UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF ILLINOIS

IN RE: CHICAGO BOARD OPTIONS EXCHANGE VOLATILITY INDEX MANIPULATION ANTITRUST LITIGATION *This Document Relates to All Actions*	1:18-cv-04171 MDL No. 2842 Honorable Manish S. Shah **CONSOLIDATED CLASS ACTION COMPLAINT** **JURY TRIAL DEMANDED**

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Plaintiffs Brian Barry, William Tad Berger, Spencer Roland Bueno, Dale Cary, Victor Choa, FTC Capital GmbH, Amy Huang, LRI Invest S.A., John Pels, Projection Capital Markets LLC, and David Samuel (collectively, "Plaintiffs"), individually and on behalf of all others similarly situated, bring this class action based upon personal knowledge of their own acts and upon information and belief as to all other matters alleged herein, including the investigation of Plaintiffs' counsel, against Cboe Global Markets, Inc., Cboe Futures Exchange, LLC, and the Chicago Board Options Exchange, Inc. (now known as Cboe Exchange, Inc.) (together, "CBOE"), as well as against other unknown persons and entities ("John Doe Defendants").

NATURE OF THE ACTION

1. This case involves the CBOE Volatility Index (the "VIX"). It is widely known as the U.S. stock market's "fear gauge" in that it purports to measure the expected volatility of the S&P 500. Since it first became tradeable in 2004, the VIX has become a highly traded financial index, responsible for the value of billions of dollars' worth of financial derivatives.

2. CBOE created the VIX to measure volatility in the equity market pursuant to an exclusive licensing agreement with Standard and Poor's ("S&P") to use S&P's benchmark figure for the value of the equity market, i.e., the S&P 500 ("SPX"). Having secured an exclusive license on SPX in order to create the VIX, CBOE has since built a suite of proprietary products based upon both, including option contracts based on the SPX ("SPX Options"), options based on the VIX ("VIX Options"), and futures based on the VIX ("VIX Futures").[1] Crucially, CBOE's exchanges are the *only* places to trade these products. In addition, since 2009, exchange-traded funds ("ETFs") and exchange-traded notes ("ETNs," which, together with ETFs, are referred to herein as "exchange-traded products" or "VIX ETPs") have emerged.

[1] CBOE began publishing real-time VIX data in 1993. VIX Futures were launched in 2004 and VIX Options in 2006.

3. CBOE has reaped tremendous profits off of its control over the nation's financial "fear gauge." VIX Options have become the most successful new product in CBOE history. Between 2007 and 2017, CBOE saw over a 3,000% increase in daily VIX Options transactions and over a 15,000% increase in VIX Futures. CBOE's annual report has made clear its 88% rise in "transaction fees" has occurred "primarily" because of volume increases in "proprietary" VIX-related trading. Trading fees on VIX Options, VIX Futures, and SPX Options during the Class Period routinely accounted for the lion's share of CBOE's revenues and profit. The Company has touted its lineup of SPX and VIX products as its "highest margin products."

4. CBOE continuously marketed its VIX products as "the world's premier barometer of investor sentiment and market volatility," and "a pure play on implied volatility independent of the direction and level of stock prices." Far from being a "pure play," however, with power over the equity market's "fear gauge," *and* exclusive control of the most popular instruments available to those who want to trade it, CBOE disregarded its oversight responsibility and, instead, acted solely to maximize its returns from its wildly successful VIX-related products, at the expense of investors in those same products. CBOE's desires for profits and market-share, combined with investor appetite in the period of market calm following the global financial crisis, led it to push and maintain VIX Options and VIX Futures in the marketplace even though it knew or recklessly disregarded that the products were flawed and ripe for manipulation.

5. Because nobody can physically deliver the VIX—it is a financial index, not a physical good—all VIX Options and VIX Futures are cash-settled. When VIX Options and VIX Futures expire, CBOE makes a series of formulaic calculations to determine who owes how much cash to whom. In essence, the formula CBOE created, operated, and maintained is a zero-

sum game that determines who is the winner and who is the loser, and by how much, for investors in VIX Options and VIX Futures.

6. In theory, CBOE performed this calculation by taking prices from trades in the SPX Options market (which CBOE also controlled). This was done because of the belief that the prices people are willing to pay or accept for a 30-day option on the SPX provide an estimate of how much movement in the market (i.e., volatility) investors currently anticipate over the next 30 days. It thus supposedly determines what VIX Options and VIX Futures should be worth today. But the actual math behind that basic concept is developed and administered by CBOE through a highly complex formula. That formula is not fed with data from SPX Options traded in the open market, but instead with SPX Options prices and quotes that are the results of an opaque "Special Opening Quotation" ("SOQ"), which is conducted only once a week on Wednesdays (and only monthly prior to mid-2015) with a select number of participants before the market opens.

7. An academic study[2] and an even-more-recent "whistleblower" letter to U.S. regulators[3] flagged that multiple suspicious choices CBOE made when designing the SOQ settlement process meant that it (and thus the cash settlement values of VIX Options and VIX Futures) was uniquely vulnerable to being manipulated. In other words, CBOE designed, then regularly administered for profit, a fatally flawed process. As a result of CBOE's malfeasance, the prices for VIX Options and VIX Futures have been subject to wholesale manipulation.

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[2] The paper was originally available at Griffin, John M. and Shams, Amin, *Manipulation in the VIX?* (May 23, 2017), https://ssrn.com/ abstract=2972979. It was later peer-reviewed and published by the Oxford University Press at John M. Griffin and Amin Shams, Manipulation in the VIX?, 31 Rev. Fin. Studies 1377 (2018).

[3] Gunjan Banerji, Wall Street Journal, *Regulator Looks Into Alleged Manipulation of VIX, Wall Street's 'Fear Index'* (Feb. 13, 2018), https://www.wsj.com/articles/wall-street-regulator-probes-alleged-manipulation-of-vix-a-popular-volatility-gauge-1518547608.

8. While CBOE claims that the settlement process was driven by free market forces, economic analyses demonstrate that the SOQ process was being manipulated. For example: (1) the ratio of puts to calls was different for settlement days than other days, which is relevant as puts have a greater ability to influence the settlement price; (2) trading volume was higher on settlement days, particularly for SPX Options that carried more weight in the settlement formula; (3) bids were filling in gaps that would otherwise exclude options from the VIX calculation, but only during the settlement window; and (4) the VIX moved differently on settlement days than on other days. Belying any notion these phenomena are explainable by natural market forces, the data also show that (5) pricing and quoting behavior changed after it was reported in February 2018 that the Financial Industry Regulatory Authority ("FINRA") would be investigating manipulation of the VIX.

