**

**May 11, 2018**

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## **I. Introduction and Qualifications**

1. I am the Chief Executive Officer of Grigoletto Financial Consulting. I recently completed my role as Chief Commercial Officer for Hull Tactical U.S. ETF (“HTUS”) and continue to consult for the Hull Family and its trading entity, Ketchum Trading Partners.

2. Prior to Hull, I served as Vice President of the Options Clearing Corporation (“OCC”) and head of education for the Options Industry Council (“OIC”). In my OIC role, I managed the education efforts of the three areas of outreach for the Council: retail investors, financial advisors, and institutions.

3. Preceding OIC, I served as the Senior Vice President of Business Development and Marketing for the Boston Options Exchange (“BOX”). Before BOX, I was a founding partner at the investment advisory firm of Chicago Analytic Capital Management.

4. I have more than 37 years of expertise in trading and investments as an options market maker, stock specialist, institutional trader, portfolio manager, and educator. I formerly was the portfolio manager for both the S&P 500 and MidCap 400 portfolios at Hull Transaction Services, a market-neutral arbitrage fund. I have considerable expertise in portfolio risk management as well as strong analytical skills in equity and equity-related (derivative) instruments.

5. My complete curriculum vitae, which provides greater detail of my qualifications, professional affiliations, and educational background, is attached as Appendix A. Appendix B lists the matters in which I have provided an expert opinion within the last four years.

6. I am being compensated for my time and services in this matter at the hourly rate of \$650. My compensation is not contingent on the opinions that I express or the outcome of this litigation.

## **II. Documents and Materials Considered**

7. In preparing this report, I have drawn on my more than 37 years of education, knowledge, and experience in the financial markets, more specifically as a portfolio manager, professional equity and options market-maker, and former Senior Vice President of BOX. I also have relied upon publicly-available information such as share prices and volume traded. I have reviewed and considered various documents, data, and other information of a type reasonably relied upon in a matter like this by experts in my field. This information includes, but is not limited to, trading records, deposition testimony, and research of publicly available information. The materials that I have relied upon in my analysis are listed in Appendix C of this report.

8. My work on this matter is ongoing and I reserve the right to update my opinions if additional relevant information becomes available. I stand ready to testify to the opinions set forth in this report. At trial, I may provide and rely on additional visual aids and exhibits to demonstrate basic principles of economics and finance, as well as to summarize the opinions expressed in this report and the bases for them.

## **III. Summary of Assignment**

9. I have been retained by the law firm, Norton Rose Fulbright US LLP, to opine concerning several matters at issue in *S.E.C. v. Lek Securities Corp. et. al.*, Case No. 17-CV-1789(DLC), in the United States District Court for the Southern District of New York.

10. I have been asked to perform the following tasks:

- i. Provide relevant information concerning the background and functioning of the equities and options markets;
- ii. Provide observations concerning the usage and industry understanding of the terms “layering” and “spoofing”;
- iii. Evaluate whether Avalon’s trading is consistent with “layering”;

- iv. Review and evaluate the conclusions in the expert reports of Terrence Hendershott;
- v. Evaluate whether Avalon's trading is consistent with an intent to trade stock to change options prices; and
- vi. Review and evaluate the conclusions in the expert report of Neil Pearson.

My observations, conclusions and opinions are included below.

#### **IV. Background on Financial Markets**

11. Beginning in the 1980s, the use of computers and technology rapidly transformed the trading of securities and commodities. In 1983, a small number of traders began using early handheld computers on an exchange floor. Today, the markets function very differently from the 1980s and very differently from the way most people perceive them. There are only a scant few "floor traders" remaining. The relatively few remaining floor traders largely rely on computer algorithms to price securities and commodities according to their particular forecast, skew, and long or short-term view of future prices. All of the "views" held by traders, whether they are on an exchange floor, at a desk looking at a computer screen, or anywhere else, contribute to price discovery in the market.

##### *A. Equities Markets*

12. The stock market is an institution that connects potential buyers and sellers of companies' stocks. As recently as the 1990s, stocks for each publicly traded company used to be confined to a single trading venue, such as the New York Stock Exchange ("NYSE") or Nasdaq. At Nasdaq, a dealer was the purchaser of every share sold by a trader and the seller of every share bought by a trader. The dealer did so at quoted prices generated through the calculation and judgment of an individual human being. At the NYSE, where there was an actual floor, the specialist for a stock, also a human being, often played a similar dealer role, but in addition posted

quotes sent in by traders willing to buy or sell at stated prices, held auctions, and helped arrange trades by brokers and traders on the floor. Nasdaq dealers and NYSE specialists are now gone.

13. Today, any given stock is potentially traded in each of almost sixty competing venues: a dozen exchanges and almost 50 dark pools. Almost all of the competing trading venues are electronic limit order books, where a trader can post, as a limit order, its firm commitment, until cancelled, to buy or sell up to a specified number of shares at a quoted price. A computer (the venue's matching engine) matches these posted limit orders with incoming buy and sell market orders, which are orders from traders willing to trade at whatever is the best available price in the market.

14. Equities markets are now characterized by much faster speeds, much higher trading volumes (even on some more illiquid stocks), and much higher rates of order cancellation. In fact, over 95% of orders are cancelled, and half of all cancellations occur within one second of an order being placed.<sup>1</sup> Traders can also choose from a number of different SEC-approved order types, including many of which are designed with the purpose to obscure the actual order size and intent of the trader. For example, traders can choose to enter the following equity order types on the Nasdaq market:

- Non-Display Orders: Orders are hidden from the marketplace. All incoming order flow can interact with hidden orders until hidden size is exhausted at the specified price.
- Supplemental orders: These are non-displayed orders that add liquidity only and always execute at the NBBO.<sup>2</sup> Orders will only execute against incoming routable orders that are the same size or smaller than the aggregate.

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<sup>1</sup> See *Trade to Order Volume Ratios*, SEC Data Highlight 2013-01 (Oct. 9, 2013) available at <https://www.sec.gov/marketstructure/research/highlight-2013-01.html>.

<sup>2</sup> The NBBO is the National Best Bid and Offer, the best available ask price when buying a security, and the best available bid price when selling a security.

- Reserve Orders (Iceberg): These allow participants to display only a fraction of the entire order. They have a round lot display size and corresponding non-display size. Incoming order flow has access to both the display and non-display portion of a booked reserve order. The minimum share quantity for a displayed order is 100 shares; this amount is replenished when the amount falls below 100 shares.
- Pegging Orders: These allow clients to price orders relative to the current market price for a security and are only supported between 9:30 a.m. and 4:00 p.m., ET. Offsets allow a client to peg an order with an incremental difference, in \$0.01 increments, from the NBBO and can be either positive (higher price) or negative (lower price). There are three types of pegged orders: Primary Peg: Peg an order to the same side of the market. Market Peg: Peg an order to the opposite side of the market. Mid-Point Peg: Peg an order to the mid-point of the market. These orders will peg in half-penny increments in the event of an odd spread.
- Discretionary Orders: These are passively displayed on the book at one price while also seeking to access liquidity at a more aggressive price. The discretionary portion of the order is not entered on the book, and only becomes active as an IOC order when shares are available within the discretionary range. Discretion can also be combined with Pegging, Reserve and non-DOT routing strategies.<sup>3</sup>

Order types on the NYSE Arca Exchange include:

- Limit Non-Displayed Order: This is a limit order that is not displayed and does not route. A Limit Non-Displayed Order is ranked Priority 3 - Non-Display Orders. A Limit Non-Displayed Order must be designated Day, is valid for any trading session, and does not participate in any auctions. A Limit Non-Displayed Order may include a Non-Display Remove Modifier.
- A Limit Order designated IOC: This order type is to be traded in whole or in part on the NYSE Arca Marketplace as soon as such order is received, and the quantity not so traded is cancelled. A Limit IOC Order does not route. A Limit IOC Order may be designated with a minimum trade size, which will trade against orders in the NYSE Arca Book that in the aggregate, meets its minimum trade size. A Limit IOC Order with an MTS that cannot be immediately traded at its minimum size will be cancelled in its entirety.
- Mid-Point Liquidity Order with an ALO modifier (“MPL-ALO Order”): On arrival, an MPL-ALO Order will trade with resting orders with a working price below or above the midpoint of the PBBO, based on whether the order is a buy or sell. The order will not trade with resting orders to sell (buy) priced at the midpoint of the PBBO. A resting MPL-ALO Order to

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<sup>3</sup> See *Order Types and Modifiers*, Nasdaq Global Trading and Market Services 2-3 (2017) available at <https://www.nasdaqtrader.com/content/ProductsServices/Trading/OrderTypesG.pdf>.

will trade with an arriving order that is eligible to trade at the midpoint of the PBBO.<sup>4</sup>

15. One element of a trader's job has remained constant. Regardless of changes in the marketplace, a trader's job has always been to trade profitably for the trader's own account, the trader's employer, or clients of the trader's employer.

16. While attempting to make profits, trading on both sides of a market is both common and appropriate. It is not unusual for a single trader to have a number of different orders, for sometimes varying quantities, at varying prices on the same side of the market or different sides of the market for a single security. Traders often try to profit in the market by taking risk to purchase at or better than the prevailing bid and sell at a price that is profitable to them. Such activity can improve the spread between bids and asks, improving the markets for other investors.

17. A trader can measure and control the price at which the trader is willing to trade. Once a trader places an order, however, the trader has no control over execution. Once an order is placed, it is subject to execution by anyone else in the market unless and until the trader cancels the order. A trader's hopes that an order actually will or will not be executed have no bearing on whether an order will be executed or the likelihood of the order being executed. The trader can only see whether someone is willing to trade a certain volume of a security at a certain price. Many of the above listed order types (e.g., hidden, iceberg/max show/reserve) are specifically designed to conceal the intention of the trader who placed that order, meaning that market participants cannot know the actual quantity of shares being offered or sold at specific prices or how the displayed bids and offers fit into the overall trading strategy for the person making the bids and

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<sup>4</sup> See *NYSE ARCA Pillar Order Types and Modifiers (Rule 7.31P)*, NYSE Arca, available at [https://www.nyse.com/publicdocs/nyse/markets/nyse-arca/NYSE\\_Arca\\_Order\\_Suite.xlsx](https://www.nyse.com/publicdocs/nyse/markets/nyse-arca/NYSE_Arca_Order_Suite.xlsx); see also Order Approving NYSE ARCA New Equity Trading Rules Relating to Orders and Modifiers, 80 Fed. Reg. 66,951, 66,952-53 (Oct. 30, 2015).

offers. Indeed, orders are not linked to a particular trader in the order book; accordingly, traders take into account the possibility that every order may be from a different trader or all orders may come from a single trader (or any possibility in between).

18. In fact, most market participants have no visibility into the number of orders on each side of the market. In comparison to certain high frequency trading (“HFT”) firms and Market Makers, the general public sees latent quotes. To obtain quotes and other information more quickly, exchanges charge millions of dollars to HFT and market-making firms to connect their servers as close to the exchanges’ data feeds as possible.<sup>5</sup> Exchanges charge fees for “collocation,” which provides a significant advantage for firms paying for collocation to see and act on orders before most other market participants are able to do so.<sup>6</sup>

19. As a trader, I generally do not have visibility into the number of orders on each side of the market. All that a standard Level II display shows are the total number of shares bid for or offered at each price. As opposed to the total number of shares that can be bought or sold at each price point, the number of orders on each side of the market is not important to me. Nor is how that order fits into the trader’s overall trading strategy (which is unknown to other market participants) relevant to my decision making. All that a trader knows for certain is that, once an

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<sup>5</sup> See Alexander Osipovich, *Want to Be a High-Frequency Trader? Here’s Your Chance*, Wall St. J. (Mar. 23, 2018), <https://www.wsj.com/articles/want-to-be-a-high-frequency-trader-heres-your-chance-1521797400>; Alexander Osipovich, *High Frequency Traders Fall on Hard Times*, Wall St. J. (March 21, 2017), <https://www.wsj.com/articles/high-frequency-traders-fall-on-hard-times-1490092200>; *Co-Location (CoLo), Unmatched Speed – Added Convenience*, Nasdaq, <http://www.nasdaqtrader.com/Trader.aspx?id=colo> (last visited May 9, 2018).

<sup>6</sup> Geoffrey Rogow, *Colocation: The Root of All High-Frequency Trading Evil?*, Wall St. J. Blog (Sept. 20, 2012), <https://blogs.wsj.com/marketbeat/2012/09/20/collocation-the-root-of-all-high-frequency-trading-evil/>.

order is consummated, someone else was willing to trade at the price and volume of the consummated trade.

20. HFT now dominates equity markets. In fact, HFT now accounts for roughly 50 percent of trading in US equity markets.<sup>7</sup> Citadel is one of the largest equities and options market making firms.<sup>8</sup> Of course, improving technology accounts, in part, for the rise of HFT. However, there are other forces at work. For instance, the former Chair of the SEC, Mary Jo White, noted the role of Regulation NMS:

Consider the connection that some have asserted between the rise of high-frequency trading and the implementation of Regulation NMS in 2007. Regulation NMS, as most of you know, is the Commission's most recent comprehensive set of rules designed to carry out our statutory mandate to establish a national market system for equities. Regulation NMS includes a so-called "trade-through" provision that generally prohibits trades at prices inferior to the best quoted prices. Some have argued that this provision facilitated the fragmentation of volume among many new trading venues, enabling high-frequency trading to flourish by exploiting the fastest connections among these venues. Given the current prevalence of high-frequency traders in our equities markets—some put the number at fifty percent of daily volume—one might reasonably ask whether Regulation NMS did in fact change the "rules of the game" in favor of speed.<sup>9</sup>

Chair White went on to note that there are serious concerns about excessive intermediation by HFT dealers as well as the need for "effective competition."<sup>10</sup> Intermediation can include instances

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<sup>7</sup> See, e.g., Ryan Vlastelica, *High-Frequency Trading Has Reshaped Wall Street in Its Image*, Market Watch (Mar. 17, 2017), <https://www.marketwatch.com/story/high-frequency-trading-has-reshaped-wall-street-in-its-image-2017-03-15>.

<sup>8</sup> See *Equities & Options*, Citadel Securities, <https://www.citadelsecurities.com/products/equities-and-options/> (last visited May 9, 2018).

<sup>9</sup> Mary Jo White, Chair, U.S. Securities & Exch. Comm'n, *Intermediation in the Modern Securities Markets: Putting Technology and Competition to Work for Investors*, Address Before the Economic Club of New York (Jun. 20, 2014) available at <https://www.sec.gov/news/speech/2014-spch062014mjw>. Regulations also require brokers to "to seek the best execution reasonably available for their customers' orders." See *Best Execution*, U.S. Securities & Exch. Comm'n (May 9, 2011), <https://www.sec.gov/fast-answers/answersbestexhtm.html>.

<sup>10</sup> See *id.*

where a HFT firm, based on its more rapid receipt of information, steps in between buyers and sellers of equities to profit from anticipated trading at the expense of investors. Given the fundamental role HFT plays in markets, speed and colocation are now critical for traders and regulators have not stated that there is anything wrong with striving to be among the fastest of HFT traders.

21. As opposed to low frequency traders, who are generally looking to make money by buying and holding securities, high frequency traders generally do not trade with a long-term view and are not scanning news outlets for recent news concerning the companies that issued the stocks they are buying and selling (or derivative securities based on those stocks). HFT traders generally look to make small amounts of money on individual trades and are not making a value judgment concerning the long-term prospects of the company that issued the shares they are buying and selling.<sup>11</sup>

*B. Options Markets*

22. Call options give the owner the right, but not the obligation, to buy an underlying security at a specified price (strike price) for a certain, fixed period (until its expiration). A single call option contract entitles the option owner to generally purchase 100 shares of the underlying stock on or before expiration. A put option gives the owner the right, but not the obligation, to sell an underlying security at a specified price (strike price) for a certain, fixed period (until its expiration). All options on listed stocks are “American Style” options. American Style options are exercisable at the strike price any time prior to the expiration date.

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<sup>11</sup> Ricky Cooper et al., *The Mysterious Ethics of High-Frequency Trading*, 26 Bus. Ethics Q. 1, 2 (2016).

23. “Exercise” is the process in which the owner (holder) of an option contract invokes the rights of the option contract. In the case of a call option, the option owner exercises (buys) the underlying stock. In the case of a put option, the option owner exercises (sells) the underlying stock. The “strike” price is the price at which an option can be exercised (i.e., the underlying stock can be bought or sold). Unlike purchasing actual shares of stock, option holders are not entitled to dividends and do not have voting rights.

24. A “listed” option is an option that is sold on a registered exchange, such as the Chicago Board Options Exchange. All listed options have stated strike prices and expiration dates. Listed options are readily available on most listed securities. Alternatively, options contracts can be traded “over-the-counter” (“OTC”) (e.g., through a dealer network). The Options Clearing Corporation (“OCC”) is the sole clearing house for all listed options transactions or open interest.

25. Options transactions generally require less capital than equivalent stock transactions (due to leverage). Options contracts may return smaller dollar figures, but a potentially greater percentage on the investment, than equivalent stock transactions. The value of a particular options contract to a buyer or seller is measured by its likelihood that it will be in-the-money (“ITM”) or out-of-the-money (“OTM”) at or before the time of expiration. In simple terms, this refers to whether the stock price of the underlying security will be below or above the strike price at or before the time of expiration. A call option contract will expire with no value if the price of the underlying stock is either at or below the strike price at the time of expiration. A call option is ITM if the current market value of the underlying stock is above the strike price of the option. For a put option, the opposite is true, i.e. if the current market value of the underlying stock is below the strike price, the put option is ITM.

26. The value of an option depends in part on the current and expected price of the underlying security. An option's value, and therefore its "premium" (i.e. the price a person pays for an option), can have two parts: an intrinsic value and a time value. Intrinsic value is the amount that the option is ITM. Time value is the excess in premium over and above its intrinsic value. Time value is based on its time to expiration and other factors, such as volatility, expected dividends, and prevailing interest rates. Time value may also be referred to as "risk premium," or what the seller charges the buyer for taking on the risk of an option increasing in value from the date of the transaction to the date of expiration. Given two options of the same strike and underlying security but with different expiration dates, the longer dated option (longer time horizon to expiration) would have more time premium than a shorter dated option. Options can be comprised (a) entirely of intrinsic value, (b) of intrinsic value and time value, or (c) entirely of time value. OTM options (i.e., those with strike prices above the prevailing stock price) have no intrinsic value and are entirely comprised of time value.

27. An option's "delta" is the amount the option is expected to change in value in response to a change in the underlying stock price. For example, an option whose delta is 65 is expected to rise by \$0.65 if the value of the underlying stock price increases by \$1 (all else equal). The value of a call option that is composed entirely of intrinsic value is expected to move almost one-for-one with the underlying stock price. These ITM options are more expensive to purchase because there is more certainty associated with them being exercisable into stock. An option that is at-the-money (ATM) or equal to the prevailing underlying stock price will move roughly 50% with the price of the underlying stock and is less expensive than an ITM option. OTM options have lower delta, meaning that their value moves less relative to the movement in the underlying stock price. These options would be priced far less than ITM or ATM options. For OTM call

options to have significant changes in value, it would require a more significant upward movement in the share price.

28. An easy analogy to illustrate how the concept of delta works is to imagine a father (representing stock) and his child (representing the option). When the child is 2 years old and walking with her dad, she may only be able to cover 1/4 of her father's gait and correspondingly she has a 25 delta. Therefore, she would resemble an OTM call. When she becomes 10 years of age, she resembles an ATM call and, for every step her father takes, she can cover half of his movement and has a 50 delta. When the child approaches adulthood, she is more like an ITM call and matches her father's movement entirely or 100%.

29. The option "volume" of a particular security is the total number of transactions that occur between buyers and sellers of options in that security and can include any and all strikes for a given period e.g. day, week, month, etc. Option volume is trading volume.

30. Option "open interest" is the number of open options contracts for a given security that have been traded and not yet closed out (i.e., expired, exercised, or closed out by an offsetting trade). Investors entering orders are required to mark their options as opening or closing transactions. Open interest increases when investors add to existing positions and it decreases when the positions are eliminated or closed out. In other words, open interest measures the number of contracts or commitments outstanding on options traded on exchanges.

31. Market Makers are the primary source of immediate liquidity for options markets. Other participants include individual and institutional investors. Market Makers are required by exchanges to make a two-sided market (buy and sell) for options by holding themselves out to buy and sell at competitive prices called "quotes." They are typically only required to quote ten contracts per side; however, they can quote more. At times, Market Makers may quote a large

number of contracts because they are competing with other Market Makers to have their quotes filled, something that occurs on a *pro rata* basis on certain exchanges.<sup>12</sup> Market Makers in return receive lower fees and better capital treatment and margining from the exchange and clearing firm. The difference between listed prices to buy and sell a particular option (the bid-ask spread) is the Market Maker's profit margin and is the output of all the risk, hedging, and clearing costs associated with trading that security.

32. Edge is what an options Market Maker requires to systematically delta hedge against the corresponding underlying stock. Market Makers do not make money on each and every trade. Their goal is to make money consistently on average.