9. On February 14, 2018, former Commodities Futures Trading Commission ("CFTC") Commissioner Bart Chilton stated that the allegation that the VIX was manipulated "rings true to me," and added that "there's certainly enough smoke."[4] On February 16, 2018, former Securities Exchange Commission ("SEC") Chairman Harvey Pitt echoed, stating "it's quite clear that [the VIX] indexes' options can be manipulated. . . . the Cboe, as the marketplace, should have sprung in to action."[5] Multiple regulators, including the CFTC, the SEC, and FINRA are now reported to be investigating the manipulation of VIX-related products.[6]

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[4] CNBC, *Former CFTC Commission: Whistleblower Allegation About Volatility Index Manipulation 'Rings true'* (Feb. 14, 20018), https://www.cnbc.com/2018/02/14/ex-cftc-head-bart-chilton-on-whistleblower-vix-manipulation-allegation.html.

[5] MarketWatch, *Ex-SEC Chairman Says 'It's Quite Clear' Wall Street's 'Fear Gauge' Can Be Manipulated* (Feb. 16, 2018), https://www.marketwatch.com/story/ex-sec-chairman-says-its-quite-clear-wall-streets-fear-gauge-can-be-manipulated-2018-02-16.

[6] *See, e.g.*, Robbin Wigglesworth & Nicole Bullock, *US Watchdog Probes Possible Manipulation of Volatility Index*, The Financial Times (Feb. 13, 2018).

10. This systemic manipulation of VIX products is something CBOE and the John Doe Defendants had secretly known about for years. As owner and manager of the VIX Options and VIX Futures settlement process, with unlimited and near-exclusive access to the underlying trading and settlement data, CBOE knew (or, at the very least, recklessly disregarded) that the SOQ process was being manipulated. As its administrator, CBOE knew exactly what levers people were pulling and what buttons people were pushing as VIX Options and VIX Futures settlement values were being determined.

11. In creating and marketing proprietary products that, among other things, were known to be flawed and advantaged certain customers over others, CBOE was acting in its role as a profit-seeking enterprise. CBOE is thus liable for under the Securities Exchange Act of 1934 ("Exchange Act") for employing a device or scheme (or both) to defraud Class members.

12. CBOE is also liable under the Commodity Exchange Act ("CEA"), which requires, for instance, CBOE to enforce rules preventing price manipulation on its exchanges. CBOE failed to enforce its own rules when it designed, made public, and promoted a process that was vulnerable to manipulation; provided certain favored insiders with specialized tools that made such manipulation even easier; and then knowingly allowed investors to be cheated by such manipulation on a weekly basis, all because CBOE was driven more by profits and market share, at the expense of securing its exchanges.

13. By its conduct, CBOE is also liable to the Class under the common law of negligence, as it breached the duty of reasonable care it owed Plaintiffs as a result of its design, testing, promotion, and surveillance of its exchanges, SPX Options, VIX Options, and VIX Futures.

14. The John Doe Defendants—the perpetrators of the alleged manipulation—are liable under numerous provisions of the Exchange Act, the CEA, and the Sherman Act, as shown below.

PARTIES

A. Plaintiffs

15. Plaintiff Brian Barry is an individual who resides in Bali, Indonesia. During the Class Period, Mr. Barry transacted in VIX Options on the CBOE's Option Exchange ("COE") and in VIX ETPs. As a direct and proximate result of the wrongdoing alleged herein, Mr. Barry suffered economic injury.

16. Plaintiff William Tad Berger is an individual who resides in Bedford, New Hampshire. During the Class Period, the Mr. Berger transacted in VIX ETPs. As a direct and proximate result of the wrongdoing alleged herein, Mr. Berger suffered economic injury.

17. Plaintiff Spencer Roland Bueno is an individual who resides in La Jolla, California. During the Class Period, Mr. Bueno transacted in VIX Options and SPX Options on the COE, and in VIX ETPs. As a direct and proximate result of the wrongdoing alleged herein, Mr. Bueno suffered economic injury. The Court has appointed Mr. Bueno as Lead Plaintiff on the Exchange Act claims.

18. Plaintiff Dale Cary is an individual who resides in Edmonds, Washington. During the Class Period, Mr. Cary transacted in VIX Options on the COE. As a direct and proximate result of the wrongdoing alleged herein, Mr. Cary suffered economic injury.

19. Plaintiff Victor Choa is an individual who resides in Jericho, New York. During the Class Period, Mr. Choa transacted in SPX Options on the COE, VIX Futures on the CBOE Futures Exchange ("CFE"), and in VIX ETPs. As a direct and proximate result of the wrongdoing alleged herein, Mr. Choa suffered economic injury.

20. Plaintiff FTC Capital GmbH ("FTC Capital") is an asset management company based in Vienna, Austria. During the Class Period, FTC Capital's sub-funds, along with FTC Futures Fund Classic, a sub-fund of FTC Futures Fund SICAV, based in Luxembourg, transacted in VIX ETPs.[7] As a direct and proximate result of the wrongdoing alleged herein, the FTC Funds suffered economic injury.

21. Plaintiff Amy Huang is an individual who resides in Brooklyn, New York. During the Class Period, Ms. Huang transacted in VIX Options on the COE and in VIX ETPs. As a direct and proximate result of the wrongdoing alleged herein, Ms. Huang suffered economic injury.

22. Plaintiff LRI Invest S.A. ("LRI Invest") is a fund administrator based in Luxembourg. During the Class Period, LRI Invest's funds transacted in VIX Options on the COE and in VIX Futures on the CFE. As a direct and proximate result of the wrongdoing alleged herein, LRI Invest suffered economic injury.

23. Plaintiff John Pels is an individual who resides in Windsor, California. During the Class Period, Mr. Pels transacted in VIX Options on the COE and VIX Futures on the CFE. As a direct and proximate result of the wrongdoing alleged herein, Mr. Pels suffered economic injury.

24. Plaintiff Projection Capital Markets LLC is a limited liability company with its headquarters in Brooklyn, New York. During the Class Period, Projection Capital Markets transacted in VIX ETPs. As a direct and proximate result of the wrongdoing alleged herein, Projection Capital Markets LLC suffered economic injury.

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[7] Prior to filing its original complaint in this Action, FTC Futures Fund SICAV assigned the claims of FTC Futures Fund Classic to FTC Capital. Together, FTC Capital's sub-finds and FTC Futures Fund Classic are referred to as the "FTC Funds."