33. When hedging positions, Market Makers may hedge by trading in other options, futures, stocks, exchange traded funds, and other instruments. They are not required to hedge in the equities markets, and often do not do so. This strategy can be viewed in the same manner as a wishbone offense in college football. In this analogy, the quarterback has the ball (trade) and wishes to maximize the yardage (profit) of a play. He can hand the ball to the fullback, keep the ball or pitch the ball to the tailback. In essence, almost all cross-market strategies operate in this mode. They run algorithms with the purpose of making profits based on what the market is offering in any given micro-second.

34. There is no certainty when one is engaged in a cross-market strategy that a hedge can be made profitably. In industry parlance, this is known as "slippage." Slippage occurs when the hedger fails to get the price needed to maintain the edge (profit) and is forced then to either cancel the order and wait for a better opportunity or hedge the trade at a loss immediately. The

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<sup>12</sup> *Everything You Need to Know About Options*, Options Industry Council 12 (2012) available at [https://www.optionseducation.org/documents/literature/files/everything\\_you\\_need\\_to\\_know.pdf](https://www.optionseducation.org/documents/literature/files/everything_you_need_to_know.pdf).

concept that a trader can simultaneously buy in one market and trade in another the same asset without risk is a fallacy. In fact, the SEC rules governing the National Market System prohibit locking or crossing the bid ask of another exchange's market.

35. Market Makers may quote the same option contracts on multiple exchanges and may purge their quotes when sufficient contracts have transacted. There are also a number of safeguards to protect Market Makers, including rapid fire and speed bump features.

36. Market Makers rely on proprietary models, often based on standard pricing models, such as the "Black Scholes Options Pricing Model," in making pricing decisions. The option price quoted by Market Makers at any given moment is the confluence of the Black Scholes Options Pricing Model (or a variation such as the Cox, Ross, Rubenstein Model) and market supply and demand. Professional Market Makers are required to provide competitive two-sided markets for options based on these factors. They, or another firm or investor, are the counter-parties to these transactions.

37. There are 15 options exchanges in the US.<sup>13</sup> Options markets are electronic, fast, and even more complex than the equities markets. If a trader places an order at a quoted price, it is assigned to a Market Maker either on a price/time or pro rata basis based on the exchange.

38. In my experience, traders frequently trade in both equities and options and there is nothing inherently wrong with such trading. In fact, it is very common. Traders often seek to hedge (either fully or partially) the risk of equity trading by trading in options and vice versa.

## **V. Layering and Spoofing**

39. The commodities and securities markets offer different products and have different oversight. Unlike commodities statutes, securities statutes do not outlaw spoofing or layering by

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<sup>13</sup> See <https://www.theocc.com/clearing/clearing-services/exchanges.jsp>.

name. In my view, there is no universally agreed definition of what spoofing and layering are and their meanings vary significantly and have changed over time. As demonstrated by deposition testimony in this case, layering used to have, at least in some settings, an entirely innocent meaning.<sup>14</sup> Even if one accepts a particular definition of spoofing, it requires “a fairly high level of understanding of the behavior, in order to determine if spoofing is happening at an organization.”<sup>15</sup> The determination is a difficult one.

**VI. Avalon’s Equity Trading is Not Consistent with Layering.**

*A. Avalon’s Trading Activity Is Not Consistent with Layering.*

40. I have reviewed the Rebuttal Report of David J. Ross Regarding the Alleged Layering Scheme (“Ross Layering Rebuttal Report”) and the data and analyses cited therein. Based on my review, experience and materials cited, I have concluded that Avalon’s purportedly non-bona fide orders were actually consistent with the goal for the trades to be executed. Specifically, the data shows that the purportedly non-bona fide orders were primarily at or inside the NBBO.<sup>16</sup> This means that, even in the absence of market movement, the orders were “at risk” for immediate execution. Whether an order will, in fact, execute is outside of the trader’s control. But in my experience as a trader, Avalon’s entry of these orders is inconsistent with the SEC and Hendershott’s assertions that Avalon did not “intend” these orders to execute.

41. Avalon’s purported non-bona fide orders are very different from riskless wash trades. Avalon’s orders are consistent with a trader trying to compete in the market by taking risk

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<sup>14</sup> See, e.g., Transcript of the Deposition of Adam Nunes on April 6, 2018 at 62:06-16.

<sup>15</sup> Alan Jukes, *Visualizing The ‘Signature’ of Spoofing*, Nasdaq Case Study 1 (June 2017) available at <http://nasdaqtech.nasdaq.com/WP-Sig-Spoofing-IB>.

<sup>16</sup> For the subset of purportedly layering trading for which the necessary data was available, 56.5% of the supposed non-bona fide orders were placed at or inside the NBBO, and 86.6% of the purported incidents of layering included an order that was placed at or inside the NBBO. See Ross Layering Rebuttal Report at 15-16, n.39.

by offering to pay more for stock than the prevailing bid and sell at a price that is lower than at which anyone else is willing to sell. This is referred to as narrowing the spread, leading to better prices for investors and benefiting the markets. In my experience, there can be no element of deception when “at risk” orders are in the market as any market participant, including hedge funds, HFT traders, other professional traders, or retail investors, can choose to interact with these orders, or not interact with these orders.

42. The notion that the alleged non-bona fide orders gave a false impression of supply and demand is inaccurate. First, because of many of the earlier described order types (e.g., hidden orders and iceberg orders), market participants understand that they do not know the actual supply and demand of a stock at given time. Second, to the extent an order can be considered to constitute a representation, that representation is that the trader will execute his order at the entered price and volume. The entry of an order says nothing about the trader’s hopes or expectations as to whether another market participant executes against the order or how that order fits into the trader’s overall trading strategy. Nor does the entry of an order include any representation as to how long the trader will leave the order open prior to canceling it.

43. The alleged non-bona fide orders rested in the market on average for over ten seconds,<sup>17</sup> which is an eternity in terms of modern equity markets. These times are quite long compared to competing algorithms that trade in microseconds, and the half of all cancellations that occur take place within one second of an order being placed.<sup>18</sup> There was plenty of time for Avalon’s orders to be matched with another order and execute, and the leaving of orders in the

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<sup>17</sup> *Id.* (The purported non-bona fide orders “had an average duration of 10.18 seconds.”)

<sup>18</sup> See *Trade to Order Volume Ratios*, SEC Data Highlight 2013-01 (Oct. 9, 2013) available at <https://www.sec.gov/marketstructure/research/highlight-2013-01.html>.

market for such a longer period of time is, in my experience, inconsistent with an intent for those orders not to be executed.

44. Avalon's supposed non-bona fide orders were also largely small orders spread across many exchanges. In my trading experience, placing orders at the same price on different exchanges is indicative of an attempt to increase the chances of the order being executed because after price and time, market center is the next factor in determining execution priority. In addition, Avalon's use of small orders was not consistent with an intent to try to drive the market in a certain direction. In my own experience as a trader, a series of small orders does not influence my trading. As defined by Nasdaq's own recent white paper on "spoofing," small orders simply do not meet the profile of spoofing as they do not convey large size depicting increased demand or supply of the security.<sup>19</sup>

*B. Labeling Avalon's Trading as Deceptive Is Inconsistent with How Markets Actually Function and Good Practice.*

45. I find it puzzling that the SEC could simultaneously approve order types such as Reserve/Iceberg and other hidden order types while taking issue with Avalon's trades. For instance, an Iceberg order is specifically designed to make it appear to the market that a trader has less interest in buying or selling a stock than the trader actually has. By only displaying a small amount with a much larger hidden amount, its purpose is to lead sellers or buyers to believe there is a smaller amount of liquidity in the market than really exists. The SEC's approval of hidden orders demonstrates that there is nothing unacceptable, deceptive or wrong with a trader choosing to not broadcast her intentions to the market and taking active steps to disguise her actual goals.

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<sup>19</sup> See Alan Jukes, *Visualizing The 'Signature' of Spoofing*, Nasdaq Case Study 1 (June 2017) available at <http://nasdaqtech.nasdaq.com/WP-Sig-Spoofing-IB>.

46. Traders frequently design their trades in order to impede other market participants from being able to determine accurately what they are trying to accomplish. It is common for market participants, particularly HFTs, to make predictions of short-term movements in a stock price by analyzing numerous variables and market conditions. For example, HFT firms sometimes employ algorithms in an effort to profit from determining the direction of markets and putting themselves in positions to profit from anticipated trades, a practice often referred to as front-running. HFTs and other sophisticated market participants are aware that their competitors often try to reverse engineer their trading strategies and therefore take steps to protect that from happening. Indeed, algorithmic traders regularly fine-tune their algorithms, meaning that such competing trading strategies have a limited life span as changes in market structure and finance evolve.

47. If firms like Avalon engage in trading that lessens the profits of HFT firms employing algorithms, the solution is for the HFT firm to change their algorithm. It is nonsensical to argue that the HFT firm's actions in such a situation are acceptable while Avalon's actions are allegedly deceptive layering. No such line can be drawn and defended and it would be quite problematic for the markets to favor one trader over the other.

48. The securities markets are supposed to be competitive and the nature of trading requires having winners and losers. Effectively punishing one group of traders because another group of market participants (who have billions of dollars in capital) complained to the regulators after experiencing losses does not promote competition and creates an uneven playing field.<sup>20</sup>

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<sup>20</sup> See Ricky Cooper et al., *The Mysterious Ethics of High-Frequency Trading*, 26 Bus. Ethics Q. 1, 20, 31 (2016).

C. *Review of the Hendershott Reports.*

49. I have also reviewed the expert report and supplemental expert reports submitted by Terrence Hendershott in this matter. I find that the reports lack context and do not incorporate important information. Specifically, they do not consider the order of trading events. More specifically, Hendershott's criteria for determining whether trades are consistent with layering do not take into account the trading that occurs within his so-called Layering Loops. For example, in numerous instances, Avalon does not have an order imbalance or even any "Loud-side" orders at the time of a "Quiet-side" execution.<sup>21</sup> Both the SEC and Hendershott, however, have defined layering as requiring the existence of a two-sided market such that the so-called Loud side orders induce an execution with the so-called Quiet side orders. The fact that Hendershott nevertheless claims that Avalon was layering in the absence of a two-sided market is just one of the reasons that his analysis cannot be relied upon.

50. Moreover, Hendershott's reports do not review, let alone consider, the vast amount of Avalon's trading that is not encompassed by the so-called Layering Loops. Thus, Hendershott failed to consider approximately 95% of Avalon's trading. Nor did he consider the activities of other traders in the full limit order book and, therefore, does not consider important context as securities markets are fluid and many of the stocks at issue are actively traded.

51. Unlike Hendershott, I have reviewed Avalon's trading in the context of other traders' activities in the full limit order book. Specifically, I reviewed the trading of Avalon

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<sup>21</sup> See Ross Layering Rebuttal Report at ¶ 21 ("139,738 (approximately 20.7 percent) of Professor Hendershott's Layering Loops contain Quiet-side orders that were executed at a time when the order imbalance would not meet Professor Hendershott's Order Imbalance criterion").

subaccount 128\_102S in Cabela's Incorporate ("CAB") on July 20, 2015.<sup>22</sup> This trading included four of Hendershott's so-called Layering Loops,<sup>23</sup> two of which were described in the Complaint.<sup>24</sup>

52. Based on my experience as a trader, and with the benefit of the context of the full limit order book, Avalon's trading in CAB is not consistent with layering and the purported non-bona fide orders would not induce a typical trader to trade with Avalon's so-called "Quiet-side" orders. Avalon traded in CAB over the course of 45 minutes. The purported instances of layering were interspersed within a variety of other trading, the majority of which was not identified as part of a Layering Loop by Hendershott. At certain times throughout this period, Avalon traded on one side of the market, while at other times it traded on both sides.

53. When trading on both sides of the market, Avalon often traded at competitive prices by narrowing the spread on both the bid and the ask. Avalon's cancellation ratio was considerably lower than the rest of the market participants. There were a substantial number of other market participants in CAB during Avalon's trading, with more than one hundred orders resting on each side of the market at any given time. Avalon was rarely alone at the top of the book and competed with other traders to execute its orders for the best prices. In none of the purported Layering Loops in CAB did I see trading activity by Avalon on the so-called "Loud side" that would have influenced me as a trader to trade with Avalon's orders on the so-called "Quiet side."

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<sup>22</sup> The Lek Defendants' counsel provided me with the Reconstruct Order Book 2 program and trading data obtained from AlgoSeek in which order events associated with subaccount 128\_102S had been identified as such. I utilized the Reconstruct Order Book 2 program to review Avalon's trading in the context of the full limit order book.

<sup>23</sup> See Supplemental Expert Report of Terrence Hendershott, dated June 23, 2017, Revised Appendix A.

<sup>24</sup> Complaint ¶¶ 43-45.

54. Hendershott also uses analyses that he states confirm the so-called Layering Loops have characteristics indicative of a layering strategy, but I have never seen these analyses in my decades as a trader and, based on my experience, they provide little insight into the characteristics of Avalon's trading. For instance, Hendershott uses a realized spread analysis, which compares an execution price to the NBBO midpoint five minutes later, to evaluate the profitability of the trades. As a trader, comparing execution prices with the NBBO midpoint is nonsensical. The NBBO midpoint is not a price and cannot be executed against by a trader. Five minutes after a trade is an arbitrary time and looking that far in the future—an eternity in today's sub-second world of trading—provides little insight into the true profitability of a trade.

**VII. Avalon's "Cross-Market" Trading Is Not Consistent with an Intent to Trade Stock to Change Options Prices**

55. I have reviewed the Rebuttal Report of David J. Ross Regarding the Alleged Cross-Market Manipulation Scheme ("Ross Cross-Market Rebuttal Report") and the data and analyses cited therein. Based on my review, experience, and materials cited, I have concluded that Avalon's options trading was consistent with a desire to seek profit from options Market Makers offering more liquidity than the Market Makers were able to profitably hedge. In essence, Avalon captured the liquidity difference between the options markets and equities markets, which is consistent with legitimate trading. For instance, I have reviewed a complaint against Lek Securities made to the SEC by Citadel Securities on October 20, 2015. The Citadel complaint does not describe manipulative or deceptive behavior. Instead, it asserts that Citadel was unable to profitably hedge option trades that it quoted, despite having access to a number of methods of risk curtailment. It also demonstrates that equity trades are not the source of Citadel's alleged losses, or Avalon's profits. A Market Maker receives many benefits. One of the benefits is not to be insulated from the risk of loss when the Market Maker takes on more risk than it can hedge.

56. Citadel itself has immense resources at its disposal to mitigate risks associated with hedging. It employs collocation and depth of book. It is the largest Designated Market Maker on the NYSE floor.<sup>25</sup> Its “platform trades approximately 20% of U.S. equities volume.”<sup>26</sup> Citadel touts itself as “a specialist or market maker in more than 3,000 U.S. listed-options names, representing 99% of traded volume,” noting that it executes “39% of all U.S.-listed retail volume, making [Citadel] the industry’s top wholesale market maker.”<sup>27</sup>

57. Avalon’s options trading involved significant risk. The Market Makers did not have to hedge their options positions and, if they hedged, they could do so without utilizing the equity markets. As stated above (*see supra* ¶ 33), Market Makers have many alternative means to hedge risk aside from the simple delta hedging examples provided by Pearson. Sophisticated firms may also employ Beta hedging,<sup>28</sup> pairs strategies, dispersion hedging, and baskets to help reduce market risk. Large Market Makers do not just hedge idiosyncratic risk but also portfolio risk. One simply cannot assume that Citadel, for instance, was unable to hedge using ETFs or other correlated securities. In fact, one cannot safely assume that Citadel hedged in all instances, let alone that Citadel incurred losses. Further, due to the significant time the alleged “Cross Market Strategy” took, Avalon was exposed to much broader market risk from developments that would potentially affect the market on a macro level.

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<sup>25</sup> *See Equities & Options*, Citadel Securities, <https://www.citadelsecurities.com/products/equities-and-options/> (last visited May 9, 2018).

<sup>26</sup> *Id.*

<sup>27</sup> *Id.*

<sup>28</sup> *See* Steven Nickolas, *What Are the Differences between Delta Hedging and Beta Hedging?*, Investopedia, <https://www.investopedia.com/ask/answers/061715/what-are-differences-between-delta-hedging-and-beta-hedging.asp> (last visited May 9, 2018).

58. The notion that Avalon's stock trades were for the purpose of decreasing the prices of the options that Avalon acquired is not consistent with Avalon's trading activity. For example, it appears that many of Pearson's so-called Cross-Market Loops consist of instances where Avalon began accumulating its options position before trading in the underlying equity.<sup>29</sup> In such situations, it is impossible for Avalon to have changed any prices with stock activity for the initial options trades as there had been no stock activity. Further, Pearson's report does not show that, in the absence of the allegedly wrongful equity trading, Avalon would not have made the same return on its options trading, meaning that the stock trading only served to reduce Avalon's profits significantly. Instead, the stock transactions are consistent with at least two other purposes: (1) to help better inform a view as to whether the liquidity being offered in the options was too much given the observed liquidity in the stock, and (2) to serve as at least a partial hedge in the event Avalon proceeded with the options transactions.

59. The conclusion that Avalon was seeking to gauge liquidity is supported by the large number of stock transactions with no corresponding options trade, consistent with a trader determining that liquidity conditions were not favorable for proceeding with the options strategy.<sup>30</sup> Pearson does not even consider those trades. There are also numerous instances among the purportedly problematic "Loops" where, after stock purchases, the stock price moved down, or where the stock price moved up after Avalon sold stock, or where the stock price moved in the direction of Avalon's trades, but the change in the stock price was too small to have any effect on

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<sup>29</sup> See Ross Cross-Market Rebuttal Report at 10, n.24 ("[T]he first transaction was an options order, not a stock order, in 110 (17.3%) of the Cross-Market Loops, and an option order was placed prior to the first equity execution in 59 (9.3%) of the Cross-Market Loops" in which the first transaction was a stock order.)

<sup>30</sup> *Id.* ¶ 22 (identifying "521,564 Stock Loops" in which there was no options trade).

options prices.<sup>31</sup> If Avalon’s trading strategy was dependent on moving the stock price, as Pearson and the SEC suggest, then Avalon would never have engaged in option purchases under these conditions.

60. Pearson ignores the much higher number of instances where Avalon transacted in options but not stock and vice versa.<sup>32</sup> In other words, Avalon did not require any stock trading at all before engaging in options trading and Avalon engaged in significant stock trading by itself. The much more logical conclusion is that, in some instances, Avalon received liquidity information from stock trades that allowed it to make a more informed decision about whether to proceed with associated options trades.

61. Based on my experience, Avalon’s equities trading is also consistent with an intent to partially hedge its trading in options. In making large option trades, Avalon was taking on significant risk. Its equities trades served as partial hedge of this risk. If prices moved in the opposite direction than Avalon expected, Avalon’s equity positions would lower its exposure. Pearson summarily dismisses this possibility because (1) Avalon’s equities trading occurred prior to the taking of the option position and (2) his claim that the “Cross-Market Strategy can only be a profitably delta-hedged options strategy if” Avalon expected “volatility.”<sup>33</sup> However, Avalon could certainly have intended to hedge its upcoming option positions. In my experience, traders

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<sup>31</sup> See, e.g., *id.* at 10, n.24 (“[T]he stock price was unchanged or moved in the opposite direction of the stock trades during the period from Loop Start to Equity Peak in 66 (12.4%) of the 533 One-Directional or Overshoot Cross-Market Loops, and from Loop Start to first option order in 71 (15.2%) of the 467 Cross-Market Loops that had an equity execution prior to the first option order.”)

<sup>32</sup> *Id.* ¶ 22 (identifying “610 Option Loops” in addition to the “521,564 Stock Loops” and noting that the 636 Cross-Market Loops “represent approximately 0.12% of the total number of Avalon trade group 038’s Loops”).

<sup>33</sup> Expert Report of Neil D. Pearson, dated March 16, 2019 (“Pearson Report”) at ¶ 94.

can and do take positions to hedge anticipated trading. Further, Pearson ignores the realities of how trading actually happens: traders make quick decisions about their next trades and may choose to utilize an existing equity position as a partial hedge while performing options trades that they believe will be profitable based on liquidity information they obtained when establishing the equity position itself. Pearson's argument about profitable delta hedging is a red herring. Traders have a number of different hedging strategies based on their risk tolerance, available opportunities to mitigate risk, and other factors at any point in time. Pearson appears to be assuming that the hedging would be for the purpose of establishing a profitable neutral position at all times, but in my experience, not all traders are seeking such a position.

62. Pearson's conclusion that the equity transactions were larger than necessary to test liquidity<sup>34</sup> misses the point because that analysis considers the entirety of the equity transactions in his "Loop." There are numerous examples in his "Cross-Market Loops" where Avalon engaged in multiple equity orders over a relatively long period of time,<sup>35</sup> consistent with an attempt to gauge relative liquidity at different points in time. Further, testing the market for liquidity is more art than science. In my personal experience trading, I have found that sending larger orders will more likely reveal where real buyers and sellers are than a single order that will likely be price improved somewhere in the middle of the NBBO, revealing no real information about the market.

63. I also disagree with Pearson's conclusion that it is not credible to claim that Avalon was testing liquidity by trading in the direction it traded in the "Loops" that he alleges to be "consistent with the Cross-Market Strategy."<sup>36</sup> In my experience, traders can use small or large

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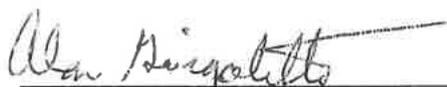
<sup>34</sup> *Id.* at ¶ 96.

<sup>35</sup> *See* Pearson Supplemental Appendix A.

<sup>36</sup> Pearson Report at ¶¶ 45, 97-98.

orders in either direction to test liquidity. A trader who has a forecast that the stock is going lower might not wish to show his intent by entering sell orders immediately. The trader instead may enter buy orders to gauge the strength of the selling interest. For instance, if the trader is filled below the ask price, it may indicate aggressive selling pressure and the trader, therefore, needs to then sell the long shares acquired and aggressively sell stock or use options to go short the security. Conversely, if a trader whose original intent was to go short was to discover that his buy orders were not being filled even at the ask price, the trader might reverse and go long in the security. Also, the manner in which Avalon traded (e.g. establishing a long equity position and then purchasing puts) provided a partial hedge if Avalon's information concerning liquidity turned out to be incorrect.

DATED: May 11, 2018

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Alan Grigoletto

## Appendix A

### **Alan G. Grigoletto** **Grigoletto Financial Consulting**

369 S. Prairie Ave.  
Elmhurst, IL 60126  
312-310-5005 Mobile  
grigolettofinance@gmail.com

## **Experience**

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### **Grigoletto Financial Consulting**

CEO and Founder

**Chicago, IL**

January-2016-Current

- Business development expert for elite individuals, trading groups, family offices and financial software companies
- Expert witness in cases of financial fraud and market manipulation on behalf of SEC and DOJ
- Author of financial articles of interest for the Canadian, U.S. exchanges, broker dealers and advisory communities
- Speaker, writer and publisher of listed options educational materials for audiences in U.S., Italy, U.K. and Canada

### **Ketchum Trading Partners**

Chief Commercial Officer

**Chicago, IL**

July 2015-January 2016

- Responsible for overseeing global risk of 25 trading partners financed with Hull capital. Monitored portfolios composed of eurodollars, treasuries, grains, oil, equity and equity commodity futures on both U.S., foreign exchanges and OTC markets.
- Analyzed the individual profit and risk of potential new partners as well as global portfolio risk to Ketchum Trading Partners as a whole.

### **Hull Tactical Funds**

Chief Commercial Officer

**Chicago, IL**

July 2015-December 2015

- Head of marketing and business development for Hull Tactical Funds US (HTUS)
- Authored the business and marketing plan for HTUS and with COO oversaw all daily operational aspects of the fund
- Reported directly to Blair Hull, Chairman and advised on strategy and tactics to grow AUM

### **Options Industry Council/OCC**

VP Education

**Chicago, IL**

June 2011-June 2015

- Served as ambassador for the options exchanges and OCC, while promoting the growth of our industry to SEC, CTFC and Federal Reserve Bank regulators
- Fully supported our coalition efforts in fighting proposed legislation and taxes that would damage our industry
- Developed materials for all educational levels of investor, retail, advisor, institutional and regulatory authorities
- Ensured that all of our educational materials maintained our standards of fairness and accuracy
- Developed new and unique educational programs that help demonstrate the diverse applications for options

- Created ties and global business relationships to further promote the use of options and ensure that the U.S. options market is considered alongside competing investment products
- Worked with OIC's public relations team to develop press relations with financial publications and serve as an information source and contributing author

**Boston Options Exchange LLC**  
SVP Business Development

**Boston/Chicago**  
February 2002-June 2011

- First employee of BOX and head of business development and marketing
- Coordinated with legal team on establishment of application process, exchange rules, policies and procedures
- Responsible for recruiting and enlisting 100 participant firms and vendors prior to exchange launch February 2004
- Worked extensively with Montreal technology team to develop matching algorithms, co-location, intermarket linkage and exchange enhancements
- Responsible for maintaining all client relations, client request for platform and regulatory change and ensured BOX was both competitive in price and functionality with all other options exchanges
- Directly reported to CEO all relevant business issues, provided yearly business plan and budget for business team
- Represented BOX interests at all industry events and liason with media to ensure industry coverage in press
- Coordinated with BOX Market Operations Chief to ensure synchronization of processes between business and market operations as well as addressing technical issues and ongoing regulatory requirements
- Authored exchange press releases and marketing materials, including design of all media advertisements

**Chicago Analytical Capital Management**  
Partner VP

**Chicago, IL**  
March 2000-March 2002

- Initiated and developed communication and electronic links with all market data vendors and brokerage firms
- Analyzed all research data for fixed income and equity selections
- Executed and rebalanced all portfolios, managed risk for the firm's Tactical Fund, executed all single stock transactions and all option trades
- Created options overlay strategy for clients with large single stock positions
- Authored quarterly newsletter
- Audited monthly and quarterly statements
- Co-developed working pairs trading model
- Private Client relations' manager
- Met with all clients on a regular basis and established database and risk profile for each while communicating our investment philosophy

**Hull Trading**  
Portfolio Manager

**Chicago, IL**  
May 1997-March 2000

- Oversaw Hull's Third Market Operation and the management of six traders. Responsible for all hedging, risk management and regulatory compliance for both Equity 500 and Midcap 400 Portfolios
- Championed and co-developed electronically driven Volume Weighted Average Pricing Model
- Worked directly with programmers and financial engineers to develop and optimize trading algorithms

- Implemented all procedures for the NASDAQ trade desk including maintenance, compliance and reporting procedures
- Coordinated with back office: resolution of out-trades, reconciliation of bills, negotiation of rebates and implementation of cost-cutting procedures. Also responsible for the procurement of all computers, routers and communication lines to existing and prospective clients
- Built agency trade desk and acted as central stock broker for all equity hedging for Hull Liquidity Fund and Hull Trading Co. Created budgets and reported quarterly portfolio performance reviews to executive group
- Head of marketing and retail sales. Attended all industry-related conferences. Maintained client relationships and developed new business contacts

**Mercury Trading/Hull Trading**

Partner/Head Trader

**Chicago, IL**

June 1995- May 1997

- Responsible for all profits and losses for both listed and NASDAQ Mkt. Operations
- Designed direct layoff operation with NASDAQ Mkt. Maker System
- Negotiated rebate terms with NASDAQ Mkt. Makers
- Assisted in all aspects and decisions of the firm including marketing, brokerage and trading strategies

**Midwest Stock Exchange** *Chancellor Dougall/ DLJ Securities*  
Specialist

**Chicago, IL**

August 1982-Jan 1995

- Specialist in firm's designated stocks
- Worked with exchange to multi-list new securities
- Allocated funds for investments outside of key designated stocks
- Responsibilities included acquiring/executing customer accounts, billing and trade checking
- Traded stocks, options and futures for firm account

**Chicago Board of Options Exchange**

Market Maker/Member

**Chicago, IL**

June 1979-May 1982

- Advanced from floor broker clerk to self-employed trader
- Also executed orders as a floor broker for customer accounts

**EDUCATION:**

University of Miami, Florida - B.B.A. Finance

**LICENSES HELD:**

Series 7, 55, 63 & 65

**ADDITIONAL:**

- U.S. and Italian Passports
- Key participant /speaker OIC 2013 China Delegation
- Languages: English primary, Italian secondary
- Options Industry Council Member, FIA steering committee member, STA Member
- Chairman of Securities Trading Association Derivatives Committee
- Certified instructor for derivatives education for Options Industry Council. Authored and co-authored instructional materials and articles of interest
- Guest Speaker: Northwestern's Kellogg Business School, University of Chicago, Wharton's Alumni Association, Washington University, University of Notre Dame, University of Bologna
- Selected by FINRA to help develop 56 examination for proprietary traders
- Guest speaker: Securities and Exchange Commission, CFTC, Futures Industry Association, House of Representatives panel debate on penny pricing

- Panelist for Wall St. Journal Future of Finance committee on financial reform post 2008 Financial Crisis held in Washington DC. Findings were presented to Larry Summers, Director of National Economic Council

**PUBLIC ARTICLES:**

- "Evolution, Revolution or Convolution," *Option Matters*, March 15, 2018
- "Understanding Credit Spreads and How They Differ from Debit Spreads," *Option Matters*, March 10, 2018
- "Flying With Condors," *Option Matters*, March 15, 2018
- "Reverse Ratio Call Backspread," *Option Matters*, March 15, 2018
- "Long Call Neutral Calendar Spreads," *Option Matters*, March 15, 2018
- "A Quick Guide to Volatility Skew," *Option Matters*, November 10, 2017
- "Understanding Options Vega," *Option Matters*, October 8, 2017
- "Going Long Volatility," *Option Matters*, December 9, 2016.
- "Of Mice and Men and Rolling Options," *Option Matters*, September 6, 2016.
- "Understanding Put-Call Parity," *Option Matters*, August 29, 2016.
- "Pairing Option Strategies with Forecasts," *Option Matters*, August 25, 2016.
- "When to Exercise Call Options to Collect the Dividend," *Option Matters*, August 10, 2016.
- "The Covered Strangle is both an Income and Investment Strategy," *Option Matters*, July 29, 2016.
- "Moving Beyond the Basics with the Covered Call Strategy," *Option Matters*, June 1, 2016.
- "A Deeper Look Into Why Options Go Unexercised," *Options Central*, Fall 2008.

## **Appendix C**

### **Pleadings**

Complaint, *Securities and Exchange Commission v. Lek Securities Corporation et al.*, March 10, 2017

### **Expert Reports and Supporting Materials**

Report of Terrence Hendershott, Ph.D., April 3, 2017

Supplemental Report of Terrence Hendershott, Ph.D., June 23, 2017

Second Supplemental Report of Terrence Hendershott, Ph.D., March 15, 2018

Expert Report of Neil D. Pearson, Ph.D., March 16, 2018

Rebuttal Report of David J. Ross Regarding the Alleged Layering Scheme, May 11, 2018

Rebuttal Report of David J. Ross Regarding the Alleged Cross-Market Manipulation Scheme, May 11, 2018

### **Transcripts**

Transcript of Deposition of Adam Nunes on April 6, 2018

Transcript of Deposition of Marin Nitzov on April 3, 2018

Transcript of Deposition of Nathan Fayer on February 5, 2018

Transcript of Testimony of Nicolas Louis on October 22, 2013

Transcript of Testimony of Nicolas Louis on December 9, 2015

Transcript of Deposition of Nicolas Louis on March 9, 2018

Transcript of Testimony of Samuel Lek on November 15, 2013

Transcript of Testimony of Samuel Lek on September 23, 2014

Transcript of Testimony of Samuel Lek on October 28, 2014

Transcript of Deposition of Samuel Lek on February 27, 2018

Transcript of Testimony of Sergey Pustelnik on February 11, 2014

Transcript of Testimony of Sergey Pustelnik on October 16, 2014

Transcript of Deposition of Sergey Pustelnik on March 21, 2018

### **Academic Literature**

Ricky Cooper et al., *The Mysterious Ethics of High-Frequency Trading*, 26 Bus. Ethics Q. 1 (2016)

### **Data**

Avalon Trade Data

Trading Data for Cabela's Incorporate ("CAB") on July 20, 2015

### **Administrative Materials**

Order Approving NYSE ARCA New Equity Trading Rules Relating to Orders and Modifiers, 80 Fed. Reg. 66,951 (Oct. 30, 2015).

### **Speeches and Addresses**

Mary Jo White, Chair, U.S. Securities & Exch. Comm'n, Intermediation in the Modern Securities Markets: Putting Technology and Competition to Work for Investors, Address Before the Economic Club of New York (Jun. 20, 2014) *available at* <https://www.sec.gov/news/speech/2014-spch062014mjw>.

### **Online Articles and Publications**

Alan Jukes, *Visualizing The 'Signature' of Spoofing*, Nasdaq Case Study 1 (June 2017) *available at* <http://nasdaqtech.nasdaq.com/WP-Sig-Spoofing-IB>.

Steven Nickolas, *What Are the Differences between Delta Hedging and Beta Hedging?*, Investopedia, <https://www.investopedia.com/ask/answers/061715/what-are-differences-between-delta-hedging-and-beta-hedging.asp> (last visited May 9, 2018).

Alexander Osipovich, *High Frequency Traders Fall on Hard Times*, Wall St. J. (March 21, 2017), <https://www.wsj.com/articles/high-frequency-traders-fall-on-hard-times-1490092200>.

Alexander Osipovich, *Want to Be a High-Frequency Trader? Here's Your Chance*, Wall St. J. (Mar. 23, 2018), <https://www.wsj.com/articles/want-to-be-a-high-frequency-trader-heres-your-chance-1521797400>.

Geoffrey Rogow, *Colocation: The Root of All High-Frequency Trading Evil?*, Wall St. J. Blog (Sept. 20, 2012), <https://blogs.wsj.com/marketbeat/2012/09/20/collocation-the-root-of-all-high-frequency-trading-evil/>.

Ryan Vlastelica, *High-Frequency Trading Has Reshaped Wall Street in Its Image*, Market Watch (Mar. 17, 2017), <https://www.marketwatch.com/story/high-frequency-trading-has-reshaped-wall-street-in-its-image-2017-03-15>.

## **Other**

*Algoseek US Equities Full Depth Data*, Algoseek (Sept. 21, 2015), [https://www.algoseek.com/static/files/documentation/equity\\_and\\_etf\\_etn/AlgoSeek.US.Equities.FullDepth.1.0.pdf](https://www.algoseek.com/static/files/documentation/equity_and_etf_etn/AlgoSeek.US.Equities.FullDepth.1.0.pdf).

*Best Execution*, U.S. Securities & Exch. Comm'n (May 9, 2011), <https://www.sec.gov/fast-answers/answersbestexhtm.html>.

*Co-Location (CoLo), Unmatched Speed – Added Convenience*, Nasdaq, <http://www.nasdaqtrader.com/Trader.aspx?id=colo> (last visited May 9, 2018).

*Everything You Need to Know About Options*, The Options Industry Council (2012), [https://www.optionseducation.org/documents/literature/files/everything\\_you\\_need\\_to\\_know.pdf](https://www.optionseducation.org/documents/literature/files/everything_you_need_to_know.pdf).

*NYSE ARCA Pillar Order Types and Modifiers (Rule 7.31P)*, NYSE Arca, available at [https://www.nyse.com/publicdocs/nyse/markets/nyse-arca/NYSE\\_Arca\\_Order\\_Suite.xlsx](https://www.nyse.com/publicdocs/nyse/markets/nyse-arca/NYSE_Arca_Order_Suite.xlsx)

*OCC Participants Exchanges & Futures Markets*, The Options Clearing Corporation, <https://www.theocc.com/clearing/clearing-services/exchanges.jsp> (last visited May 9, 2018).

*Order Types and Modifiers*, Nasdaq Global Trading and Market Services 2-3 (2017) available at <https://www.nasdaqtrader.com/content/ProductsServices/Trading/OrderTypesG.pdf>.

*Trade to Order Volume Ratios*, SEC Data Highlight 2013-01 (Oct. 9, 2013) available at <https://www.sec.gov/marketstructure/research/highlight-2013-01.html>.

**UNITED STATES DISTRICT COURT  
SOUTHERN DISTRICT OF NEW YORK**

SECURITIES AND EXCHANGE  
COMMISSION,

Plaintiff,

v.

LEK SECURITIES CORPORATION,  
SAMUEL LEK, VALI MANAGEMENT  
PARTNERS d/b/a AVALON FA LTD,  
NATHAN FAYYER, and SERGEY  
PUSTELNIK a/k/a/ SERGE PUSTELNIK,

Defendants.

17-cv-01789 (DLC)

**REBUTTAL REPORT OF DAVID J. ROSS  
REGARDING THE ALLEGED LAYERING SCHEME**

**May 11, 2018**

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## **I. QUALIFICATIONS**

1. I am an Executive Vice President of Compass Lexecon, a consulting firm that specializes in the application of economics to a variety of legal and regulatory issues. At Compass Lexecon, I have specialized in the areas of financial economics and the economics of corporate law, and worked on hundreds of matters involving a wide variety of financial issues.

2. My curriculum vitae, which contains a list of my publications and other professional activities, is attached as Appendix A.

3. I received a B.A. in economics from the University of Chicago in 1983. In 1985, I received an M.B.A. from the University of Chicago Graduate School of Business (now known as the University of Chicago Booth School of Business), having completed the specialization requirements in economics, finance and industrial relations.

4. I have testified as an expert witness regarding a wide variety of financial issues in proceedings throughout the United States. These proceedings are also listed on Appendix A.

## **II. INTRODUCTION, ASSIGNMENT, AND SUMMARY OF CONCLUSIONS**

5. The Securities and Exchange Commission (“SEC”) alleges that Vali Management Partners dba Avalon FA Ltd (“Avalon”), a foreign trading firm, perpetrated two schemes to manipulate the securities markets: “layering” and “cross-market manipulation.”<sup>1</sup> The SEC also alleges that Lek Securities Corp.

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1. Complaint, ¶¶ 1-3. The SEC also alleges that Nathan Fayer (“Fayer”) and

(“Lek”) and Samuel Lek, its Chief Executive Officer (collectively, the “Lek Defendants”), “approved, permitted and facilitated Avalon’s schemes even though they knew or were reckless in not knowing that Avalon was engaging in market manipulation.”<sup>2</sup>

6. This report addresses the SEC’s claims regarding the alleged layering scheme.

7. The SEC alleges that as part of the layering scheme, Avalon placed “non-bona fide orders”—which the SEC defines as orders that Avalon “did not intend to execute” and had “no legitimate economic reason” for placing—to buy or sell stock “with the intent of injecting false information into the marketplace about supply or demand for the stock ... to trick and induce other market participants to execute against Avalon’s bona fide orders (i.e. orders that Avalon did intend to execute) for the same stock on the opposite side of the market.”<sup>3</sup> The SEC further alleges that “[b]y placing the non bona fide orders, Avalon was able to manipulate the market for the stocks and thereby obtain more favorable prices on

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Sergey Pustelnik a/k/a Serge Pustelnik (“Pustelnik”) directly participated in and assisted the manipulative schemes. Id., ¶ 1. Fayer is Avalon’s disclosed principal and Pustelnik is allegedly an undisclosed control person of Avalon and a former registered representative at Lek Securities Corporation. Id.

2. Id., ¶ 6. Lek is a registered U.S. broker-dealer based in New York, and Avalon was a customer of Lek. Id., ¶¶ 1 & 7.

3. Complaint, ¶ 2. See also id., ¶ 36 (“The non-bona fide orders are intended to inject false information into the marketplace about supply or demand for the security at issue and thereby to induce other market participants to execute against the trader's bona fide orders ... for the same security on the opposite side of the market at an artificial price.”)

the executions of its bona fide orders than otherwise would have been available.”<sup>4</sup>

The SEC alleges that Avalon engaged in hundreds of thousands of instances of layering in numerous securities from approximately December 2010 through at least September 2016.<sup>5</sup>

8. The SEC retained Terrence Hendershott to review Avalon’s transaction data for common stock traded on U.S. markets through Lek during the period of December 2010 through September 2016 (the “Avalon Trade Data”) and provide opinions concerning (a) whether any of Avalon’s order and trade activity is consistent with “layering”; and (b) to quantify the amount of trading revenue, if any, that resulted from any such activity.<sup>6</sup> Professor Hendershott has opined that “there are 675,506 instances consistent with layering over the period from December 2010 to September 2016” and that Avalon’s “trading revenue from trading consistent with layering totaled more than \$21 million, of which \$12 million was earned in 2015 and 2016 alone.”<sup>7</sup>

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4. Id., ¶ 2. See also id. ¶ 41(e) (“these instances of layering enabled Avalon to manipulate the market so that it could reap profits by buying low and selling high at artificial prices.”)

5. Id., ¶ 2.

6. See Report of Terrence Hendershott, Ph.D., April 3, 2017 (“Hendershott Report”), ¶ 8.

7. Id., ¶ 11. Professor Hendershott submitted a supplemental report on June 23, 2017 which, among other things, revises his previous analysis to remove two loops, leaving 675,504 Layering Loops. See Supplemental Report of Terrence Hendershott, Ph.D., June 23, 2017 (“Hendershott Supp.”), ¶ 8. Professor Hendershott states that “[r]emoving those two loops leads to very minor changes to [Hendershott Report] Appendix A and Exhibits 4, 9, 10, 12, 15, and 16,” but does not change his opinion “that the Avalon Trade Data reflects orders and execution activity consistent with layering.” Id., ¶¶ 8-9. Professor Hendershott submitted a second supplemental report on March 15, 2018 that

9. I have been asked by counsel for the Lek Defendants to review and evaluate Professor Hendershott's analysis. In performing this work, I have received assistance from members of Compass Lexecon's professional staff.<sup>8</sup> Section III of this report summarizes Professor Hendershott's analyses; Section IV summarizes my primary conclusions; and Section V provides the bases for my conclusions. Appendix B identifies the materials that we have relied upon in preparing this report.