25. Plaintiff David Samuel is an individual who resides in Auckland, New Zealand. During the Class Period, Mr. Samuel transacted in VIX ETPs. As a direct and proximate result of the wrongdoing alleged herein, Mr. Samuel suffered economic injury.

B. Defendants

26. Defendant Cboe Global Markets, Inc. (formerly known as CBOE Holdings, Inc.) is a corporation organized under the laws of Delaware with its principal place of business in Chicago, Illinois. Cboe Global Markets, Inc. maintains offices around the globe. CBOE Global Markets, Inc. is the publicly traded holding company of, among other entities, CBOE Futures Exchange, LLC (which is responsible for operating the CFE) and the Chicago Board Options Exchange, Inc. (which is responsible for operating the COE).

27. Defendant Cboe Futures Exchange, LLC is a corporation organized under the laws of Delaware with its principal place of business in Chicago, Illinois.

28. Chicago Board Options Exchange, Inc. (now known as Cboe Exchange, Inc.) is a corporation organized under the laws of Delaware with its principal place of business in Chicago, Illinois.

29. Defendants Cboe Global Markets, Inc., Cboe Futures Exchange, LLC, Chicago Board Options Exchange, Inc., and their subsidiaries, officers, and directors are referenced collectively in this Complaint as "CBOE."

30. John Doe Defendants are persons and entities that directly or indirectly manipulated or attempted to manipulate the settlement prices of VIX Options and VIX Futures, including through trading SPX Options during the settlement window for VIX Options and VIX Futures. Trading of VIX Options and SPX Options on the COE, and of VIX Futures on the CFE, is anonymous. Plaintiffs intend to seek leave to amend their complaint upon learning the identity of the John Doe Defendants.

JURISDICTION AND VENUE

31. This Court has subject matter jurisdiction over this action pursuant to Section 22 of the CEA (7 U.S.C. § 25) and Section 10(b) of the Exchange Act (15 U.S.C. § 78aa). The Court also has jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1337(a) to recover damages for violation of Sections 1 and 2 of the Sherman Act (15 U.S.C. § 2).

32. This is also a class action arising under the Class Action Fairness Act of 2005 (28 U.S.C. §§ 1332(d), 1453, 1711-1715), which explicitly provides for the original jurisdiction of the Federal Courts over any class action in which any member of the plaintiff class is a citizen of a state different from any defendant, and in which the matter in controversy exceeds in the aggregate of $5,000,000, exclusive of interest and costs. The total claims of the individual members of the Class here are in excess of $5,000,000 in the aggregate, exclusive of interest and costs, as required by 28 U.S.C. § 1332(d)(2)(A).

33. Venue is proper in this District pursuant to Section 22 of the CEA (7 U.S.C. § 25) and Section 10(b) of the Exchange Act (15 U.S.C. § 78aa), and pursuant to Sections 4(a) and 12 of the Clayton Act (15 U.S.C. §§ 15(a) and 22, and 28 U.S.C. § 1391(b), (c), and (d)). A substantial part of Defendants' acts or omissions occurred in this District, for which Defendants, directly or indirectly, used the means and instrumentalities of interstate commerce, including, but not limited to, the facilities of the national securities markets. All the products at issue in this case represent billions of dollars in interstate commerce each year in the United States.

34. This Court has personal jurisdiction over each Defendant, because: each Defendant was found or resided in this District, had agents in this District, or transacted business throughout the United States, including this District; a substantial part of the events giving rise to Plaintiffs' claims arose in this District; and a substantial portion of the affected interstate trade and commerce described herein has been carried out in this District.

FACTUAL BACKGROUND

A. Futures and Options Contracts

35. An option contract is an agreement that gives the buyer the right—but not the obligation—either to buy (in the case of a "call option") or to sell (in the case of a "put option") a particular commodity or financial instrument, at a predetermined price, at or during a specified time period in the future (the "expiry date"). The agreed price is generally known as the "strike price."

36. A physically settled option requires physical delivery of the underlying financial instrument on settlement. For example, many stock options are physically settled, meaning settlement requires actual delivery of the stock to the holder if she exercises the option. A cash-settled option, in contrast, results in a cash payment to the holder of the option based on prevailing market values for the underlying product or instrument at the time of settlement, rather than delivery of the product or instrument.

37. The main driver of whether a cash-settled option is exercised is whether it is "in the money" or "out of the money." An in-the-money option is one where the holder is entitled to a cash payment if she exercises the option. For example, if an option holder has the right to buy a widget at a price of $300 (a call), and the market price for the widget is currently $500, the call option is in the money—because the option holder could make a $200 profit by buying a widget for $300 and immediately selling it for $500.

38. An out-of-the-money put or call is one where the option holder is not entitled to a cash payment if she exercises the option. For example, if an option holder has the right to sell a widget at a price of $300 (a put), and the market price for the widget is currently $500, the option is out of the money—because the opportunity to sell at $300 is worthless when the option holder could sell at $500 on the open market.

39. Whether a put or call option ultimately is in or out of the money depends on the relevant prevailing market price at the time of the settlement of the option—the at-the-money price. In the case of a widget, the at-the-money price is the prevailing market price of a widget. An option can be in or out of the money at one point in time and just the opposite at the time of settlement of the option.

40. Futures contracts involve a promise—generally made through a futures exchange—to buy or sell a particular commodity or financial instrument, at a predetermined price, on a fixed date in the future (i.e., again, on an "expiry date"). Futures contracts can also be cash-settled, instead of requiring physical delivery of the underlying commodity or instrument on the expiry date.

41. Because there is no "SPX" or "VIX" to be physically delivered, SPX Options, VIX Options, and VIX Futures are cash-settled.

B. The SPX and SPX Options

42. The S&P 500 index (SPX) is a capitalization-weighted index of 500 U.S. stocks from a broad range of industries. The impact of a component's price change is proportional to the issue's total market value, which is the share price multiplied by the number of shares outstanding.

43. The SPX is widely regarded as the leading benchmark of the overall U.S. stock market, and CBOE is the exclusive provider of options on the SPX (SPX Options). CBOE provides a range of SPX Options, including SPX Options with A.M. settlement, with P.M. settlement, weekly options, end-of-month options, and Mini SPX options.