10. I have also been asked to calculate the amount of Section 31 fees the SEC received as a result of Avalon's trading, as discussed in Section V of this report.

### **III. SUMMARY OF PROFESSOR HENDERSHOTT'S ANALYSES**

#### **A. Identifying Layering Loops**

11. Professor Hendershott uses the term "Loop" to refer to all orders and trades in a stock from the time at which an initial order is placed until all outstanding orders for that stock are closed through cancellation or execution.<sup>9</sup>

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"supplements" his report and supplemental report "by providing additional examples of Layering Loops and charts illustrating certain characteristics of the Layering Loops" but does not provide any additional analyses or opinions. See Second Supplemental Report of Terrence Hendershott, Ph.D., March 15, 2018 ("Hendershott Second Supp."), ¶ 3.

8. Compass Lexecon bills for professional services at hourly rates, and our bills are not contingent on the outcome of this matter. My hourly rate is \$950. My work in this matter is ongoing and I reserve the right to supplement this analysis in the future. If needed, I may prepare graphic or illustrative exhibits to use at trial based on the documents and information relied upon and my analysis of those documents and information.
9. Hendershott Report, ¶ 17.

Professor Hendershott relies on four criteria he devised to identify Loops that he claims to be “consistent with a layering strategy” (which he calls “Layering Loops”).<sup>10</sup>

12. Professor Hendershott’s first criterion is that a Layering Loop must include both purchase and sale orders (i.e., it is two-sided) and end within 60 seconds; I refer to Loops that satisfy this criterion as “Two-sided Short Loops.”<sup>11</sup> Second, a Layering Loop must have a sufficient “Order Imbalance”; in particular, he requires “the ratio of Loud-side orders to Quiet-side orders (both with respect to the number of orders and the number of shares in those orders) to be at least 2-to-1....”<sup>12</sup> Third, a Layering Loop must have a sufficient “Execution Imbalance”; in particular, he requires “the ratio of executed Quiet-side shares to executed Loud-side shares to be at least 3-to-1.”<sup>13</sup> Finally, Professor Hendershot requires “that no Loud-side orders be placed more than one second after the last Quiet-side execution or cancellation in Layering Loops, as a layering strategy typically involves using Loud-side orders to achieve favorable execution for Quiet-side orders.”<sup>14</sup> Professor Hendershott ultimately concluded 675,504 of Avalon’s Loops “qualify as Layering Loops.”<sup>15,16</sup>

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10. *Id.*, ¶ 17 & note 15.

11. *Id.*, ¶¶ 17-18.

12. *Id.*, ¶¶ 17 & 19. The “Loud” side is the side with more orders for a greater quantity of shares and the “Quiet” side is the side with fewer orders for a smaller quantity of shares. *Id.*, ¶ 14. Professor Hendershott only considers displayed orders when determining whether there is an “Order Imbalance” and omits Loops with 3 orders or less. *Id.*, note 14.

13. *Id.*, ¶¶ 17 & 20.

14. *Id.*, note 15.

15. *Id.*, ¶ 21 (reporting 676,506 Layering Loops); Hendershott Supp., ¶¶ 6-8

## **B. Further Analyses of Layering Loops**

13. Professor Hendershott then “perform[s] additional analyses to [purportedly] evaluate (i) whether the Layering Loops [he identified] have characteristics indicative of a layering strategy that misleads market participants to achieve more favorable executions, and (ii) whether such characteristics are likely to arise unintentionally or as part of a non-layering strategy that places orders on both sides of the market, such as market making.”<sup>17</sup> These additional analyses consist of what he refers to as (i) “Cancellation Analysis,” (ii) “Position Analysis,” (iii) “NBBO Movement Analysis,” and (iv) “Realized Spread Analysis.”<sup>18</sup>

## **C. Examples of Layering Loops**

14. Professor Hendershott also provides four examples of Layering Loops in his initial report and four examples of Layering Loops in his second supplemental report.<sup>19</sup>

## **D. Trading Revenues**

15. Finally, Professor Hendershott purports to analyze Avalon’s trading revenue from Layering Loops.<sup>20</sup> He claims that Avalon obtained total

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(“removing ... two loops” that Professor Hendershott had previously categorized incorrectly).

16. In some cases, the Avalon Trade Data show the same reported time for multiple events (i.e., orders entered, executed, or cancelled) relating to orders entered by the same trader in a stock. Professor Hendershott does not explain the method that he used to sequence these events or demonstrate its reliability. Moreover, in some cases the procedure he uses results in the placement of events with the same time stamp into different Loops.

17. Hendershott Report, ¶ 22.

18. *Id.*, ¶¶ 23-31.

19. *Id.*, ¶¶ 32-37 & Exhibits 7a, 7b, 8a & 8b; Hendershott Second Supp., ¶ 3 & Exhibits 18, 19, 20a & 20b.

trading revenue of more than \$21 million from Layering Loops between December 2010 and September 2016.<sup>21</sup> He also finds that the “distribution of Avalon’s trading revenue provides further evidence that its traders were engaged in layering strategy because “on average, Quiet-side executions in Layering Loops generate positive trading revenue” whereas Loud-side executions in Layering Loops generate negative trading revenue.”<sup>22</sup>

#### **E. Alternative Order and Execution Imbalance Ratios**

16. Professor Hendershott’s analyses described above “use an Order Imbalance of 2-to-1 and an Execution Imbalance of 3-to-1.”<sup>23</sup> To purportedly “ensure that overall conclusions are not sensitive to those exact ratios,” Professor Hendershott also “perform[ed] the same analyses using three additional ratios for Order Imbalance (3-to-1, 5-to-1, and 10-to-1) and for two additional ratios for Execution Imbalance (5-to-1 and 10-to-1).”<sup>24</sup> Professor Hendershott claims that his findings “confirm that the evidence of the substantial activity in the Avalon Trade Data consistent with layering is robust to the choice of Order Imbalance and Execution Imbalance ratios.”<sup>25</sup>

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20. Hendershott Report, ¶¶ 38-41.

21. Id., ¶ 38.

22. Id., ¶ 39-40.

23. Id., ¶ 42.

24. Id.

25. Id., ¶ 43.

#### **IV. SUMMARY OF MY CONCLUSIONS**

17. As reflected in this report, I have concluded that Professor Hendershott's analysis is fundamentally flawed and does not establish that Avalon was engaged in the alleged layering strategy for many reasons, including:

- Professor Hendershott's analysis does not establish that Avalon had manipulative intent when it placed its Loud-side orders in the Layering Loops.
- The criteria Professor Hendershott devised to identify Layering Loops do not reliably identify trading activity that is consistent with layering or attributable to the alleged layering strategy.
- Professor Hendershott ignores Avalon's other trading activity, and that activity belies his claim that characteristics he asserts are consistent with a layering strategy "are unlikely to arise unintentionally or as part of a non-layering strategy that places orders on both sides of the market."
- The overwhelming majority of Professor Hendershott's Layering Loops (including his illustrative examples) have characteristics inconsistent with the alleged layering strategy.
- Professor Hendershott's "further analyses" do not establish that Avalon was engaged in the alleged layering strategy.

I elaborate upon and provide the bases for these and other conclusions in the next section of this report.

**V. PROFESSOR HENDERSHOTT’S ANALYSES ARE FLAWED AND DO NOT ESTABLISH THAT AVALON WAS ENGAGED IN THE ALLEGED LAYERING STRATEGY**

**A. Professor Hendershott’s Analysis Does Not Establish That Avalon Had Manipulative Intent When It Placed Its Loud-side Orders in the “Layering Loops”**

18. As explained above, the SEC alleges that Avalon placed “non-bona fide orders” (i.e., orders that it “did not intend to execute” and had “no legitimate economic reason” for placing) to buy or sell stock “with the intent of injecting false information into the marketplace about [the] supply or demand for the stock ... to trick and induce other market participants to execute against Avalon’s bona fide orders (i.e. orders that Avalon did intend to execute) for the same stock on the opposite side of the market.”<sup>26</sup>

19. Professor Hendershott recognizes that layering requires manipulative intent.<sup>27</sup> However, Professor Hendershott concedes that he cannot determine the intent of the trader for any individual trade.<sup>28</sup> Thus, he is unable to ascertain whether the trading in any specific Layering Loop constitutes layering. Moreover, Professor Hendershott does not demonstrate that the trading activity in Layering Loops is not consistent with legitimate trading strategies, including the trading strategies that Avalon used in trading activities that the SEC has not

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26. Complaint, ¶ 2.

27. See, e.g., Hendershott Report, ¶ 13 (“Strategies often referred to as ‘spoofing’ or ‘layering’ typically involve certain traders placing visible limit orders ... that they do not intend to execute, but rather to create an artificial appearance of supply or demand to improve the execution of their other orders”).

28. See Transcript of Videotaped Deposition of Terrence Hendershott, Ph.D, May 9, 2017, at 374:22-375:5. See also id., at 421:22- 422:2.

contended were manipulative. Therefore, Professor Hendershott's analysis does not demonstrate that Avalon was engaged in the alleged layering strategy rather than a legitimate trading strategy when it placed its Loud-side orders in the Layering Loops.

**B. Professor Hendershott's Method for Identifying Layering Loops Is Not Reliable**

20. Professor Hendershott devised the specific criteria he used to identify Layering Loops and does not claim that these criteria appear in any statute, rule, regulation, or peer-reviewed article.<sup>29</sup> Nevertheless, Professor Hendershott claims that "the evidence of substantial activity in the Avalon Trade Data consistent with layering is robust to the choice of Order Imbalance and Execution Imbalance ratios."<sup>30</sup> But that is not so: the number of Loops that would be classified as Layering Loops varies substantially when these ratios are changed. For example, if 10-1 Order Imbalance and 10-1 Execution Imbalance ratios were used, then the number of Avalon's Loops that would be identified as Layering Loops would decline by over 75% to 167,713 Loops.<sup>31</sup>

21. Professor Hendershott's methodology for identifying trading that is "consistent with layering" is also suspect because he analyzes order imbalances by comparing the ratio of Loud-side orders entered at any time during a

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29. *Id.*, at 25:3-7; 27:16-28:1; 28:18-29:2; 29:3-8; 30:6-12. I also understand that "layering" is not a term that is defined in any securities law, rule or regulation.

30. Hendershott Report, ¶ 43.

31. The number of Loops that would be identified as Layering Loops is generated by the computer code that was used to produce Hendershott Report, Exhibits 11-16, but is not reported on any of those exhibits.

Loop to the ratio of Quiet-side orders entered at any time during the Loop. This methodology does not ensure that there was an order imbalance (or even any Loud-side orders open) at the time of the Quiet-side executions in the Layering Loops. In fact, 139,738 (approximately 20.7 percent) of Professor Hendershott's Layering Loops contain Quiet-side orders that were executed at a time when the order imbalance would not meet Professor Hendershott's Order Imbalance criterion if that criterion were evaluated at the time the order was executed.

22. Professor Hendershott's methodology for identifying trading that is "consistent with layering" is also inconsistent with whatever methodology the Financial Institutions Regulatory Authority ("FINRA") uses to identify potential layering. Beginning in March 2016, FINRA began issuing "Cross-Market Supervision Report Cards" to broker-dealers which, among other things, "provide[] firms feedback on exceptions that were generated based on firms' order entries and trading activities in a given surveillance period" and "covers layering ...."<sup>32</sup> We compared the 93,787 Layering Loops that Professor Hendershott identified between March 2016 and September 2016 with the "Layering – non-relationship" exceptions identified by FINRA in Lek's Cross-Market Supervision Report Cards

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32. FINRA's report cards refer to two categories of layering exceptions: "Layering – non-relationship" involves the same market participant conducting the baiting activity and receiving the beneficial execution" whereas "Layering – relationship" involves two separate market participants with one participant conducting the baiting activity and the other participant receiving the beneficial execution." See FINRA, Cross Market Equity Supervision Report (available at: [https://tools.finra.org/reportcenterhelp/#Cross\\_Market\\_Equity\\_Supervision\\_Reports.htm](https://tools.finra.org/reportcenterhelp/#Cross_Market_Equity_Supervision_Reports.htm)).

for the same period and found 77,056 (82.2%) of Hendershott's Layering Loops did not contain any orders with such exceptions.

**C. Professor Hendershott Ignores Avalon's Other Trading Activity**

23. Professor Hendershott asserts that certain characteristics of the orders and trades in the Layering Loops “are unlikely to arise unintentionally or as part of a non-layering strategy that places orders on both sides of the market such as market-making.”<sup>33</sup> However, Professor Hendershott limited his analysis to the subset of Loops that he selected because they had characteristics that he considered to be consistent with layering. He did not consider Avalon's other trading activity (which, as described below, accounts for the overwhelming majority of Avalon's overall trading activity) or analyze whether Avalon's other trading activity also had those characteristics.<sup>34</sup> In fact, contrary to Professor Hendershott's assertion, this is exactly what the data show, as demonstrated below.

24. To address the selection bias in Professor Hendershott's analysis, we analyzed all the Loops in the Avalon Trade Data, not just the Layering Loops he analyzed. Exhibit A disaggregates all the Loops in the Avalon Trade Data into six mutually exclusive categories, reports the number of Loops in each category, and provides certain information about the orders and trades in these Loops. The first category is Professor Hendershott's so-called Layering Loops. The second category is “One-sided Loops” and consists of Loops that only include

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33. Hendershott Report, ¶ 11.c.

34. This type of error is commonly referred to in the literature as a “selection bias.”

orders placed on one side of the market.<sup>35</sup> The third category is “Long Loops” and consists of Loops that lasted for more than 60 seconds. The fourth category is “Balanced Order Entry Loops” and consists of Two-sided Short Loops that do not satisfy Professor Hendershott’s Order Imbalance criterion. The fifth category is “Balanced Order Execution Loops” and consists of Two-sided Short Loops that satisfy Professor Hendershott’s Order Imbalance criterion but do not satisfy Professor Hendershott’s Execution Imbalance criterion. The sixth category is “Late Loud-side Order Loops” and consists of Two-sided Short loops that satisfy both Professor Hendershott’s Order Imbalance and Execution Imbalance criteria, but also includes Loud-side orders placed more than one second after the last Quiet-side execution or cancellation (i.e., “late Loud-side orders”).

25. As Exhibit A shows, the 675,504 Layering Loops that Professor Hendershott chose to study constitute only 1.4 percent of the 47,799,524 Loops in the Avalon Trade Data.<sup>36</sup> The fact that 98.6% of Avalon’s Loops are not Layering Loops demonstrates that Avalon was necessarily engaged in trading strategies other than “layering” that Professor Hendershott does not claim were manipulative.<sup>37</sup> Moreover, as discussed below, and in the remainder of this report,

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35. Approximately 85 percent of the One-sided Loops ended within 60 seconds.

36. Professor Hendershott reports that “less than 5% of Avalon’s equity trading volume is in Layering Loops.” Hendershott Report, ¶ 41. See also id., Exhibit 10 (showing that 4.4% of Avalon’s trading volume was in Layering Loops).

37. The academic literature (including an article co-authored by Professor Hendershott) recognizes that the strategies utilized by high-frequency traders (“HFTs”) are diverse and difficult to categorize. See, e.g., Jonathan Brogaard, Terrence Hendershott and Ryan Riordan, “High-Frequency Trading and Price Discovery,” 27 The Review of Financial Studies (2014), 2267-2306 (stating that “HFTs ... follow a variety of strategies beyond traditional market

the frequency and characteristics of trading activity in these other categories undermine Professor Hendershott's conclusions.

26. In particular, Exhibit A shows that 35,432,624 (74.1 percent) of the Loops in the Avalon Trade Data are One-sided Loops. The prevalence of One-sided Loops demonstrates that Avalon was engaged in trading strategies other than layering and market making since both layering and market making involve placing orders on both sides of the market.<sup>38</sup> The prevalence of One-sided Loops in the Avalon Trade Data also suggests one way that Layering Loops could arise unintentionally. Suppose, for example, that a trader places several orders on one side of the market (the Loud-side) but those orders do not execute and the trader subsequently decides to place one or more orders on the other side of the market (the Quiet-side). If a sufficient portion of the Quiet-side orders executed and the trader then cancelled his remaining orders, the orders and trades in this Loop could end up having all the characteristics of a Layering Loop even though the trader had no intention of canceling the Loud-side orders when he placed them.

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making” and mentioning: “various arbitrage strategies”, “contrarian strategies,” “proprietary lower-frequency trading strategies,” “statistical arbitrage strategies,” “directional strategies,” “momentum ignition strategies,” “short-horizon trading strategies,” and “a momentum strategy.”). See also Björn Hagströmer & Lars Nordén, “The diversity of high-frequency traders,” 16 *Journal of Financial Markets* (2013) 741-70, at 742 (“[I]nvestors use algorithms for many different reasons and strategies.... As limit order book markets in general preserve trader anonymity, empirical analysis of distinct AT and HFT strategies is difficult.”).

38. One-sided Loops are not consistent with a layering strategy (because layering requires two-sided orders) or a market making strategy (because market making, according to Professor Hendershott, requires the placement of “similar orders on both sides of the market.” Hendershott Report, note 15.

27. Exhibit A also shows that 1,341,010 of the Loops in the Avalon Trade Data are Balanced Order Execution Loops. Professor Hendershott ignores these Loops, even though they occur almost twice as frequently as the Layering Loops that are his sole focus. However, because Balanced Order Execution Loops are Two-sided Short Loops that satisfy Professor Hendershott's Order Imbalance criterion, their only distinguishing feature is their higher Loud-side order execution rates. For Balanced Order Execution Loops, the total Loud-side quantity executed (1,225,393,765 shares) substantially exceeds the total Quiet-side quantity executed (867,623,570 shares). The relatively high frequency of Balanced Order Execution Loops demonstrates that a trading strategy that involves placing two-sided imbalanced orders and leaving them open for 60 seconds or less does not typically result in imbalanced executions in favor of the Quiet-side. This establishes that the relatively low execution rate of Loud-side orders in Layering Loops is attributable to the Execution Imbalance criterion that Professor Hendershott used to select the Layering Loops, not the fact that Avalon often placed two-sided imbalanced orders.<sup>39</sup> For this reason, the lower execution rates of Loud-side orders compared

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39. The Loud-side orders in the Layering Loops also had other characteristics that increased the likelihood of execution. Those Loud-side orders had an average duration of 10.18 seconds. Moreover, in Layering Loops for which appropriate data are available (i.e. the Layering Loops included in Professor Hendershott's NBBO analysis with reported order entry times in milliseconds), 56.5% of the Loud-side orders were placed at or inside the NBBO and 86.6% of those Layering Loops contained at least one Loud-side order placed at or inside the NBBO.

to Quiet-side orders in Layering Loops cannot be used to reliably infer that Avalon's traders did not intend for those Loud-side orders to be executed.<sup>40</sup>

28. Exhibit A also shows that there are 44,348 Late Loud-side Order Loops. These late Loud-side Order Loops are not consistent with a layering strategy because Late Loud-side orders could not have been entered to achieve favorable execution for Quiet-side orders, as all the trader's Quiet-side orders had been executed or cancelled before the Late Loud-side orders were placed. However, Late Loud-side Order Loops meet all of Professor Hendershott's other criteria for a Layering Loop (i.e., they are Two-sided Short Loops with Order Imbalances and Execution Imbalances), which indicates that Loops that have those characteristics can arise when a trader is not engaged in a layering strategy.

29. Exhibit A also shows that there are 8,322,843 Long Loops, which are Loops that do not satisfy Professor Hendershott's duration criterion because they had durations of more than 60 seconds. Professor Hendershott asserts

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40. It is also important to recognize that in today's electronic financial markets, the overwhelming majority of limit orders are cancelled, and a large percentage of limit orders are cancelled within seconds of entry. See, e.g., Joel Hasbrouck and Gideon Saar, "Technology and liquidity provision: The blurring of traditional definitions," 12 *Journal of Financial Markets* (2009), 143-72, at 143 & 152 (investigating the trading of 100 Nasdaq-listed stocks on INET, Nasdaq's primary trading platform, and finding that "only 7.99% [of nonmarketable limit-orders] achieve even partial execution" and that "over one-third of nonmarketable limit orders are cancelled within two seconds."). See also Joel Hasbrouck and Gideon Saar, "Low-latency trading," 16 *Journal of Financial Markets* (2013), 649-79, at 651 (providing data for the top 500 Nasdaq-listed stocks by market capitalization showing that, on average, 92.18% of limit orders were cancelled in 2008). Therefore, high cancellation rates by themselves do not establish bad intent.

that excluding Long Loops from his analysis is conservative.<sup>41</sup> That is not so. The data show that the total Loud-side quantity executed in Long Loops (approximately 4.0 million shares) substantially exceeds the total Quiet-side quantity executed (approximately 3.3 million shares). The large quantity of Loud-side executions in Long Loops is inconsistent with the conclusion that Avalon traders did not intend for their Loud-side orders to execute.