44. SPX Options are available for trading solely on CBOE's COE exchange. Indeed, CBOE markets SPX Options as its "flagship contract," and as "the index option of choice for

institutional investors trading large and complex [S&P 500 options] orders."[8] As CBOE has acknowledged in its public filings with the SEC throughout the Class Period, "[t]he options we offer on the S&P 500 Index are exclusive to CBOE and contribute substantially to our volumes and transaction fees."[9]

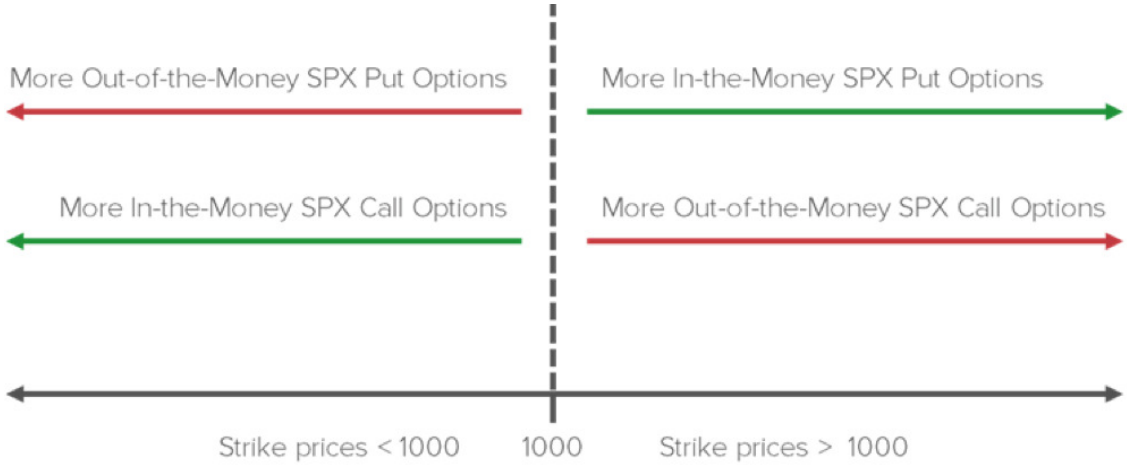
45. Like any other option, SPX Options can be either call or put options. They also can be in or out of the money at any given point in time, depending on the market's current expectation of the S&P 500 Index's value in the future. For example, the at-the-money price for an SPX Option that expires in 30 days reflects the market expectation of the level of the S&P 500 in 30 days' time.

46. There is a spectrum of in-the-money/out-of-the-money SPX put and call options, shown below for a hypothetical at-the-money price of $1,000. SPX Option puts that have lower strike prices are more out of the money because the market is less likely to decline to those lower strike prices. Similarly, SPX Option calls that have higher strike prices are more out of the money because the market is less likely to rise to those higher strike prices. This can be seen in the following diagram:

[8] CBOE, *S&P 500 Index*, http://www.cboe.com/products/stock-index-options-spx-rut-msci-ftse/s-p-500-index-options/s-p-500-index.

[9] CBOE, Annual Report 2016, at 12.

At-The-Money Strike Price
For SPX Option Puts and Calls



C. The VIX

47. The VIX is a popular index used to measure the stock market's expectation of volatility, and is colloquially referred to as the "fear index" or the "fear gauge." "[W]idely reported by financial media" and "closely followed by a variety of market participants as a daily market indicator,"[10] the VIX is higher when the market is expected to be more volatile 30 days in the future, and is lower when the market is expected to be less volatile 30 days in the future.

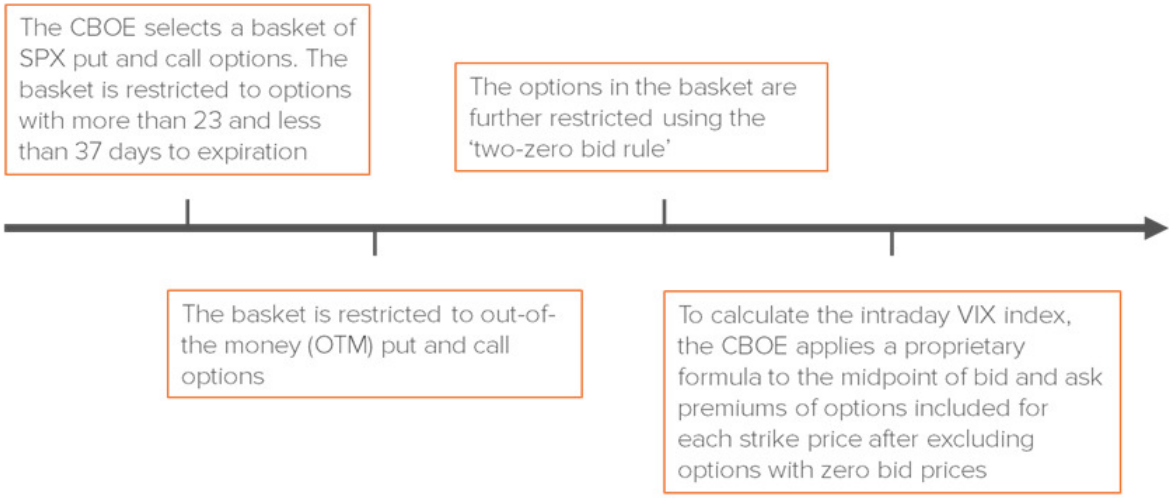
48. The VIX is determined by reference to the prices of SPX Options (the cost of purchasing the options at particular strike prices) because the prevailing quotation levels of SPX Options serve as an indicator of the market's expectations of future stock price volatility. For example, an option to buy or sell the SPX at a given level will be worth more when the market expectation is that stock prices will be volatile (and more likely to move significantly above or below that level), whereas it will be worth less when the market expectation is that stock prices will be calm (and less likely to move significantly above or below that level).

[10] CBOE, *VIX*, http://www.cboe.com/vix/.

49. CBOE explains the relation between SPX Options and the VIX on its website:[11]

> The VIX Index is an up-to-the-minute market estimate of implied (expected) volatility that is calculated by using the midpoint of real-time S&P 500® Index (SPX) option bid/ask quotes. More specifically, the VIX Index is intended to provide an instantaneous measure of how much the market thinks the S&P 500 Index will fluctuate in the 30 days from the time of each tick of the VIX Index.
>
> Cboe Options Exchange® (Cboe®) calculates the VIX Index using standard SPX options and weekly SPX options that are listed for trading on Cboe. Standard SPX options expire on the third Friday of each month and weekly SPX options expire on all other Fridays. Only SPX options with Friday expirations are used to calculate the VIX Index. Only SPX options with more than 23 days and less than 37 days to the Friday SPX expiration are used to calculate the VIX Index. These SPX options are then weighted to yield a constant, 30-day measure of the expected volatility of the S&P 500 Index.

50. The VIX calculation process is summarized in the following diagram:



51. The VIX calculation occurs approximately every 15 seconds throughout the trading day and is based upon bid and ask premiums at various strike prices for a number of different SPX Options. To determine which SPX put and call options should be used to calculate the VIX, the calculation process starts from the strike price that is closest to the prevailing at-the-money value and proceeds in both out of the money directions until two zero-bid strike prices are

[11] CBOE, *VIX FAQs*, http://www.cboe.com/products/vix-index-volatility/vix-options-and-futures/vix-index/vix-faqs#1.

reached. The "two-zero bid rule" requires that the basket of SPX put and call options used to determine the value of the VIX must be drawn from puts and calls that are not "zero-bid" two or more times in a row.

52. The following table offers a hypothetical illustration of whether the strike for a series of calls or puts on SPX Options would be included in the VIX calculation upon application of the two-zero bid rule:

Application of the Two-Zero Bid Rule

Put Strike	Bid Premium	Ask Premium	Included in VIX calculation?
1380	0.1	0.2	Yes
1375	0.1	0.15	Yes
1370	0.05	0.35	Yes
1365	0	0.35	No
1360	0	0.35	No
1355	0.05	0.35	Excluded following two zero bids
1350	0.05	0.15	
1345	0	0.15	

Call Strike	Bid Premium	Ask Premium	Included in VIX calculation?
2100	0.05	0.15	Yes
2120	0	0.15	No
2125	0.05	0.15	Yes
2150	0	0.1	No
2175	0	0.05	No
2200	0.05	0.05	Excluded following two zero bids
2225	0.05	0.1	
2250	0	0.05	

53. As this table demonstrates, whether a given strike price or series of strike prices and the attendant bid and ask premium are included in the calculation for the VIX process is dependent on whether participants have chosen to bid on puts or calls at those strike prices.

D. VIX Options, VIX Futures, VIX ETPs, and the "SOQ" Settlement Process

54. Initially the VIX was just a benchmark figure. Investors could not "take a position" in the VIX, or on the direction they thought it would go. CBOE responded to investor demand to allow investments based upon investors' views of volatility and their attendant expectations regarding movements in the VIX by creating VIX Futures in 2004 and VIX Options

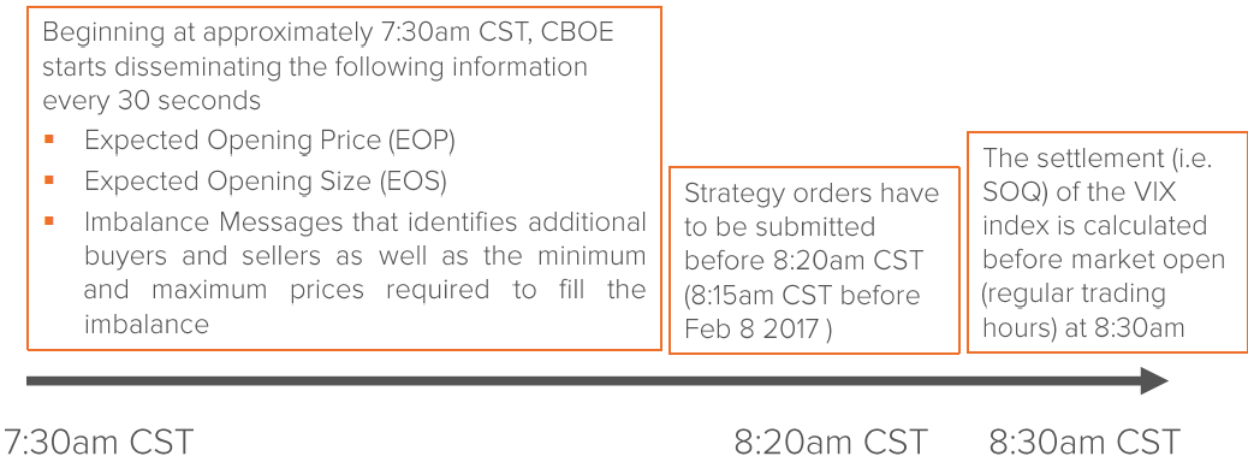
in 2006.[12] The products—exclusive to CBOE—thereafter allowed traders and investors to speculate on the extent to which the stock market, as reflected by the S&P 500, will be more or less volatile in the future.

55. VIX Options can only be exercised at expiration, which occurs every Wednesday since mid-2005 (monthly previously), and all are cash-settled. VIX Futures are also cash-settled at expiry. The cash-settlement value at expiry is determined through the same CBOE-administered SOQ process for both VIX Options and VIX Futures. The SOQ process is similar, but not identical, to the process used to calculate the VIX itself.[13]

56. The SOQ settlement process is conducted by CBOE using a proprietary auction mechanism called the "Hybrid Opening System" (or "HOSS"). The HOSS finds a single clearing price that maximizes the number of contracts that can be traded within the SOQ price range. The following table demonstrates the HOSS auction mechanism within the SOQ process:

[12] Prior to September 2003, the VIX was calculated based on a small range of strike prices for puts and calls of OEX Options (options on the S&P 100), clustered around an at-the-money price. After that time, there was a move to the system designed instead around out-of-the-money patterns, which made it more susceptible to manipulation.

[13] In addition to those discussed below, other differences between the intraday VIX calculation and the settlement calculation include that: (1) the VIX is calculated and published every 15 seconds throughout the trading day, whereas the VIX settlement price is calculated on the day that VIX Options and VIX Futures expire; (2) settlement calculations include only SPX Options that expire in exactly 30 days, whereas the intraday VIX computations include SPX Options that expire in the range of 23 to 37 days; and (3) the intraday VIX is derived from the midpoint of bid and ask premiums of SPX Options, whereas the settlement calculations use actual traded prices where possible.



57. Prior to September 2007, there was an "Order Book Official" who was able to work with market makers personally throughout the SOQ process. As CBOE prepared to take itself public, it engaged in a push towards automation—what it called a "Hybrid 3.0" system. That removed the Order Book Official from the picture. CBOE officials—including, without limitation, John Johnston (Vice President of Execution Services) and Phil Slocum (Executive Vice President of Trading Operations)—were warned that the removal of this safeguard exposed the SOQ process to the risk of being influenced by orders that were not reasonable and that did not reflect prevailing market conditions.