30. Moreover, as Exhibit B shows, only 84,394 of the Long Loops (i.e., 1.0 percent) would be classified as Layering Loops in the absence of the 60 second limitation. In contrast, 773,739 Long Loops (9.3 percent) would be classified as Balanced Order Execution Loops and 35,472 (0.4 percent) would be classified as Late Loud-side Order Loops absent the 60 second limitation. Because both Balanced Order Execution Loops and Late Loud-side Order Loops are composed of two-sided imbalanced orders (i.e., they meet Professor Hendershott's Order Imbalance criterion), these data provide additional evidence that Loops that are composed of two-sided imbalanced orders are consistent with a non-layering strategy.

**D. An Overwhelming Majority of Professor Hendershott's "Layering Loops" Have Characteristics Inconsistent with Layering**

31. As explained above, Professor Hendershott's analysis only considers four criteria in determining whether a Loop is "consistent with layering": (i) the length of the Loop, (ii) the Order Imbalance ratio, (iii) the Execution Imbalance ratio, and (iv) whether the Loop includes Late Loud-side orders. Thus,

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41. Hendershott Report, ¶ 18.

Professor Hendershott fails to consider whether the Layering Loops satisfying his criteria have characteristics that are inconsistent with the alleged layering strategy. Exhibit C identifies several such characteristics and demonstrates that 94.7% (or 639,967) of the Layering Loops have at least one characteristic inconsistent with the alleged layering strategy.

32. For example, Exhibit C shows that 12.5 percent of Layering Loops contain Loud-side orders that were cancelled one second or more before the first Quiet-side order was entered, 15.7 percent of Layering Loops contain Loud-side orders that were cancelled one second or more before the first Quiet-side order was executed, and 44.9 percent of Layering Loops contain Loud-side orders that were cancelled while Quiet-side orders remained open. Professor Hendershott contends that a trader engaged in a layering strategy will place imbalanced Loud-side orders “in an attempt to mislead other market participants with respect to the supply and demand for that security ... in order to obtain better execution of [his Quiet-side] orders on the other side of the market.”<sup>42</sup> The cancellations of these Loud-side orders before the Quiet-side orders executed is inconsistent with the alleged layering strategy because these cancellations necessarily reduced any apparent order imbalance.

33. Exhibit C also shows that 48.2 percent of the Layering Loops contain Quiet-side orders that were cancelled while Loud-side orders remained open. This suggests that the Loud-side orders were placed and/or left open for a reason other than creating an order imbalance to facilitate the execution of those

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42. *Id.*, ¶ 11.a.

Quiet-side orders. Therefore, such cancellations are not consistent with the alleged layering strategy.

34. Exhibit C also shows that 78.5 percent of Professor Hendershott's Layering Loops contain Loud-side orders that were entered one or more seconds before the first Quiet-side order was placed, and 50.8 percent of Professor Hendershott's Layering Loops contain Loud-side orders that were entered five or more seconds before the first Quiet-side order was placed.<sup>43</sup> These Loud-side orders could not facilitate the execution of Quiet-side orders when there were no Quiet-side orders outstanding, but could have been executed as long as they remained open. Therefore, these findings are not consistent with the alleged layering strategy, which purportedly "tries to minimize the execution rate of Loud-side orders."<sup>44</sup>

35. Exhibit C also shows that 28.3 percent of the Layering Loops contain Loud-side orders that were entered more than one second after other Loud-side orders had executed, and 36.9 percent of the Layering Loops contain Loud-side orders that were left open more than one second after other Loud-side orders had executed. This is inconsistent with a layering strategy which "tries to

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43. Due to the extensive use of computer algorithms and automated trading, one second is considered to be a long period of time in electronic financial markets. See, e.g., Hasbrouck and Saar (2013) at 647 ("[T]raders employ cutting-edge technology and locate computers in close proximity to the trading venue in order to reduce the latency of their orders and gain an advantage. As a result, today's markets experience intense activity in the 'millisecond environment,' where computer algorithms respond to each other at a pace 100 times faster than it would take for a human trader to blink.")

44. Hendershott Report, ¶ 23.

minimize the execution rate of Loud-side orders” because once some Loud-side orders have executed, any remaining or additional Loud-side orders presumably would be more likely to execute. Thus, not cancelling remaining Loud-side orders and/or placing additional Loud-side orders after a Loud-side execution is inconsistent with the allegation that Avalon did not intend for its Loud-side orders to execute.

36. As Exhibit C shows, we also estimate that 21.7 percent of Professor Hendershott’s Layering Loops contain marketable Loud-side orders.<sup>45</sup> Entering marketable Loud-side orders is contrary to the alleged layering strategy which “tries to minimize the execution rate of Loud-side orders” because a portion of any marketable Loud-side order is certain to execute.

37. In total, Exhibit C shows that 94.7 percent of Professor Hendershott’s Layering Loops have one or more of the characteristics discussed above that are inconsistent with the alleged layering strategy. Thus, contrary to Professor Hendershott’s opinion, the characteristics of these Layering Loops actually suggest that Avalon was not engaged in the alleged layering strategy.

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45. This estimate is based on our analysis of the Layering Loops included in Professor Hendershott’s NBBO analysis with reported order entry times in milliseconds. That data can be used to identify marketable orders, because a marketable order is an order that is placed at the same price as resting orders on the opposite side of the market, which triggers immediate execution.

**E. Professor Hendershott’s Cancellation Analysis Does Not Support the Claim That Avalon Was Engaged in the Alleged Layering Scheme**

38. Professor Hendershott states that “once the Quiet-side orders are executed or are cancelled, a layering strategy would attempt to cancel Loud-side orders quickly to avoid execution of these transactions” because “a layering strategy ... tries to minimize the execution rate of Loud-side orders.”<sup>46</sup> However, Hendershott Report, Exhibit 3 shows that in 48.2% of Layering Loops, the Loud-side orders were not cancelled within one second of the last Quiet-side execution or cancellation. Avalon’s decisions to leave its Loud-side orders open for one or more seconds after its Quiet-side orders executed are not consistent with a layering strategy because these Loud-side orders could have been executed but could not have facilitated the execution of Avalon’s Quiet-side orders as there were none open.<sup>47</sup>

39. Professor Hendershott finds that in 93.4% of his Layering Loops, all of Avalon’s Loud-side orders were cancelled within five seconds of the last Quiet-side execution or cancellation.<sup>48</sup> This finding, to a large extent, is an artifact of the criteria that Professor Hendershott used to select his Layering Loops: his Execution Imbalance criterion necessarily means that Layering Loops include Loud-side orders that were cancelled, and his requirement that Layering Loops end within 60 seconds insures that these cancellations occurred within a relatively short

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46. Id.

47. As noted above one second is a long period of time in modern electronic financial markets due to the extensive use of computer algorithms and automated trading. See note 43 supra.

48. Hendershott Report, Exhibit 3.

period of time.<sup>49</sup> In other words, the findings of Professor Hendershott's Cancellation Analysis are hardwired by his selection criteria and do not establish that the traders who entered those Loud-side orders in the Layering Loops never intended for those orders to be executed.

40. To further evaluate the findings of Professor Hendershott's Cancellation Analysis, we performed Cancellation Analyses of other types of Two-sided Short Loops.<sup>50</sup> As Exhibit D shows, both Balanced Order Entry Loops and Balanced Order Execution Loops have cancellation patterns that are like the cancellation patterns of Layering Loops. Most notably, all pending Loud-side orders are cancelled within five seconds of the final Quiet-side execution or cancellation for 87.4% of Balanced Order Entry Loops and 81.8% of the Balanced Order Execution Loops. Therefore, these findings further undercut Professor Hendershott's assertion that the findings of his "Cancellation Analysis" support the conclusion that Avalon engaged in the alleged layering strategy.

**F. Professor Hendershott's Position Analysis Does Not Establish That Avalon Was Engaged in the Alleged Layering Scheme**

41. In his Position Analysis, Professor Hendershott "examine[s] [whether] the Order Imbalances in the Layering Loops are consistent with attempting to reduce positions in a given equity."<sup>51</sup> Professor Hendershott asserts

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49. In contrast, only 40.0% of Long Loops (i.e., Loops which last for longer than 60 seconds) had all pending Loud-side orders cancelled within five seconds of the final Quiet-side execution or cancellation.

50. Professor Hendershott's Cancellation Analysis is not applicable to One-sided Loops because such Loops do not contain Quiet-side orders.

51. Hendershott Report, ¶ 24.

that “Traders with short holding periods manage risk by trading in the opposite direction of any long or short position they have at the start of a Loop” whereas traders with “a layering strategy will do the opposite [because] Loud-side orders are used to mislead market participants to achieve more favorable Quiet-side executions....”<sup>52</sup> Professor Hendershott “find[s] that when a trader’s position is long at the beginning of a Layering Loop, the buy side is the Loud-side 88% of the time, and when a trader is short at the beginning of the Layering Loop, the sell side is the Loud-side 89% of the time.”<sup>53</sup> According to Professor Hendershott, “[t]his result suggests that Order and Execution Imbalances do not arise unintentionally and are not consistent with market making, but are consistent with a layering strategy.”<sup>54</sup>

42. Professor Hendershott’s Position Analysis is flawed because, contrary to his assumption, high-frequency traders who are not layering do not necessarily manage their short-term inventory by trading in the opposite direction of their existing position. In fact, a recent article by Benos & Sagade (2016) that examines the “inventory dynamics” of different groups of HFTs finds “substantial heterogeneity in trading patterns.”<sup>55</sup> Specifically:

[O]ver longer horizons (measured in hours), the inventories of all groups are mean-reverting and exhibit very similar patterns of serial

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52. Id.

53. Id., ¶ 25 & Exhibit 4.

54. Id.

55. See Evangelos Benos and Satchit Sagade, “Price discovery and the cross-section of high-frequency trading,” 30 Journal of Financial Markets (2016) 54-77, at 55. The authors “group HFT firms according to their overall liquidity taking/making behavior into passive, neutral, and aggressive groups....” Id.

correlation. However, over shorter horizons (measured in seconds), the various groups manage their inventories in markedly different ways. In particular, aggressive HFTs appear to be insensitive to recent (i.e., 10 second) price changes, consistent with news trading. Neutral HFTs are trend chasers (i.e., they trade in the direction of recent price changes), which is suggestive of momentum strategies. Finally, passive HFTs trade in the opposite direction of only the previous second price change, which is consistent with market-making. At the same time, aggressive and passive HFTs are more sensitive to their accumulated inventory level, whereas neutral HFTs are less so and as a result they accumulate larger intra-day positions.<sup>56</sup>

In other words, both aggressive HFTs and neutral HFTs engage in presumably legitimate trading strategies that frequently do not result in the execution of trades in the opposite direction of their existing positions. Therefore, Professor Hendershott's finding that Avalon's Loud-side orders, if executed, would frequently not result in the execution of trades in the opposite direction of its existing position does not establish that Avalon was engaged in the alleged layering strategy.

43. To further evaluate Professor Hendershott's claim that transactions which increase the size of a position are "unlikely to arise as part of a non-layering strategy," we analyzed other types of Loops using the same methodology. As Exhibit E shows, when a trader's position is long at the beginning of a Loop, the buy side typically is the Loud-side, and when a trader is short at the beginning of a Loop, the sell side typically is the Loud-side, for all types of two-sided Loops, not just Layering Loops.<sup>57</sup> As the qualitative findings of

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56. Id.

57. This also occurs for One-sided Loops, though less frequently, which suggests that One-sided Loops are more frequently used to reduce the size of open positions.

Professor Hendershott's Position Analysis are not unique to Layering Loops, his Position Analysis does not establish that Avalon was engaged in the alleged layering scheme.

**G. Professor Hendershott's NBBO Movement Analysis Does Not Establish That Avalon Was Engaged in the Alleged Layering Scheme**

44. In his "NBBO Movement Analysis," Professor Hendershott "analyze[s] the movement of National Best Bid and Offer ('NBBO') prices during [a subset of] Avalon's Layering Loops."<sup>58</sup> Professor Hendershott finds that "[i]n Layering Loops where Loud-side orders are purchases, ... the NBBO midpoint at the time of Quiet-side sale executions is higher than at the start of the Loop 62% of the time," and that "[w]hen Loud-side orders are sales, the NBBO midpoint is lower at the time of Quiet-side purchase executions than at the start of the Loop 64% of the time."<sup>59</sup>

45. Professor Hendershott claims that his "results are consistent with Avalon's Loud-side orders contributing to a favorable shift in the NBBO midpoint more often than would be expected by chance."<sup>60</sup> However, Professor Hendershott's results are likely attributable, at least in part, to a selection bias that

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58. Hendershott Report, ¶ 26. At the SEC's request, Professor Hendershott "perform[ed] this analysis using data from Avalon sub-account 188 during the period from August 2012-December 2012, sub-account 208 from April 2013-September 2013, and sub-account 128 from March 2015-August 2015." *Id.*, note 22. In addition, because "a small part of this [subset of the] Avalon data did not have corresponding NBBO data in Wharton Research Data Services," Professor Hendershott did not include that in his NBBO analyses. *Id.*

59. *Id.*, ¶ 28.

60. *Id.*

arises because he analyzed changes in the midpoint of the NBBO from the start of a Loop until the time at which each Quiet-side order executed. Passive order executions do not occur at random, but instead occur when an order is entered with a price that is aggressive enough to trigger the execution. This is more likely to occur after the NBBO has moved in the direction of the passive order.<sup>61</sup> Therefore, one would expect that the NBBO would typically increase before passive Quiet-side sell orders execute and decrease before passive Quiet-side buy orders execute, just as Professor Hendershott finds. For this reason, Professor Hendershott's findings do not establish that Avalon's Loud-side orders affected the NBBO or caused other market participants to place orders that affected the NBBO.

46. Moreover, even if Avalon's Loud-side orders did affect the NBBO, that would not establish that Avalon was engaged in the alleged layering scheme. To the contrary, a trader who wanted to maximize the likelihood that his passive orders would execute would place orders that improve the NBBO because an order that improves the NBBO is more likely to execute than any existing passive order. Therefore, the placement of Loud-side orders that improved the NBBO is consistent with having the intent to execute.

47. In order to further evaluate whether the findings of Professor Hendershott's NBBO analysis could arise as part of a non-layering strategy, we

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61. See Ronald L. Goettler, Christine A. Parlour, and Uday Rajan, 60 The Journal of Finance (2005), 2149-92, at 2150 ("Adverse selection arises [in a dynamic limit order market in which rational traders choose optimal submission strategies] as limit buys execute more often when the value drops and limit sells execute more often when the value increases.").

used the same methodology to analyze the other types of two-sided Loops that Professor Hendershott ignored.<sup>62</sup> Our results, which appear in Exhibit F, show that for each type of two-sided Loop, the NBBO midpoint typically increases before the execution of Quiet-side sales (i.e., when the Loud-side orders are purchases) and the NBBO midpoint typically decreases before the execution of Quiet-side purchases (i.e., when the Loud-side orders are sales). In fact, in all the other categories of two-sided Loops, the percentage of Loops where the NBBO midpoint increased when the Loud-side orders were purchases or decreased where the Loud-side orders were sales was higher than the percentage for Layering Loops. Similarly, the average NBBO midpoint changes in the other categories of two-sided Loops were higher than the average for Layering Loops. Thus, Professor Hendershott's "NBBO Movement Analysis" does not establish that Avalon was engaged in the alleged layering strategy.

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62. NBBO Movement Analysis is not applicable to One-sided Loops because such Loops have no Quiet-side orders and, therefore, no Quiet-side executions.

## **H. Professor Hendershott’s Realized Spread Analysis Does Not Establish That Avalon Engaged in the Alleged Layering Scheme**

48. In his “Realized Spread Analysis,” Professor Hendershott “examine[s] the profitability of Avalon’s Loud-side and Quiet-side executions by calculating ... the realized spread for each trade [which is defined as] the difference in execution price and the NBBO midpoint five minutes in the future.”<sup>63</sup> Professor Hendershott finds “that Quiet-side executions in layering loops tend to have a positive realized spread when compared to the NBBO midpoint 5 minutes later, while Loud-side executions tend to have a small negative realized spread.”<sup>64</sup>

49. Professor Hendershott claims that the positive average spreads on Quiet-side executions are “consistent with Avalon impacting the market in order to execute its Quiet-side orders at a more favorable price than would have been available absent its Loud-side orders” and that the “negative realized spread on Loud-side executions is not consistent with the Loud-side orders having an economic rationale on their own.”<sup>65</sup>

50. To evaluate the findings of Professor Hendershott’s “Realized Spread Analysis,” we analyzed the other categories of Loops that Professor Hendershott ignored using the same methodology. Our results, which appear in Exhibit G, show that for all types of Loops, Quiet-side executions have positive average realized spreads when compared to the NBBO midpoint five minutes later, while Loud-side executions have negative average realized spreads. This

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63. *Id.*, ¶ 29.

64. *Id.*, ¶ 30 & Exhibit 6.

65. *Id.*

demonstrates that Professor Hendershott's findings are also observed for trading activity in other categories of Loops that do not have characteristics that he considers to be consistent with a layering strategy. Therefore, Professor Hendershott's findings do not establish that Avalon was engaged in the alleged layering scheme.

**I. Professor Hendershott's Examples Do Not Establish That Avalon Was Layering**

51. As noted above, Professor Hendershott provided four examples of Layering Loops in his initial report and four examples of Layering Loops in his second supplemental report.<sup>66</sup> These examples do not establish that Avalon was engaged in the alleged layering scheme because Professor Hendershott has not established that Avalon did not intend its Loud-side orders to execute when they were placed, but instead placed those orders to create an artificial appearance of supply or demand to improve the execution of its Quiet-side orders. Nor does Professor Hendershott establish that Avalon's Loud-side orders improved the execution of any of its Quiet-side orders. Furthermore, even though Professor

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66. The data shown on Professor Hendershott's exhibits deviate from the underlying data in two respects. First, even though the Avalon Trade Data purportedly reflected in Hendershott Report, Exhibits 7a, 7b, 19, 20a, and 20b identify only the second in which Avalon's orders, cancellations and trades occurred, not the millisecond, those exhibits assign milliseconds to some of these events. Second, Hendershott Report, Exhibits 8a, 8b, and 18 report times for certain events that do not match the times reported in the Avalon Trade Data. Professor Hendershott does not explain why the reported times were altered or demonstrate that these alterations were appropriate. I also note that the horizontal axes in Professor Hendershott's exhibits do not reflect uniform time intervals.

Hendershott hand-picked his examples from the larger set of Layering Loops, and those Layering Loops were themselves selected by him from a vastly larger set of Loops precisely because they have characteristics that he considers to be consistent with layering, each of his examples nevertheless has one or more features that are inconsistent with the alleged layering scheme, as is demonstrated below.

**Hendershott Report, Exhibits 7a and 7b**

52. Hendershott Report, “Exhibits 7a and 7b illustrate two consecutive Layering Loops [that Professor Hendershott] identified in the Avalon Trade Data that involve trading in the shares of Cerner Corporation (‘CERN’) on November 1, 2012.” In the first Loop, which is illustrated in Hendershott Report Exhibit 7a, Professor Hendershott claims that the Avalon trader “place[d] multiple Loud-side purchase orders” to create “an artificial appearance of demand, thereby placing upward pressure on the stock price, and allowing him to sell shares at an advantageous price.”<sup>67</sup> In the second Loop, which is illustrated in Hendershott Report, Exhibit 7b, Professor Hendershott contends that the Avalon trader “place[d] multiple Loud-side sale orders” to create “an artificial appearance of supply, thereby placing downward pressure on the stock price, and allowing him to buy back the shares at an advantageous price.”<sup>68</sup>

53. There are several features of the Loop illustrated in Hendershott Report, Exhibit 7a that are inconsistent with Professor Hendershott’s conclusions. First, the Avalon trader placed his first Quiet-side sell order in the second

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67. Id.

68. Id.

beginning 12:50:40 at a price of \$77.15, which was one cent above the best offer of \$77.14.<sup>69</sup> It is implausible that at the time this order was placed, the Avalon trader intended to subsequently enter Loud-side buy orders that he did not expect to execute to facilitate the execution of this Quiet-side sell order, because the open sell orders previously placed by other traders at prices of \$77.14 and \$77.15 would either have to be executed or cancelled before the Avalon trader's sell order at \$77.15 would execute, and any Loud-side buy orders that the Avalon trader placed could have been executed before that occurred.

54. The Avalon trader then placed three Loud-side buy orders for 100 shares each during the second beginning 12:50:42 at a price of \$77.11, which was one cent below the best bid of \$77.12. It is implausible that the Avalon trader entered these Loud-side buy orders to facilitate the execution of his open Quiet-side sell order for two reasons. First, at the time the Loud-side buy orders were entered, the Avalon trader's Quiet-side sell order was still priced above the best offer. Second, the Avalon trader's Loud-side buy orders were small orders that were priced below the best bid, and, therefore, were not likely to contribute substantially to the appearance of demand.