58. With respect to SPX Options, a large amount of control over the bidding and trading process is vested in "Lead Market Makers" appointed by the CBOE. Under CBOE Rule 8.15(b)(1), a Lead Market Maker must "provide continuous electronic quotes (as defined in Rule 1.1 (ccc)) in at least the lesser of 99% of the non-adjusted option series or 100% of the non-adjusted option series minus one call-put pair."

59. In 2008, for the first time, the CBOE designated dual Lead Market Makers for SPX Options. In October of 2012, it expanded the Lead Market Maker structure for SPX Options so that more than two but no more than four Lead Market Makers could be designated.

In 2014, the CBOE introduced extended trading hours for both SPX Options and VIX Options. In that year and subsequent years, it designated three Lead Market Makers for each.

60. Lead Market Makers (and all other classes of market maker) are eligible to participate in the SOQ. However, as per CBOE rule 8.15(b)(v), Lead Market Makers have the obligation to "enter opening quotes within one minute of the initiation of an opening rotation in any series that is not open due to the lack of a quote." In other words, if no one else participating in the SOQ offers a quote, Lead Market Makers are obligated to do so.[14]

61. CBOE keeps confidential the identity of the participants in the SOQ process. However, according to CBOE Rule 8.13, Lead Market Makers are required to enter opening quotes for SPX Options, and according to CBOE Rule 8.85, "Designated Primary Market Makers" are required to enter opening quotes for SPXW options (i.e., weekly SPX Options).

62. Both the orders and quotes of Lead Market Makers and Designated Primary Market Makers are eligible to participate in the SOQ. By contrast, all other market participants can participate in the opening only through orders (which are binding offers to either buy *or* sell), and not through quotes (which can simultaneously indicate a willingness to buy or sell at different prices).

63. Where there is no opening trade for SPX Options during the settlement window on a settlement date for VIX Options and VIX Futures—and thus no price to incorporate into the SOQ and HOSS processes—the opening price will be the average of an SPX Option's bid and ask price determined at the open at 8:30 a.m. At that time, CBOE executes SPX Options orders at market-clearing prices and removes all remaining unexecuted orders. The auction clearing

[14] Certain market makers are given steep discounts for quoting out-of-the-money SPX Options. This is a feature not seen in other, comparable options contracts.

prices for SPX Options expiring in exactly 30 days are then used as part of the calculations to settle VIX Options and VIX Futures expiring that calculation day.

64. Shortly after VIX Options were created, a new set of products arose which allowed investors to purchase shares (in the case of ETFs) or notes (in the case of ETNs), the value of which are directly linked to the value of the VIX and/or related products, such as VIX Futures. They trade on a national securities exchange like a security.

FACTUAL ALLEGATIONS

I. CBOE REPEATEDLY ASSURED INVESTORS THAT ITS VIX PRODUCTS ACCURATELY MEASURED AND REFLECTED MARKET VOLATILITY

65. CBOE has long promoted VIX Options and VIX Futures as an accurate and reliable means for investors to take positions on market volatility.

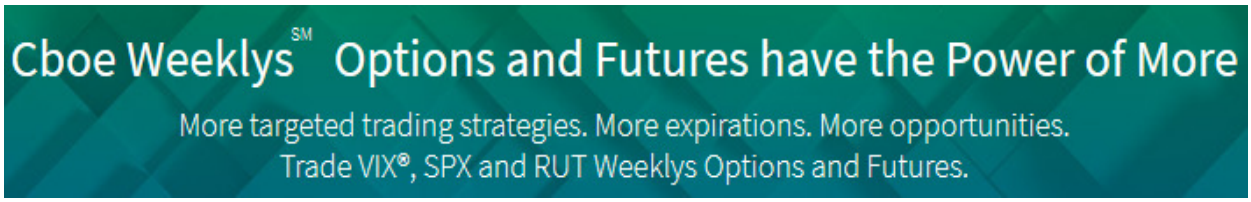
66. As of the date of filing, for example, CBOE's website promoted both VIX Options and VIX Futures for a variety of purposes, ranging from speculation, to risk management, to portfolio diversification, to hedging:[15]

> Cboe Volatility Index® (VIX®) Options and Futures help you turn volatility to your advantage. Harness it to seek diversification, hedge or capitalize on volatility or efficiently generate income.

67. Indeed, through its website, CBOE expressly represents VIX Options and VIX Futures as a means for investors to protect themselves against adverse market moves, to cabin or reduce their risk, and to achieve efficient investment returns:

[15] CBOE, http://insight.cboe.com/vix/.

68. CBOE has promoted VIX Options and VIX Futures in this way for years, even as it has changed how it offers them. For example, when CBOE moved from offering VIX Options and VIX Futures with only monthly expiries to offering them with weekly expiries in 2015, it touted this change as allowing "more opportunities" for "more targeted" use of the products to reduce risk or for investment:



69. Through the fact sheets that it published for its VIX products, CBOE stressed that the VIX index upon which the VIX Options and VIX Futures were based was "a leading measure of market expectations of near-term volatility."[16] CBOE also stressed that "[t]he addition of weekly expirations to standard monthly features and options expirations offers volatility exposures that more precisely track the performance of the VIX Index."[17] Similarly, CBOE emphasized that "[w]ith the launch of VIX Futures at Cboe Futures Exchange (CFE) in 2004 and

[16] Cboe, *VIX Futures and Options* (2018, v 1.2), http://www.cboe.com/micro/vix/pdf/vix-fut-and-options-cboe-vix-fact-sheet.pdf.

[17] *Id.*, at 2.

VIX Options at Cboe in 2006, there has been a growing acceptance of trading VIX and VIX-linked products as risk management tools."[18]

70. All of these representations to the market regarding the accuracy and reliability of VIX Options and VIX Futures as trading and investment products were part of CBOE's concerted efforts to grow itself as a newly "for profit" company.

71. In 2007, for example, CBOE engaged in a "new branding campaign" through which it wanted to "communicat[e] to the world that CBOE is a vital necessity in the options marketplace for which there is no substitute."[19] By 2012, CBOE was marketing its creation of weekly expiring VIX Options as allowing investors "targeted trading strategies around market news and events."[20]

72. As seen in the examples above, CBOE represented VIX Options and VIX Futures as accurately reflecting market volatility throughout its advertising, marketing campaigns, web and print product descriptions, annual reports, and elsewhere.

II. INSTEAD, THE VIX SOQ PROCESS WAS VULNERABLE TO MANIPULATION

73. Contrary to CBOE's repeated representations, and unbeknownst to investors, the VIX settlement process was being routinely hijacked by the John Doe Defendants to, e.g., manipulate the cash settlement values for VIX Options and VIX Futures. And this hijacking was occurring, consistently, for *years*. Thus, far from accurately reflecting market volatility, the SOQ settlement process CBOE designed and administered allowed the John Doe Defendants—

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[18] *Id.*, at 2.