55. The Avalon trader then placed several Loud-side buy orders during the second beginning at 12:50:43 at the best bid of \$77.12. However, it is implausible that the Avalon trader entered these Loud-side buy orders to facilitate

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69. As noted above, the Avalon Trade Data for CERN on November 1, 2012 identify only the second in which Avalon's orders, cancellations and trades occurred, not the millisecond. The NBBO data do report times in milliseconds.

the execution of his open Quiet-side sell order because at the time these Loud-side buy orders were entered, the Avalon trader's Quiet-side sell order was still priced above the best offer, which means that the open sell orders previously placed by other traders at the same price or a lower price either would have to be executed or cancelled before the Avalon trader's sell order at \$77.15 would execute, whereas the Avalon trader's Loud-side buy orders at the best bid could have been executed before that occurred.

56. The best bid increased from \$77.12 to \$77.13 and the best offer increased from \$77.14 to \$77.15 at 12:50:44.280, which meant that the sell order that the Avalon trader had previously entered in the second beginning 12:50:40 was at the best offer. The best bid increased again to \$77.14 at 12:50:45.934. The Avalon trader entered several Loud-side buy orders at the best bid between 12:50:44.280 and the second beginning 12:50:48. During the second beginning 12:50:47, portions of the Avalon trader's Quiet-side sell order executed at \$77.15 and the Avalon trader cancelled all his open Loud-side buy orders except for the Loud-side buy orders he had placed at \$77.11 in the second beginning 12:50:42. Professor Hendershott does not demonstrate that the Avalon trader intended to cancel these Loud-side buy orders when they were entered or rule out the possibility that the Avalon trader placed these orders because he wanted to buy at those prices. Moreover, the fact that the Avalon trader cancelled these Loud-side buy orders while a portion of his Quiet-side sell order remained open is difficult to reconcile with a layering strategy.

57. The Avalon trader then placed a Quiet-side order to sell 100 shares in the second beginning 12:50:48 at a price of \$77.12 when the best bid was

\$77.14.<sup>70</sup> This was a marketable offer that executed immediately against passive orders that other traders had placed at \$77.14. The Avalon trader's decision to place a marketable Quiet-side sell order at a price below the best bid is inconsistent with a layering strategy that seeks to facilitate the execution of passive orders, because a marketable sell order will execute immediately against any open passive buy orders that had previously been placed by other traders at or above the sell order's price.<sup>71</sup> In other words, the Avalon trader's Quiet-side sell order executed because the Avalon trader was willing to supply shares at or below the price that other market participants were willing to buy those shares. Moreover, Professor Hendershott does not contend or establish that the Avalon trader's Loud-side buy orders caused other traders to place passive buy orders at \$77.14 or otherwise facilitated the execution of the Avalon trader's marketable sell order.

58. The Avalon trader's remaining Quiet-side sell orders at \$77.15 executed in the second beginning 12:50:49. It is unlikely that these executions were facilitated by the Avalon trader's previous Loud-side buy orders, as most of his Loud-side buy orders had been cancelled in the second ending 12:50:48, and

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70. Note that the Avalon trader had to cancel his outstanding Loud-side buy orders at prices of \$77.12 or higher before placing this marketable Quiet-side sell order at a price of \$77.12 to avoid the possibility that his own orders would cross and result in an impermissible wash trade.

71. Approximately 8.8% of Layering Loops in the subset of Layering Loops for which Professor Hendershott obtained NBBO data contained marketable Quiet-side orders, and in approximately 73% of these Layering Loops, all of Avalon's Quiet-side executions were attributable to its marketable Quiet-side orders.

the remaining buy orders were entered several seconds earlier at a price (\$77.11) that was well below the best offer (i.e., \$77.15) at 12:50:49.

59. Finally, the Avalon trader left his remaining Loud-side buy orders open for approximately two seconds after his last Quiet-side sell order executed. That is also inconsistent with a layering scheme as these Loud-side orders could have been executed at any time before they were cancelled, but could not have facilitated the execution of his Quiet-side orders, as he had none.

60. There are several features of the Loop illustrated in Hendershott Report, Exhibit 7b that are inconsistent with Professor Hendershott's conclusions. First, the Avalon trader placed several Loud-side sell orders at prices that were at or below the best offer during the period from 12:50:52 to 12:51:00 but had no buy orders outstanding during that period. Because these Loud-side sell orders were placed at aggressive prices (i.e., at or below the NBBO), they were more likely to execute than the sell orders that were already in the order book. In fact, one of these Loud-side sell orders did execute at approximately 12:50:58 at a price of \$77.13. These Loud-side sell orders are inconsistent with the claimed layering scheme because these orders could not have facilitated the execution of the trader's Quiet-side buy orders at a time when the trader had no Quiet-side buy orders outstanding.

61. Second, the Avalon trader placed his first Quiet-side buy order in the second beginning 12:51:00 at the best bid of \$77.07, but then cancelled that order at approximately 12:51:07, at a time when the Avalon trader had multiple open Loud-side sell orders, including several orders priced at or below the NBBO that the Avalon trader entered after the Quiet-side buy order was entered.

Moreover, the Avalon trader left all his Loud-side sell orders open until the second beginning 12:51:10 even though he had no Quiet-side buy orders outstanding after this Quiet-side buy order was cancelled. This is not consistent with the alleged layering scheme, as these Loud-side sell orders could have been executed as long as they remained open, but could not have facilitated the execution of his Quiet-side buy orders, as the trader had no open Quiet-side buy orders.

62. The Avalon trader cancelled most of his outstanding Loud-side sell orders in the second beginning 12:51:10 except for Loud-side sell orders at prices that far exceeded the best offer of \$77.06. The Avalon trader then placed a Quiet-side order to buy 1,200 shares in the second beginning 12:51:10 at a price of \$77.10 when the best offer was \$77.06.<sup>72</sup> This Quiet-side buy order was a marketable order that executed immediately. The Avalon trader's decision to place a marketable Quiet-side buy order is inconsistent with a layering strategy that seeks to facilitate the execution of passive orders, because a marketable buy order will execute immediately against any open passive sell orders that had previously been placed by other traders at or below the marketable buy order's price. In other words, the Avalon trader's Quiet-side buy order executed because the Avalon trader demanded shares at or above the price that other market participants were willing to supply those shares. Professor Hendershott does not contend or establish that the Avalon trader's previous Loud-side sell orders caused other traders to

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72. Note that the Avalon trader had to cancel his outstanding Loud-side sell orders at prices of \$77.10 or lower before placing this marketable Quiet-side buy order at a price of \$77.10 to avoid the possibility that his own orders would cross and result in an impermissible wash trade.

place passive sell orders at \$77.06 or otherwise facilitated the execution of the Avalon trader's marketable Quiet-side buy order.

63. Finally, the Avalon trader left his remaining Loud-side sell orders open several seconds before cancelling them. This is not consistent with a layering strategy because the Avalon trader did not have any Quiet-side buy orders open, and these Loud-side sell orders could have been executed at any time until they were cancelled.

### **Hendershott Report, Exhibits 8a and 8b**

64. Hendershott Report, "Exhibits 8a and 8b illustrate two consecutive Layering Loops that involve trading in shares of Grupo Televisa ('TV') on August 12, 2015."<sup>73</sup> In the first Loop, which is illustrated in Exhibit 8a, Professor Hendershott claims that "the [Avalon] trader placed multiple Loud-side sale orders consistent with creating an artificial appearance of supply, thereby placing downward pressure on the stock price and allowing him to purchase shares at an advantageous price."<sup>74</sup> In the second Loop, which is illustrated in Exhibit 8b, Professor Hendershott claims that "the [Avalon] trader [sold] his long position by placing multiple Loud-side purchase orders consistent with creating an artificial appearance of demand, thereby placing upward pressure on the stock price and allowing him to sell the shares at an advantageous price."<sup>75</sup> As is demonstrated below, the orders have features that are inconsistent with the claim that the Avalon

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73. Id., ¶ 35. Note that the times for the NBBO, order, and execution data for Grupo Televisa are reported to the nearest millisecond.

74. Id.

75. Id.

trader was engaged in the alleged layering scheme, and the data do not establish that the Avalon trader's Loud-side orders facilitated the execution of its Quiet-side orders.

65. First, consider Hendershott Report, Exhibit 8a. As the exhibit shows, the Avalon trader placed two Quiet-side buy orders, each for 3,500 shares at \$32.37, at approximately 10:13:35. At that time, Hendershott Report, Exhibit 8a shows that the national best bid was \$32.40, i.e., \$0.03 above the order price. Given that, it is not reasonable to conclude that at the time these Quiet-side buy orders were placed, the Avalon trader intended to subsequently enter Loud-side sell orders that he did not expect to execute in order to facilitate the execution of these Quiet-side buy orders, because the open buy orders previously placed by other traders at prices from \$32.37 to \$32.40 would either have to be executed or cancelled before the Avalon trader's Quiet-side buy orders at \$32.37 would execute, and any Loud-side sell orders that the Avalon trader placed could have been executed before that occurred.

66. By approximately 10:13:50, the NBBO had declined to \$32.37/\$32.38, which meant that the Quiet-side buy orders Avalon had placed approximately 15 seconds earlier were at the best bid then. The decline in the NBBO between 10:13:35 and 10:13:50 increased the likelihood that Avalon's buy order would execute, but could not have been caused by the Avalon trader's Loud-side sell orders because the Avalon trader had not yet placed any such orders.

67. Between 10:13:54.528 and 10:13:54.810, the Avalon trader placed 12 Loud-side sell orders for 1,000 to 3,000 shares each at prices of \$32.40, \$32.39, and \$32.38 (i.e., prices at or above the best offer).<sup>76</sup> The Avalon trader cancelled all these Loud-side sell orders shortly thereafter (i.e., between 10:13:55.070 and 10:13:55.172, according to the Avalon Trade Data Professor Hendershott relies upon).

68. The data show that at 10:13:55.26 (i.e., after all the Avalon trader's Loud-side sell orders had been cancelled), one or more other market participants placed one or more marketable orders to sell TV stock at a price of \$32.37 that were sufficiently large to cause all open buy orders at \$32.37 to execute (including the Avalon trader's Quiet-side buy orders), and to cause the NBBO to decline to \$32.36/\$32.37. In other words, the Avalon trader's Quiet-side buy orders executed because one or more other market participants was willing to supply a large quantity of shares at \$32.37. Professor Hendershott does not claim or establish that the Avalon trader's Loud-side sell orders caused these other traders to place these marketable sell orders.

69. The Loop illustrated in Hendershott Report, Exhibit 8b is virtually a mirror image of the Loop illustrated in Hendershott Report, Exhibit 8a. As Hendershott Report, Exhibit 8b shows, the Avalon trader placed two Quiet-side sell orders, each for 3,500 shares at \$32.43, at approximately 10:14:08. At the time these Quiet-side sell orders were placed, the best offer was \$32.39, i.e., \$0.04 lower than the order price. It is not reasonable to conclude that at the time these

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76. Id., note 30 & Exhibit 8a.

Quiet-side sell orders were placed, the Avalon trader intended to subsequently enter Loud-side buy orders that he did not expect to execute in order to facilitate the execution of these Quiet-side sell orders, because the open sell orders previously placed by other traders at prices from \$32.39 to \$32.43 would either have to be executed or cancelled before the Avalon trader's Quiet-side sell orders at \$32.43 would execute, and any Loud-side buy orders that the Avalon trader placed could have been executed before that occurred.

70. During approximately the next 25 seconds, the NBBO increased to \$32.42/\$32.43.<sup>77</sup> At this point, the Quiet-side sell orders that the Avalon trader had placed earlier were at the best offer. However, because the increase in the NBBO occurred before the Avalon trader placed any Loud-side buy orders, that increase could not have been caused by the Avalon trader's Loud-side buy orders.

71. Between 10:14:41.387 and 10:14:41.625, the Avalon trader placed 12 Loud-side buy orders for 1,000 to 3,000 shares each at prices of \$32.40, \$32.41, and \$32.42 (i.e., prices at or below the best bid).<sup>78</sup> Shortly thereafter -- between 10:14:41.861 and 10:14:41.998 -- the Avalon trader cancelled all these Loud-side buy orders.

72. The data show that at 10:14:42.100 (i.e., after the Avalon trader's Loud-side buy orders had been cancelled), one or more other market participants placed one or more marketable orders to buy TV stock at a price of

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77. Id., Exhibit 8b.

78. Id., note 32 & Exhibit 8b.

\$32.43 that was sufficiently large to cause all outstanding sell orders at \$32.43 to execute (including the Avalon trader's Quiet-side sell orders), and to cause the NBBO to increase to \$32.43/\$32.44. Thus, the Avalon trader's Quiet-side sell orders executed because one or more other market participants demanded to buy a large quantity of shares at \$32.43. Professor Hendershott does not claim or establish that the Avalon trader's Loud-side buy orders caused these other traders to place these marketable buy orders.

**Hendershott Second Supp., Exhibits 18, 19, 20a and 20b**

73. The Loops shown in Hendershott Second Supp., Exhibits 18, 19, 20a and 20b also have characteristics that are inconsistent with the alleged layering strategy. In particular: (a) the Avalon trader placed Loud-side orders at aggressive prices (i.e., prices at or better than the NBBO) one or more seconds before he placed Quiet-side orders at the NBBO (Exhibit 18, 19, and 20b), (b) the Avalon left his Loud-side orders open for one or more seconds after all Quiet-side orders were executed or cancelled (Exhibit 19, 20a and 20b), or (c) both (Exhibits 18 and 20b).

**J. Professor Hendershott's Analysis of Trading Revenues Does Not Establish That Avalon Was Engaged in the Alleged Layering Strategy**

74. Professor Hendershott purports to calculate Avalon's trading revenue from Layering Loops by matching purchases to sales, in sequence, and aggregating the revenue from each purchase and sale across Layering Loops.<sup>79</sup>

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79. Hendershott Report, ¶ 38. Professor Hendershott defines revenue for each trading Loop as the difference between the sale price and the purchase price,

Using this methodology, Professor Hendershott calculates Avalon’s total revenue across all Layering Loops during the period from December 2010 to September 2016 to be over \$21 million.<sup>80</sup> Professor Hendershott also finds that, “on average, Quiet-side executions in Layering Loops generate positive trading revenue of over \$.0207 per share, while Loud-side executions in Layering Loops generate negative trading revenues of about \$0.0006 per share.”<sup>81</sup> Professor Hendershott opines that “the positive trading revenues on Quiet-side executions and the negative trading revenues on Loud-side executions are consistent with Avalon impacting the market in order to execute its Quiet-side orders at a more favorable price than would have been available if it did not place Loud-side orders.”<sup>82</sup>

75. To evaluate whether the findings of Professor Hendershott’s “Trading Revenues” analysis could arise as part of a non-layering strategy, we used the same methodology to analyze the Loops that Professor Hendershott ignored. Our results, which appear in Exhibit H, show that Quiet-side executions have positive trading revenues, on average, for all types of Loops, and that Loud-side executions have negative trading revenues, on average, for all types of Loops except Balanced Order Entry Loops. This demonstrates that Professor

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multiplied by the number of shares bought and sold. *Id.* In cases where only one side of a matched transaction occurred during a Layering Loop, Professor Hendershott attributes half of the calculated trading revenue to that Layering Loop. *Id.*, note 34.

80. *Id.*, ¶ 38. Note that Professor Hendershott calculates trading revenue, not trading profit. The calculation of trading profit would have to account for trading costs such as commissions and exchange fees.

81. *Id.*, ¶ 40 & Exhibit 9.

82. *Id.*, ¶ 40.

Hendershott's qualitative findings are not unique to Layering Loops. Therefore, his findings do not support his conclusion that Avalon was engaged in the alleged layering strategy.

76. While Professor Hendershott does not present data on the average revenue per trade for other types of Loops, he does “examine Avalon’s trading revenues to determine trading revenues relative to trading volume for Layering Loops versus Non-Layering Loops,” because “Layering Loops may be more profitable than non-manipulative strategies.”<sup>83</sup> Professor Hendershott finds that “although less than 5% of Avalon’s equities trading volume is in Layering Loops, the Layering Loops account for more than 45% of Avalon’s total equities trading revenue.”<sup>84</sup> That figure is extremely misleading because Professor Hendershott’s selection criteria ensure that most of the executions in Layering Loops are Quiet-side executions (which have positive trading revenue, on average), not Loud-side executions (which have negative trading revenue, on average). The differences in the net trading revenues across different Loop categories are largely driven by the differences in the proportions of executions on each side (as well as differences in trading revenue per share). As Exhibit H shows, approximately 17.2% of Avalon’s revenue from Quiet-side executions is attributable to Layering Loops.<sup>85</sup> In any event, Professor Hendershott’s analysis of

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83. *Id.*, ¶ 41.

84. *Id.*, ¶ 41 & Exhibit 10.

85. This figure is calculated by dividing the trading revenue from Quiet-side executions in Layering Loops by the total trading revenue from all Quiet-side executions.

trading revenue does not establish that Avalon was engaged in layering because, as Professor Hendershott recognizes, “large trading revenue is not by itself an indicator of layering activity ....”<sup>86</sup>

## **VI. SEC FEES**

77. Counsel for the Lek Defendants asked me to calculate the fees to which the SEC was entitled pursuant to Section 31 of the Securities Exchange Act attributable to Avalon’s trading, based on the assumption that these fees can be calculated by multiplying the dollar amount of executed trades in millions of dollars by the SEC-established rate, which periodically changes.<sup>87</sup> The results of these calculations for all Avalon’s trades, trades on or after March 12, 2012, trades in Layering Loops, and trades in Layering Loops on or after March 12, 2012, are presented in Exhibit I.

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86. Id., ¶ 41.

87. See [www.sec.gov/divisions/marketreg/mrfreqreq.shtml#feerate](http://www.sec.gov/divisions/marketreg/mrfreqreq.shtml#feerate)

A handwritten signature in blue ink, appearing to read 'D. J. Ross', positioned above a horizontal line.

David J. Ross

## Exhibit A

### Summary of Avalon's Trading Activity by Loop Category

	Layering Loops	One-sided Loops	Long Loops	Balanced Order Entry Loops	Balanced Order Execution Loops	Late Loud-side Order Loops	All Loops
[1] Number of Loops	675,504	35,432,624	8,322,843	1,983,195	1,341,010	44,348	47,799,524
[2] Percent of Loops	1.4%	74.1%	17.4%	4.1%	2.8%	0.1%	100.0%
[3] Loud-side Order Quantity	3,046,622,165	42,033,825,766	17,843,115,454	4,746,369,100	9,116,417,967	199,477,607	76,985,828,059
[4] Quiet-side Order Quantity	1,782,822,011	NA	8,612,702,272	6,687,375,498	2,190,372,875	143,561,539	19,416,834,195
[5] Total Loud-side Orders	17,269,054	154,343,385	106,127,590	32,481,966	51,893,872	1,273,189	363,389,056
[6] Total Quiet-side Orders	1,449,375	NA	18,098,175	9,299,013	2,853,839	85,281	31,785,683
[7] Loud-side Quantity Executed	83,415,269	10,370,224,193	4,015,424,396	875,896,987	1,225,393,765	12,605,694	16,582,960,304
[8] Quiet-side Quantity Executed	1,045,752,840	NA	3,312,051,878	3,242,990,466	867,623,570	98,290,539	8,566,709,293

Note: Long Loops and Balanced Order Entry Loops include 389,189 Long and Balanced Order Entry Loops that had an equal number of buy and sell orders. These Loops are included in rows [1] and [2] but not included in rows [3]-[6].

## Exhibit B

### Decomposition of Long Loops Into Loop Categories

Loop Category	Number of Loops	Percent of Total
[1] Layering Loops	84,394	1.0%
[2] One-sided Loops	6,288,211	75.6%
[3] Balanced Order Entry Loops	1,141,027	13.7%
[4] Balanced Order Execution Loops	773,739	9.3%
[5] Late Loud-side Order Loops	35,472	0.4%
<b>Total</b>	<b>8,322,843</b>	<b>100.0%</b>

Note: This exhibit shows how Long Loops would be classified absent Professor Hendershott's 60-second criterion.