[19] CBOE, Annual Report 2006, at 3, http://www.cboe.com/framed/pdfframed?content=/aboutcboe/annualreportarchive/annualreport2006.pdf&section=SEC_ABOUT_CBOE&title=Cboe+Annual+Report+2006.

[20] CBOE, Annual Report 2012, at 4, http://www.cboe.com/framed/pdfframed?content=/aboutcboe/annualreportarchive/annualreport2012.pdf&section=SEC_ABOUT_CBOE&title=Cboe+Annual+Report+2012.

who had the incentive, means, and access—to fool everyone else into accepting artificial settlement prices.

74. While CBOE's proprietary settlement process for VIX Options and VIX Futures was complex, it was ripe for corruption by those with the necessary level of sophistication. In the words of Matt Levine (a former banker at Goldman Sachs and a former mergers and acquisitions lawyer at Wachtell, Lipton, Rosen & Katz), the process was flawed:

> [I]f you are a trader who owns a lot of the market in VIX futures, you could push around a large dollar value of futures by trading a small dollar value in options. This is particularly true because the S&P option volume is divided among many strikes, and the illiquid deep out-of-the-money S&P 500 options have a big influence on the VIX: You can move the price of those options a lot with relatively small trades, and those price changes have a disproportionate effect on the VIX. . . . [Thus,] if you are going to manipulate a tradable market . . . then VIX looks pretty tempting.[21]

75. As Plaintiffs explain below, these temptations took multiple forms because this now-notorious process contained multiple flaws.

A. The Settlement Process Was Vulnerable to Manipulation by "Banging the Close"

76. The VIX settlement process is dependent on the value of thinly traded, illiquid financial instruments. Specifically, it relies upon out-of-the-money SPX Options. These SPX Options trade in far lower volumes than VIX Options and VIX Futures.[22]

77. This made it easier for the John Doe Defendants to move prices in the direction they wanted, because trading even a small number of out-of-the-money SPX Options could result in large differences in the settlement value of VIX Options and VIX Futures. Though the

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[21] Matt Levine, *VIX Trading, Hoaxes, and Blockchain* (May 24, 2017), https://www.bloomberg.com/view/articles/2017-05-24/vix-trading-hoaxes-and-blockchain.

[22] Indeed, the paper by Prof. Griffin and Mr. Shams found that "the size of VIX futures with open interest at settlement is on average 5.7 times the size SPX options traded at settlement, and it is 7.3 times for VIX options that are in-the-money at settlement." Griffin, John M. and Shams, Amin, *Manipulation in the VIX?* (May 23, 2017), at 32, https://ssrn.com/abstract=2972979.

relevant acts here happened to take place at the beginning of the day, this strategy is analogous to what is generally referred to in other markets as "banging the close."

78. The ability to manipulate was amplified because active trading in "strategy orders" for the relevant SPX Options must be submitted before 8:20 a.m., but CBOE only begins publishing information about the relevant SPX Options at 7:30 a.m. This means that manipulators only needed to move the market in the intended direction shortly before 8:20 a.m. in order to have the intended effect. The short time window for manipulation is further intensified by the relatively infrequent nature of VIX settlements.[23] If CBOE had made the SOQ settlement window longer, during normal market hours, or taken the measurement more often, manipulators would have had more difficulty reaping their ill-gotten gains.[24] CBOE knew or recklessly disregarded that these features of its SOQ process rendered it more susceptible to manipulation.

79. Because the VIX SOQ settlement process relied upon thinly traded instruments over a short time period, the John Doe Defendants could and did engage in trading designed to move the cash settlement value for these instruments in a desired direction. Specifically, they could and did raise their bid premiums or lower their ask premiums for SPX Option puts at certain strike prices, knowing that those manipulated prices would be incorporated into the VIX SOQ settlement process.

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[23] On July 21, 2015, the SEC granted CBOEs request to commence weekly expiries of VIX Options. *See* Securities and Exchange Commission, *Release No. 34-75501*, https://www.sec.gov/rules/sro/cboe/2015/34-75501.pdf.

[24] The John Doe Defendants had, among other things, VIX Options and VIX Futures that were going to be cash settled. By manipulating the SOQ process, the John Doe Defendants were paid more (or were forced to pay less) than they would have otherwise. Such manipulated payouts were a major motivation for the manipulation, though not the only such motivation.

80. By placing higher bid premiums on puts at particular strike prices, the John Doe Defendants were able to "bang up" the level of the mid premium for that strike (i.e., the mid-level between the bid and ask premium for a put at a given strike), and thus increase the settlement value for any corresponding VIX Option or VIX Future. Conversely, by placing lower ask premiums on puts at particular strike prices, the John Doe Defendants were able to decrease or "bang down" the level of the mid premium for that strike, and thus decrease the settlement value for any corresponding VIX Option or VIX Future. Such actions could be magnified and made less risky for the manipulator where the prices are "spoofed," such as where an artificial bid or ask is given then withdrawn quickly once it has served its purpose (here, impacting the SOQ process). Traders could also cancel or delay the placement of bids or quotes until after the settlement process was complete in order to impact the settlement process.

B. The VIX Settlement Process Was Vulnerable to Manipulation by Abuse of the Two-Zero Bid Rule

81. As discussed above, the SOQ calculation starts at the center and works outwards through increasingly out-of-the-money strike prices. This calculation stops when two zeroes are found in a row—the so-called two-zero bid rule. The calculation stops at that point because that is supposed to be an indication that the SPX Option is so far out of the money that the pricing is likely too unreliable to use in the settlement calculation.

82. The John Doe Defendants could and did circumvent the two-zero bid rule by spreading bids out across strike prices. This was done to ensure that there were never two or more consecutive "zero bid" puts ahead of any strike prices that these Defendants wanted the SOQ process to take into account. With any gaps artificially bridged in this way, the SOQ calculation would reach deeper and deeper into the range of out-of-the-money strike prices when determining the settlement value for the expiring VIX Options and VIX Futures.