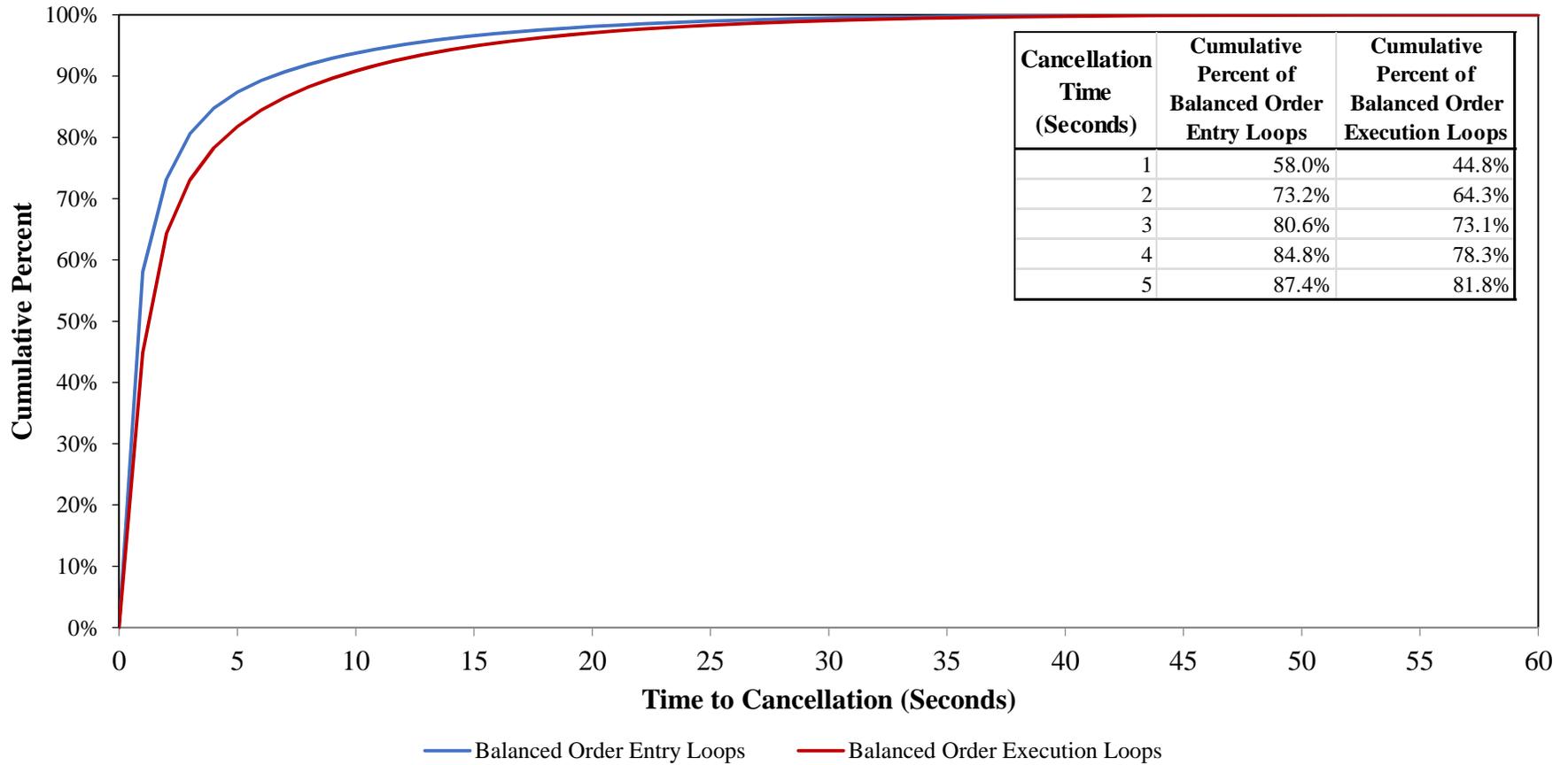
## Exhibit C

### Number of Layering Loops With Characteristics Inconsistent With the Alleged Layering Strategy

Characteristic	Number of Loops	Percentage of Loops
[1] Loud-side Cancel(s) One Second or More Before First Quiet-side Order	84,540	12.5%
[2] Loud-side Cancel(s) One Second or More Before First Quiet-side Execution	106,230	15.7%
[3] Loud-side Cancel(s) with Quiet-side Orders Open	303,341	44.9%
[4] Quiet-side Cancel(s) with Loud-side Orders Open	325,572	48.2%
[5] Loud-side Orders Entered One Second or More Before First Quiet-side Order	530,336	78.5%
[6] Loud-side Orders Entered Five Seconds or More Before First Quiet-side Order	343,085	50.8%
[7] Loud-side Orders Entered More Than One Second After Loud-side Execution	191,007	28.3%
[8] Loud-side Orders Left Open More Than One Second After Loud-side Execution	249,384	36.9%
[9] Loop Includes Marketable Loud-side Orders	6,729*	21.7%*
<b>One or More of the Characteristics Listed Above</b>	<b>639,967</b>	<b>94.7%</b>

\* These findings are based on the 31,021 Layering Loops included in Professor Hendershott's NBBO Analysis with order times reported in milliseconds, and are not included in the "One or More of the Characteristics Listed Above" row of this table.

**Exhibit D**  
**Cancellation Analysis:**  
**Time from Last-Quiet-side Execution/Cancellation to All Loud-side Cancellations**  
**(Cumulative Percent of Balanced Order Entry Loops and Balanced Order Execution Loops)**



**Source:**

Avalon Trade Data from Lek Securities Corp.

**Notes:**

1. Time to cancellation is the average time taken from the last Quiet-side execution/cancellation, whichever comes later, to all Loud-side cancellations (provided there are outstanding Loud-side orders as of the last Quiet-side execution/cancellation). Approximately 998,000 Balanced Order Entry Loops and 345,000 Balanced Order Execution Loops did not have loud-side cancellations after the last quiet-side execution/cancellation.

## Exhibit E

### Position Analysis: Starting Position Relative to Loud-side Orders By Loop Category

Loop Category	Long Position Going Into Loop			Short Position Going Into Loop		
	Loops With Loud-side Purchase Orders	Loops With Loud-side Sale Orders	Percent Inconsistent With Market Making	Loops With Loud-side Purchase Orders	Loops With Loud-side Sale Orders	Percent Inconsistent With Market Making
[1] Layering Loops	279,747	37,336	88.2%	25,751	199,815	88.6%
[2] One-sided Loops	4,319,008	6,504,275	39.9%	4,275,420	2,629,755	38.1%
[3] One-sided Long Loops	224,983	974,915	18.8%	401,546	110,727	21.6%
[4] Two-sided Long Loops	438,287	228,321	65.7%	159,196	193,300	54.8%
[5] Balanced Order Entry Loops	556,102	178,575	75.7%	116,969	375,840	76.3%
[6] Balanced Order Execution Loops	214,415	90,205	70.4%	128,735	156,346	54.8%
[7] Late Loud-side Order Loops	22,896	1,885	92.4%	733	12,649	94.5%

Notes: This exhibit extends the analysis in Hendershott Report, Exhibit 4 to other Loop categories. The 398,189 Long Loops and Balanced Order Entry Loops for which Professor Hendershott did not classify a Loud-side are excluded. Loops with no position going into Loop are not shown.

**Exhibit F**

**NBBO Movement Analysis: Price Movement Relative to Loud-side Orders  
By Loop Category**

Loop Category	Loud-side Orders Are Purchases				Loud-side Orders Are Sales			
	Average NBBO Midpoint Change From Loop Start to Quiet-side Execution	Number of Loops with Available NBBO Data	Number of Loops Where NBBO Midpoint Increased	Percent of Loops Where NBBO Midpoint Increased	Average NBBO Midpoint Change From Loop Start to Quiet-side Execution	Number of Loops with Available NBBO Data	Number of Loops Where NBBO Midpoint Decreased	Percent of Loops Where NBBO Midpoint Decreased
[1] Layering Loops	0.029%	45,237	28,227	62.4%	-0.031%	41,521	26,676	64.2%
[2] Long Loops	0.094%	5,281	4,289	81.2%	-0.087%	4,381	3,531	80.6%
[3] Balanced Order Entry Loops	0.032%	105,592	72,124	68.3%	-0.033%	104,898	73,538	70.1%
[4] Balanced Order Execution Loops	0.059%	26,991	21,370	79.2%	-0.056%	24,302	19,240	79.2%
[5] Late Loud-side Order Loops	0.027%	1,320	825	62.5%	-0.030%	981	633	64.5%

Note: This exhibit extends the analysis in Hendershott Report, Exhibit 5 to other categories of Two-sided Loops. Results for all traders combined are shown. The 398,189 Long Loops and Balanced Order Entry Loops for which Professor Hendershott did not classify a Loud-side are excluded.

## Exhibit G

### Realized Spread Analysis, by Loop Category

Loop Category	Average NBBO Midpoint Change from Loop Start to:			
	Loud-side Purchase Execution	Quiet-side Purchase Execution	Loud-side Sale Execution	Quiet-side Sale Execution
[1] Layering Loops	-0.0326	0.0438	-0.0472	0.0334
[2] One-sided Loops	-0.0160	NA	-0.0288	NA
[3] Long Loops	-0.0409	0.0338	-0.0402	0.0340
[4] Balanced Order Entry Loops	-0.0497	0.0568	-0.0721	0.0368
[5] Balanced Order Execution Loops	-0.0684	0.0822	-0.0868	0.0698
[6] Late Loud-side Order Loops	-0.0586	0.0722	-0.0643	0.0713

Note: This exhibit extends the analysis in Hendershott Report, Exhibit 6 to other categories of Loops. Results for all traders combined are shown. The 398,189 Long Loops and Balanced Order Entry Loops for which Professor Hendershott did not classify a Loud-side are excluded.

## Exhibit H

### Equity Trading Revenue Analysis, by Loop Category

Loop Category	Trading Revenue			Trading Revenue Per Share		
	Loud-side Executions	Quiet-side Executions	Total	Loud-side Executions	Quiet-side Executions	Total
[1] Layering Loops	-\$49,007	\$21,678,095	\$21,629,088	-0.0006	0.0207	0.0192
[2] One-sided Loops	-\$52,909,791	NA	-\$52,909,791	-0.0051	NA	-0.0051
[3] Long Loops	-\$23,299,503	\$35,537,455	\$12,237,953	-0.0058	0.0107	0.0017
[4] Balanced Order Entry Loops	\$2,614,322	\$65,854,784	\$68,469,106	0.0030	0.0203	0.0166
[5] Balanced Order Execution Loops	-\$9,248,763	\$1,658,631	-\$7,590,132	-0.0075	0.0019	-0.0036
[6] Late Loud-side Order Loops	<u>-\$108,388</u>	<u>\$1,408,361</u>	<u>\$1,299,973</u>	-0.0086	0.0143	0.0117
<b>TOTAL</b>	<b>-\$83,001,130</b>	<b>\$126,137,327</b>	<b>\$43,136,197</b>			

Note: This exhibit extends the analysis in Hendershott Report, Exhibit 9 to other Loop categories. Results for all traders combined are shown. The 398,189 Long Loops and Balanced Order Entry Loops for which Professor Hendershott did not classify a Loud-side are excluded.

## Exhibit I

### Section 31 Fees Attributable to Avalon's Trading

Loop Category	Section 31 Fees
[1] All Loops	\$26,555,824
[2] All Loops on or after March 12, 2012	\$26,051,991
[3] Layering Loops	\$1,297,450
[4] Layering Loops on or after March 12, 2012	\$1,263,103

# **Appendix A**

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M.B.A. UNIVERSITY OF CHICAGO: 1985  
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B.A. UNIVERSITY OF CHICAGO: 1983  
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**PROFESSIONAL EXPERIENCE**

Compass Lexecon (formerly Lexecon) Chicago, Illinois  
(1985 to present) Current Position: Executive Vice President

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Finance  
Labor Economics  
Economic Analysis of Law

**ACADEMIC HONORS AND SCHOLARSHIPS**

Beta Gamma Sigma  
University of Chicago Graduate School of Business Fellowship  
Phi Beta Kappa  
University of Chicago National Merit Scholarship

## **ARTICLES**

The Use of Trading Models to Estimate Aggregate Damages in Securities Fraud Litigation: An Update (with Daniel R. Fischel and Michael A. Keable) in Briefly... Perspectives on Legislation, Regulation, and Litigation, National Legal Center for the Public Interest, Vol. 10, No. 3 (March 2006).

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Do Conflicts Between Class Members Vitiolate Class Action Securities Fraud Suits?, St. John's L. Rev., Vol. 70, No. 2 (Spring 1996).

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Should the Law Prohibit "Manipulation" in Financial Markets? (with Daniel R. Fischel), Harv. L. Rev., Vol. 105, No. 2, p. 503 (December 1991).

Comparisons of Term Premium Forecasts: More Information in the Term Structure, University of Chicago Graduate School of Business, Manuscript (December 1986).

## **OTHER ACTIVITIES**

Member, American Economic Association, American Finance Association.

Member, Investment Committee, Jewish United Fund/Jewish Federation of Metropolitan Chicago.

Have acted as a consultant and/or advisor to the Commodity Futures Trading Commission, the Federal Deposit Insurance Corporation, the Internal Revenue Service, the National Association of Securities Dealers, the Office of Thrift Supervision, the U.S. Department of Justice, and the U.S. Securities & Exchange Commission.

Referee: Journal of Business, Journal of Law and Economics, Journal of Legal Studies.

## **EXPERT TESTIMONY**

Declaration of David J. Ross in Re: Commodity Futures Trading Commission v. Monex Credit Company et al., United States District Court, Central District of California, Case No. 8:17-cv-01868-JVS-DFM (February 5, 2018).

Deposition of David J. Ross in Re: The People of the State of New York v. Maurice R. Greenberg and Howard I. Smith, Supreme Court of the State of New York, County of New York, Index No. 401720/05 (December 9, 2014).

Testimony of David J. Ross in Re: Dennis L. Winger et al., v. Life Technologies Corporation, Before the American Arbitration Association, AAA No. 12-166-00307-10 (May 3 & 4, 2012).

Testimony of David J. Ross in Re: Bank of New York Mellon Corporation v. Commissioner of Internal Revenue, United States Tax Court, Docket No. 26683-09 (May 2, 2012).

Deposition of David J. Ross in Re: MoneyGram International Inc. Shareholder Litigation, In the Court of Chancery of the State of Delaware, Case No. C.A. 6387-VCL (April 24, 2012)

Deposition of David J. Ross in Re: Bank of New York Mellon Corporation v. Commissioner of Internal Revenue, United States Tax Court, Docket No. 26683-09 (February 22, 2012).

Testimony of David J. Ross in Re: Buttonwood Tree Value Partners, LP et al., v. Smith et al., Arbitration (January 18, 2012).

Deposition of David J. Ross in Re: Transatlantic Holdings, Inc. et al., v. American International Group, Inc. et al., Before the American Arbitration Association, Case No. 50-148-T-00376-10 (January 10, 2012).

Deposition of David J. Ross in Re: Buttonwood Tree Value Partners, LP et al., v. Smith et al., Arbitration (December 15, 2011).

Deposition of David J. Ross in Re: Pat Beesley et al., v. International Paper Company et al., United States District Court, Southern District of Illinois, No. 06-703-DRH-CJP (December 13, 2011).

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Deposition of David J. Ross in Re: Gerald George et al. v. Kraft Foods Global, Inc. et al., United States District Court, Northern District of Illinois, Case No. 1:08-cv-03799 (December 14, 2010).

Testimony of David J. Ross in Re: Hewlett-Packard Company and Consolidated Subsidiaries v. Commissioner of Internal Revenue, United States Tax Court, Docket No. 21976-07, 10075-08 (September 22, 2010).

Deposition of David J. Ross in Re: Hewlett-Packard Company and Consolidated Subsidiaries v. Commissioner of Internal Revenue, United States Tax Court, Docket No. 21976-07, 10075-08 (August 2, 2010).

Affidavit of David J. Ross in Re: Delilah Morrison and Sherri Arguello v. MoneyGram International, Inc. et al., United States District Court, District of Minnesota, Civil Action: 08-cv-01121-PJS-JJG (May 28, 2010).

Declaration of David J. Ross in Re: Aristocrat Leisure Limited v. Deutsche Bank Trust Company Americas et al., United States District Court, Southern District of New York, Case No. 04-CV-10014 (PKL) (December 4, 2009).

Testimony of David J. Ross in Re: Aristocrat Leisure Limited v. Deutsche Bank Trust Company Americas et al., United States District Court, Southern District of New York, Case No. 04-CV-10014 (PKL) (October 14 & 15, 2009).

Affidavit of David J. Ross in Re: Hochstadt et al. v. Boston Scientific Corporation et al., United States District Court, District of Massachusetts, Case No. 08-CV-12139-DPW (July 30, 2009).

Testimony of David J. Ross in Re: Brieger et al. v. Tellabs, Inc. et al., United States District Court, Northern District of Illinois, Docket No. 06 C 1882 (May 1, 2009).

Deposition of David J. Ross in Re: Brieger et al. v. Tellabs, Inc. et al., United States District Court, Northern District of Illinois, Case No. 1:06-cv-1882 (January 29, 2009).

Deposition of David J. Ross in Re: Beesley et al. v. International Paper Company et al., United States District Court, Southern District of Illinois, Case No. 3:06-cv-00703-DRH-CJP (December 23, 2008).

Affidavit of David J. Ross in Re: Boston Scientific Corporation ERISA Litigation, United States District Court, District of Massachusetts: Master File No. 1:06-cv-10105-JLT (May 27, 2008).

Testimony of David J. Ross in Re: Loral Space and Communications, Inc., Consolidated Litigation, in the Court of Chancery of the State of Delaware in and for the County of New Castle, Case No. 2808-VCS (May 12, 2008).

Deposition of David J. Ross in Re: Loral Space and Communications, Inc., Consolidated Litigation, in the Court of Chancery of the State of Delaware in and for the County of New Castle, Case No. 2808-VCS (February 19, 2008; February 25, 2008 & May 8, 2008).

Testimony of David J. Ross in Re: Schering-Plough Corporation v. United States of America, In the United States District Court for the District of New Jersey, Civil No. 05-2575 (January 24, 2008, January 25, 2008 & February 29, 2008).

Testimony of David J. Ross in Re: Shell Petroleum Inc. v. United States of America, In the United States District Court, Southern District of Texas, Houston Division, Civil Action No. H-05-2016 (December 6, 2007).

Deposition of David J. Ross in Re: Stephen C. Lingis et al. v. Motorola, Inc. et al., In the United States District Court, Northern District of Illinois, Eastern Division, No. 03 C 5044 (November 15, 2007).

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Deposition of David J. Ross in Re: Forest Laboratories, Inc. Securities Litigation, United States District Court, Southern District of New York, Civil Action No. 05-CV-2827-RMB (October 24, 2007).

Supplemental Declaration of David J. Ross in Re: Forest Laboratories, Inc. Securities Litigation, United States District Court, Southern District of New York, Civil Action No. 05-CV-2827-RMB (October 5, 2007).

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Declaration of David J. Ross in Re: Don Brieger et al. v. Tellabs Inc. et al., United States District Court, Northern District of Illinois, Case No. 1:06-cv-1882 (July 2, 2007).

Deposition of David J. Ross in Re: Nortel Networks Corp. ERISA Litigation, In the United States District Court for the Middle District of Tennessee, Nashville Division, MDL Docket No. 3:03-MD-1537 (June 28, 2007).

Declaration of David J. Ross in Re: Stephen C. Lingis et al., v. Motorola Inc. et al., United States District Court, Northern District of Illinois, Eastern Division, No. 03 C 5044 (June 7, 2007).

Supplemental Declaration of David J. Ross in Re: Nortel Networks Corp. Erisa Litigation, United States District Court for the Middle District of Tennessee, Nashville Division, MDL Docket No. 3:03-MD-1537, (May 21, 2007).

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Supplemental Affidavit of David J. Ross in Re: Sprint Corporation Shareholders Litigation, District Court of Johnson County, Kansas, Civil Court Department, Case No. 04 CV 01714, (March 12, 2007).

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Declaration of David J. Ross in Re: Dennis Lively, Willis Harms and Larry Grab v. Dynegey, Inc., Illinois Power Company et al., United States District Court, Southern District of Illinois, Case No. 05-00063-MJR (October 21, 2005).

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Testimony of David J. Ross in Re: UAL Corporation et al. v. Debtors, United States Bankruptcy Court, Northern District of Illinois, Eastern Division, Chapter 11 Case No. 02 B 48191 (September 14 & 15, 2005).

Deposition of David J. Ross in Re: UAL Corporation et al. v. Debtors, United States Bankruptcy Court, Northern District of Illinois, Eastern Division, Chapter 11 Case No. 02-B-48191 (September 12, 2005).

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Declaration of David J. Ross in Re: McKesson HBOC, Inc. Securities Litigation, United States District Court, Northern District of California, Case No. CV-99-20743 RMW (January 16, 2004).

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Deposition of David J. Ross in Re: Irene Abrams et al. v. Van Kampen Funds Inc. et al., United States District Court, Northern District of Illinois, Eastern Division, Case No. 01C7538 (October 27, 2003).

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Deposition of David J. Ross in Re: Wilmonte A. Naustavicus, Aylin Gulbenkian, Richard Henry Bolt and Jane Bolt v. National Partnership Investments Corp. et al., United States District Court, Central District of California, Case No. 98-7035 (June 14, 2001).

Testimony of David J. Ross in Re: Jerome Feldman et al. v. National Westminster Bank et al., Index No. 605549/99 and Roberta Hayes et al. v. National Westminster Bank, Index No. 403545/00, Supreme Court of the State of New York, County of New York, Civil Term: Part 27 (April 9, 2001).

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Testimony of David J. Ross in Re: Nicole Rose Corp. F.K.A. Quintron Corp. v. Commissioner of Internal Revenue, United States Tax Court, New York, NY, No., 3328-00 (December 7, 2000).

Testimony of David J. Ross in Re: Boca Investering Partnership v. United States, United States District Court, District of Columbia, No. CA 97-602 PLF (September 11 & 18, 2000).

Joint Affidavit of Daniel R. Fischel and David J. Ross in Re: Floyd D. Wilson v. Massachusetts Mutual Life Insurance Company, In the First Judicial District Court, County of Santa Fe, State of New Mexico, Case No. D0101 CV-98-02814 (August 4, 2000).

Testimony of David J. Ross in Re: United States of America v. Raymond J. McClendon et al., United States District Court, Northern District of Georgia, No. 1:99-CR-462 (August 1, 2000).

Deposition of David J. Ross in Re: The Globe Savings Bank, FSB et al. v. United States of America, United States Court of Federal Claims, Civil Action No. 91-1550C (June 19 & 20, 2000 October 10 & 11, 2000 and November 8 & 9, 2000).

Deposition of David J. Ross in Re: American Savings Bank et al. v. United States of America, United States Court of Federal Claims, Civil Action No. 92-872C (May 16, 17 & 18, 2000 and October 4 & 5, 2000).

Deposition of David J. Ross in Re: Coast Federal Bank, F.S.B. v. United States of America, United States Court of Federal Claims, Civil Action No. 92-466C (April 17, 18, & 19, 2000).

Deposition of David J. Ross in Re: Granite Partners et al. v. Bear, Stearns & Co. Inc. et al., United States District Court, Southern District of New York, No. 96-Civ.-7874 and ABF Capital Management et al. v. Askin Capital Management, L.P. et al., No. 96-Civ-2978, (March 9, 2000).

Testimony of David J. Ross in Re: United States of America v. Robert Krilich, United States District Court, Northern District of Illinois, No. 94-CR-419 (January 28 & 31, 2000).

Affidavit of David J. Ross in Re: Kaufman v. Motorola, Inc., United States District Court, Northern District of Illinois, Eastern Division, No. 95-C-1069 (October 15, 1999).

Supplemental Affidavit of David J. Ross in Re: IES Industries, Inc. and Subsidiaries v. United States of America, United States District Court, Northern District of Iowa, Cedar Rapids Division No. C97-206-EJM (May 4, 1999).

Testimony of David J. Ross in Re: United States of America v. Gordon Hall et al., United States District Court, Southern District of New York, No. S1-97-Cr.-1215 (DC) (May 3, 1999).

Affidavit of David J. Ross in Re: FTD Corporation et al. v. Bankers Trust Company et al., United States District Court, Southern District of New York, No. 96-CIV-0405 (SHS) (April 29, 1999).

Supplemental Declaration of David J. Ross in Re: Borland Securities Litigation, United States District Court, Northern District of California, Case No. C-95-2295 VRW (April 27, 1999).

Affidavit of David J. Ross in Re: IES Industries, Inc. and Subsidiaries v. United States of America, United States District Court, Northern District of Iowa, Cedar Rapids Division, No. C97-206-EJM (March 23, 1999).

Testimony of David J. Ross in Re: LaSalle Talman, F.S.B. v. United States of America, United States Court of Federal Claims, No. 92-652C (March 1, 2, & 12, 1999).

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Deposition of David J. Ross in Re: LaSalle Talman, F.S.B. v. United States of America, United States District Court, Northern District of Illinois, Eastern Division, No. 92-652C (December 17 & 18, 1998).

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Testimony of David J. Ross in Re: District Business Conduct Committee for District No. 10 v. A.S. Goldmen & Co., Inc., Anthony J. Marchiano, Stuart E. Winkler, Stacy Meyers, NASD Regulation, Inc., New York, New York, Complaint No. C10960208 (September 17 & October 14, 1997).

Affidavit of David J. Ross in Re: Westcap Enterprises, Inc. (successor by merger to Westcap Securities, L.P.) and The Westcap Corporation, (successor by merger to Westcap Securities Investment, Inc. and Westcap Securities Management, Inc.), Debtors, Board of Trustees of Community College District No. 508, County of Cook, State of Illinois, Claimant, v. Westcap Enterprises, Inc. and The Westcap Corporation, Debtors, United States Bankruptcy Court, Southern District of Texas, Houston Division, (Jointly Administered Under) Case No. 96-43191-H2-11 (September 14, 1997).

Deposition of David J. Ross in Re: Marcia Rubin, Jason Gorchow, and Michelle Gorchow v. Jules Laser, Civil Action No. 93-CH-010972, Circuit Court of Cook County, Illinois, County Department - Chancery Division, (July 15 & October 1, 1997).

Deposition of David J. Ross in Re: David Abbott et al. v. Kidder, Peabody & Company et al. Civil Action No. 93-S-1709, United States District Court for the District of Colorado (July 11, 1997).

Testimony of David J. Ross in Re: Sandra Lerner, Leonard Bosack, and The Trust v. Goldman Sachs & Co., Kent C. McCarthy, Craig A.S. Steiger, Simon J. Michael, Ralph Severson, William J. Buckley & Roy Zuckerberg, Before the American Arbitration Association; 75-136-00090-94 (April 8, 9, 10 & 11, 1997; May 28, 1997 & June 4, 1997).

Testimony of David J. Ross Re: The Matter of the Arbitration Between Metrobank, Claimant and Shearson Lehman Brothers, Inc. and Wayne A. Wagner, Respondents, Municipal Securities Rulemaking Board, MS 96-4 (February 19 & 20, 1997).

Testimony of David J. Ross in Re: Bert Vladimir v. United States Banknote Corporation, Morris Weissman, John T. Gorman, and Stanley Kreitman, United States District Court, Southern District of New York, 94-CV-0255-MGC (January 16, 1997).

Supplemental Declaration of David J. Ross in Re: California Micro Devices Securities Litigation, United States District Court, Northern District of California, Master File No. C-94-2817-VRW (December 11, 1996).

Declaration of David J. Ross in Re: California Micro Devices Securities Litigation, United States District Court, Northern District of California, Master File No. C-94-2817-VRW (October 16, 1996).

Deposition of David J. Ross in Re: Thomas De La Rue AG v. U.S. Banknote Corporation, No. 94-Civ-7925 (MGC) and U.S. Banknote Corporation v. Thomas De La Rue AG, and De La Rue pk, No. 94-Civ-9210 (MAC), United States District Court Southern District of New York (June 17, 1996).

Deposition of David J. Ross in Re: Andrew W. McGhee v. Richard L. Joutras et al., United States District Court, Northern District of Illinois, Eastern Division, Master File No. 94-C-7052 (May 30, 1996).

Deposition of David J. Ross in Re: Bert Vladimir v. U.S. Banknote Corporation, United States District Court, Southern District of New York, Civil Action No. 94-CIV-0255 (MGC) (March 20, 1996).

Deposition of David J. Ross in Re: Scattered Corporation v. Midwest Clearing Corporation, Circuit Court of Cook County, Illinois County Department, Law Division, No. 93 L 10216 (February 27, 1996).

Deposition of David J. Ross in Re: Andrew W. McGhee v. Richard L. Joutras et al., United States District Court, Northern District of Illinois, Eastern Division, Master File No. 94-C-7052 (August 3 & 4, 1995).

Declaration of David J. Ross in Re: Wells Fargo Securities Litigation, United States District Court, Northern District of California, Master File No. C-91-1944 VRW, (March 31, 1995).

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Deposition of David J. Ross in Re: Gloria G. Haft v. Herbert H. Haft, Superior Court of the District of Columbia, Civil Action No. DR-2087-93d (April 8, 1994)

Supplemental Declaration of David J. Ross in Re: Oracle Securities Litigation, United States District Court, Northern District of California, Master File No. C 90 0931 VRW (May 21, 1993)

Declaration of David J. Ross in Re: Oracle Securities Litigation, United States District Court, Northern District of California, Master File No. C 90 0931 VRW (April 20, 1993).

Testimony of David J. Ross in Re: State of West Virginia v. Morgan Stanley & Co. Incorporated, in the Circuit Court of Kanawha County, West Virginia, Civil Action No. 89-C-3700 (May 5, 1992).

Deposition of David J. Ross in Re: State of West Virginia v. Morgan Stanley & Co. Incorporated, in the Circuit Court of Kanawha County, West Virginia, Civil Action No. 89-C-3700 (April 25, 1992).

Testimony of David J. Ross in Re: The Stuart-James Co. et al., United States of America before the Securities & Exchange Commission, Denver, Colorado, Administrative Proceeding File No. 3-7164 (May 6,1991).

Affidavit of David J. Ross in Re: Dean Peter Debruyne and Evelyn S. Carlyle, individually and on behalf of all others similarly situated v. The Equitable Life Assurance Society of the United States and Equitable Capital Management Corporation, United States District Court, Northern District of Illinois, Eastern Division, No. 88 C 10098 (October 12,1989).

## **Appendix B**

### **Pleadings**

Complaint, Securities and Exchange Commission v. Lek Securities Corporation et al., March 10, 2017

### **Expert Reports**

Report of Terrence Hendershott, Ph.D., April 3, 2017

Supplemental Report of Terrence Hendershott, Ph.D., June 23, 2017

Second Supplemental Report of Terrence Hendershott, Ph.D., March 15, 2018

Backup Materials Produced by Terrence Hendershott. Ph.D.

### **Academic Literature**

Evangelos Benos and Satchit Sagade, “Price discovery and the cross-section of high-frequency trading,” 30 Journal of Financial Markets (2016) 54-77

Jonathan Brogaard, Terrence Hendershott and Ryan Riordan, “High-Frequency Trading and Price Discovery,” 27 The Review of Financial Studies (2014), 2267-2306

Ronald L. Goettler, Christine A. Parlour, and Uday Rajan, 60 The Journal of Finance (2005), 2149-92

Björn Hagströmer & Lars Nordén, “The diversity of high-frequency traders,” 16 Journal of Financial Markets (2013) 741-70

Joel Hasbrouck and Gideon Saar, “Technology and liquidity provision: The blurring of traditional definitions,” 12 Journal of Financial Markets (2009), 143-72, at 143 & 152

Joel Hasbrouck and Gideon Saar, “Low-latency trading,” 16 Journal of Financial Markets (2013), 649-79

### **Data**

Avalon Trade Data produced by Terrence Hendershott. Ph.D.

National Best Bid and Offer, TAQ Quotes and Trades data from Wharton Research Data Services (WRDS) produced by Terrence Hendershott. Ph.D.

[www.sec.gov/divisions/marketreg/mrfreqreq.shtml#feerate](http://www.sec.gov/divisions/marketreg/mrfreqreq.shtml#feerate)

**Other**

FINRA, Cross Market Equity Supervision Report (available at:  
[https://tools.finra.org/reportcenterhelp/#Cross\\_Market\\_Equity\\_Supervision\\_Reports.htm](https://tools.finra.org/reportcenterhelp/#Cross_Market_Equity_Supervision_Reports.htm))

February 15, 2013

Gene DeMaio  
Danny Milento  
Eric Brown  
Max Tourtelot  
FINRA  
One Liberty Plaza  
New York, NY 10006

By email to: [Gene.DeMaio@finra.org](mailto:Gene.DeMaio@finra.org)  
[Eric.Brown@finra.org](mailto:Eric.Brown@finra.org)  
[Max.Tourtelot@finra.org](mailto:Max.Tourtelot@finra.org)

Dear Sirs:

I am writing this letter in follow up to our meeting on January 10, 2013 regarding whether certain trading by Avalon FA Ltd. ("Avalon") may constitute market manipulation. Lek Securities Corp. ("LSC") takes its responsibilities as a FINRA member extremely seriously, including the responsibility for surveiling for potentially illegal trades placed through our systems. Accordingly, LSC has robust controls in place designed to identify potentially manipulative trades. For the reasons discussed during our January 10<sup>th</sup> meeting and set forth in this letter, based on information available to us, including conversations with Avalon, LSC is not able to reasonably conclude or otherwise suspect that Avalon has engaged in market manipulation. If, however, FINRA has additional relevant information, we request that you share it with us so we can also evaluate it and take any necessary actions.

Based upon the information available to us, it appears that Avalon has engaged in a series of open market transactions in which his trades were subject to market risk. The basic trading pattern at issue consists of Avalon purchasing stock in large cap companies (e.g., IBM, Visa, Union Pacific) and, depending on the price at which his purchases are executed, he then purchases corresponding put options<sup>1</sup>. Although the stock purchases are not a large percentage of the trading volume for the stocks, it appears that Avalon believes that market makers and/or algorithmic traders cancel their offers upon detection of his buying interest. In the absence of other offers coming in at equivalent prices, the cancelation of those offers naturally causes the stock price to increase and can result in Avalon's purchase orders being filled at prices that he thinks are too high. In those cases, he then purchases put options so that if the stock price declines, he will make money on the puts. He generally purchases puts on more shares than he purchased presumably because his experience tends to show that when a stock price has increased because of market makers and/or algorithmic traders quickly canceling offers upon

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<sup>1</sup> Alternatively the customer may sell or sell short stock and subsequently buy call options, but the strategy is fundamentally the same.

detection of new buying interest, the stock price is likely to decline shortly thereafter. Avalon's theory appears to be frequently – but not always – correct.

When applying the facts above to the elements required for market manipulation, we do not have information that would reasonably permit us to conclude that Avalon's trades are part of an illegal market manipulation scheme. The Supreme Court has explained that manipulation "connotes intentional or willful conduct designed to deceive or defraud investors by controlling or artificially affecting the price of securities." *Ernst & Ernst v. Hochfelder*, 425 U.S. 185, 199 (1976). Based upon this standard, market manipulation "generally refers to practices, such as wash sales, matched orders, or rigged prices, that are intended to mislead investors by artificially affecting market activity." *Santa Fe Indus. v. Green*, 430 U.S. 462, 476 (1977). We are not aware of any information indicating that Avalon has engaged in wash sales, matched orders or similar types of trades where there was no change in beneficial ownership, and FINRA has not suggested otherwise. Thus, the operative question is under what circumstances open market transactions can constitute illegal market manipulation.

Courts, including the Second Circuit, apply a rigorous standard before being willing to conclude that open market transactions constitute market manipulation. That standard requires proof that the defendant injected false information into the market. *See, e.g., ATSI Communications, Inc. v. Wolfson*, 493 F.3d 87, 100 (2d Cir. 2007) ("case law in this circuit and elsewhere has required a showing that an alleged manipulator engaged in market activity aimed at deceiving investors as to how other market participants have valued the security. The deception arises from the fact that investors are misled to believe 'that prices at which they purchase and sell securities are determined by the natural interplay of supply and demand, not rigged by manipulators.'") (citation omitted); *GFL Advantage Fund, Ltd. v. Colkitt*, 272 F.3d 189, 205 (3d Cir. 2001) ("Requiring a Section 10(b) plaintiff to establish that the alleged manipulator injected 'inaccurate information' into the market or created a false impression of market activity . . . permits courts to differentiate between legitimate trading activities that permissibly may influence prices, such as short sales, and 'ingenious devices that might be used to manipulate securities prices,' [citation omitted] such as wash sales and matched orders.").

Thus, based on the stringent standards described above, engaging in securities transactions with the hope that the trades will impact the price in a manner that benefits another position held by the trader is not manipulative. For example, in *GFL*, Colkitt, the founder and majority shareholder of two small capitalization companies, sought financing from GFL Advantage Fund. The loan agreement gave GFL the right to require Colkitt to repay the loan with stock in his companies at discounts of 17% and 18% of the average closing price for the prior five days. Before requiring repayment, GFL began short selling the stocks, which resulted in declining stock prices. Colkitt argued that GFL engaged in market manipulation by purposefully depressing the stock prices thereby forcing Colkitt to provide GFL with more shares in order to retire the same amount of debt. In upholding dismissal of Colkitt's manipulation claims, the Court noted that GFL's short sales were lawful transactions. *GFL* at 207. The Court stated, "The fact that these short sales may have contributed to a decline in the stocks' prices is not evidence of deceptive or manipulative conduct, for there is no reason to believe these prices were depressed artificially." *Id.* The Court further explained that "short selling, even in large volumes, is not in and of itself unlawful and therefore cannot be regarded

as evidence of market manipulation[]” and that any resulting changes in share prices “simply are natural consequences of a lawful and carefully regulated trading practice.” *Id.* at 209. The Court concluded that “selling [stock] in the open market in legitimate transactions to real buyers does not artificially affect prices and therefore cannot be manipulative.” *Id.*

In *ATSI*, the Second Circuit analyzed a similar fact pattern and likewise concluded that engaging in legitimate open market transactions to move the price of security in a manner that made the trader’s convertible preferred stock more valuable did not constitute market manipulation. In that case, *ATSI* claimed that the defendants fraudulently induced it to sell them convertible preferred stock. *ATSI* further claimed that the defendants then engaged in market manipulation by “aggressively” shorting the common stock thereby causing the price to decrease and enabling them to convert their preferred stock to cover the short positions and pocket an “enormous” profit. *ATSI* claimed that the defendants deliberately caused a “death spiral” in the price of the common stock. In assessing the manipulation claims, the Court said that “[t]he critical question then becomes what activity ‘artificially’ affects a security’s price in a deceptive manner.” *ATSI* at 100. The Court explained, “[t]o be actionable as a manipulative act, short selling must be willfully combined with something more to create a false impression of how market participants value a security.” *Id.* at 101. The Court held that purchasing convertible securities coupled with short selling is not inherently manipulative. *Id.* Indeed, the Court went so far as to characterize *ATSI* position as “ludicrous” and pointed out that “[o]ne does not observe constant prices or trading volumes in the stock markets.” *Id.* at 103.

The Seventh Circuit employed a similar rationale in holding that “flooding a market with short sales” does not constitute market manipulation because “[o]n the other side of each such sale is a buyer who thinks the market price will rise.” *Sullivan & Long, Inc. v. Scattered Corp.*, 47 F.3d 857, 862 (7<sup>th</sup> Cir. 1995). In that case, the defendant sold short 170 million shares of LTV, which was more than the 122 million shares that were outstanding. LTV, which was in bankruptcy, announced in February 1993 a plan of reorganization pursuant to which existing stock would be replaced by new stock that the plan estimated would be worth \$0.03 or \$0.04. The bankruptcy court approved the plan on May 27, 1993 and fixed June 29, 1993 as the last day that the old shares would be tradable. At the time LTV announced the reorganization plan, the stock was trading at \$0.30. Apparently, many purchasers on the other side of the defendant’s short sales did not read the reorganization plan and did not realize the stock they were buying would be worth much less by June 29<sup>th</sup>. In dismissing the plaintiff’s claims, the Court stated, “[t]here is nothing unlawful about trading on an information advantage, provided that it is not based on inside information.” *Id.* at 860. The Court added that the defendant “merely had a better understanding of the information about the reorganization than the investors with whom it traded.” *Id.* The Court observed that the defendant was engaged in arbitrage, not manipulation. *Id.* at 862. In concluding that the defendant’s trading did not give any false impression of supply or demand, the Court noted that on the other side of all of the defendant’s “transactions were real buyers, betting against [the defendant], however foolishly, that the price of LTV stock would rise. And [the defendant] made no representations, true or false, actual or implicit, concerning the number of shares that it would sell short.” *Id.* at 864.

The three Circuit Court opinions described above demonstrate that open market transactions, including those done with an expectation that the transactions will impact the stock

price, are not manipulative in the absence of evidence that the traders took other steps to inject false information into the marketplace. Based upon the information available to us, we are not aware of Avalon doing anything more than trading stock and put options in the open market. The apparent likelihood that he may have identified anomalies in trading patterns that often enable him to make a profit on small, short-term movements in stock prices appears to be much more akin to arbitrage than manipulation. Nevertheless, if FINRA is aware of additional facts suggesting that Avalon has placed inaccurate information into the marketplace with respect to his trades, or that his trades are not resulting in changes of beneficial ownership, we urge you to share that information with us so we can assess whether LSC should take any action.

I hope that you will find this analysis useful. We intend to continue to closely monitor to account. In the meantime, please do not hesitate to contact me if you have any questions or concerns.

Very truly yours,

Samuel F. Lek

UNITED STATES OF AMERICA  
Before the  
SECURITIES AND EXCHANGE COMMISSION

Securities Exchange Act Of 1934

Admin. Proc. File No. 3-19798

In the Matter of

SERGEY PUSTELNIK a/k/a  
SERGE PUSTELNIK,

Respondent.

**Certificate of Service**

As per mutual agreement with the Staff to use email as means of service dated June 8, 2020  
MR. PUSTELNIK'S ANSWER TO THE ALLEGATIONS OF ORDER has been served on

Sarah Nilson  
[NilsonS@sec.gov](mailto:NilsonS@sec.gov)

Sincerely,

July 28, 2020

/s/ Sergey Pustelnik  
Sergey Pustelnik  
[serge.pustelnik@gmail.com](mailto:serge.pustelnik@gmail.com)  
45 River Drive South  
Jersey City, NJ 07310