83. The following table illustrates this strategy, and the way in which the John Doe Defendants could achieve greater weighting from deep out-of-the-money puts in the SOQ process:

Bridging the Two-Zero Bid Gap

More OTM strike prices

But-for Orders/Quotes

Strike of OTM SPX put Option	Bid Premium	Ask Premium	Included in VIX calculation?
835	0.05	0.55	Yes
830	0.05	0.5	Yes
825	0	0.5	No
820	0.05	0.3	yes
815	0.05	0.3	yes
810	0	0.3	No
790	0	0.15	No
785	0.05	0.1	Excluded because of two-zero bid rule
780	0.05	0.15	
775	0.05	0.1	
770	0.05	0.1	

Actual Orders/Quotes

Strike of OTM SPX put Option	Bid Premium	Ask Premium	Included in VIX calculation?
835	0.05	0.55	Yes
830	0.05	0.5	Yes
825	0	0.5	No
820	0.05	0.3	Yes
815	0.05	0.3	Yes
810	0	0.3	No
805	0.05	0.1	Yes
800	0.05	0.3	Yes
795	0.05	0.1	Yes
790	0	0.15	No
785	0.05	0.1	Yes
780	0.05	0.1	Yes
775	0.05	0.1	Yes
770	0.05	0.1	Yes

Trader puts in manipulative orders to fill in the two-zero bids gap in order to increase the VIX

Deep OTM strike premiums included in VIX calculation

84. The manipulative effect of such a scheme was magnified by the formula used by CBOE. The VIX is calculated using the following formula:

$$\sigma_I^2 = \frac{2}{T_1}\sum_i \frac{\Delta K_i}{K_i^2} e^{R_i T_i} Q(K_i) - \frac{1}{T_1}\left[\frac{F_1}{K_0} - 1\right]^2$$

85. This formula shows a number of important relationships that influence how the VIX is set.[25] The term $Q(K_i)$ is the midpoint of the bid-ask spread for each option with strike K_i. The price of each K_i is weighted in the equation by the weight factor:

[25] In this formula, in addition to the terms explained below, σ is VIX / 100; T is the time to expiration; F is the forward index level; K0 is the first strike price below the forward index level F; Ki is the strike price for the i-th out-of-the-money option (a call option if Ki > K0, a put option if Ki < K0, and

$$\frac{\Delta K_i}{K_i^2} e^{R_i T_i}$$

86. The size of this weighing factor therefore determines how much the pricing of a given strike will influence the VIX settlement value. First, consider ΔK_i, which is half the difference between the strike prices on either side of a given strike price K_i. This variable captures whether certain strikes were "skipped" and therefore trading across strike prices is more spread out. ΔK_i tends to be larger for the more out-of-the-money options. Second, consider K_i^2 which is the square of the strike price. If this term is smaller, e.g., has a smaller strike price, then the weighing factor will *increase*. For this reason, out-of-the-money put options (not call options) have a much greater impact on the ultimate VIX settlement price because the strike prices of out-of-the-money put options are always *less* than the prevailing at-the-money price, while the strike prices of out-of-the-money call options are always *greater* than the prevailing at-the-money strike price.

87. Together, these factors mean that *the put options that are the most out of the money* will have a disproportionate impact on the ultimate VIX settlement price. This relationship is shown in the following figure. This means that by avoiding the two-zero bid rule, and thus causing the calculation to reach into bids and asks that were *even deeper out of the money*, the John Doe Defendants were able to amplify the impact of their manipulative acts. CBOE, which designed and oversaw the SOQ process, including the two-zero bid rule and the VIX settlement formula, knew or recklessly disregarded that these features of its SOQ process rendered it more susceptible to such manipulation.

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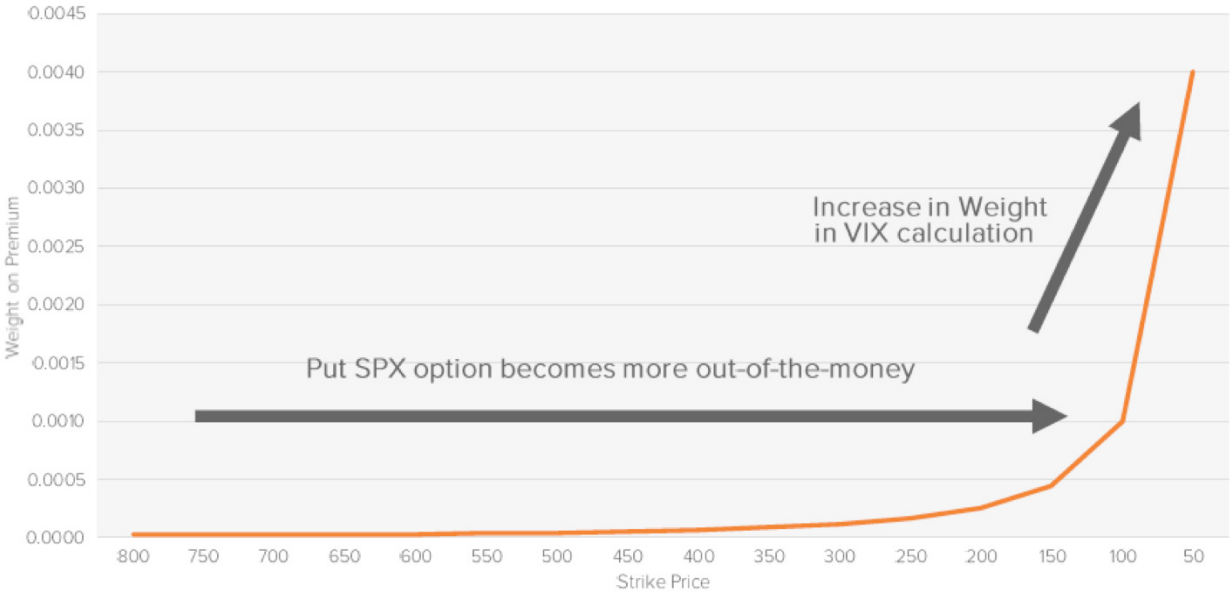
a put and a call if Ki = K0); ΔKi is the interval between the strike prices (half the difference between the strike on either side of Ki); and R is the risk-free interest rate to expiration.

Hypothetical Example: Moneyness of SPX Put Option and Weight on Premium in VIX Calculation



III. THE VIX SOQ PROCESS WAS CONSISTENTLY BEING MANIPULATED

88. In May 2017, a research paper titled "Manipulation in the VIX?" by Professor Griffin and Mr. Shams of the University of Texas was first made available.[26] That paper concluded:

> First, at the exact time of monthly VIX settlement, highly statistically and economically significant trading volume spikes occur in the underlying SPX options. Second, the spike occurs only in the OTM [out-of-the-money] SPX options that are included in the VIX settlement calculation and not in the excluded in-the-money (ITM) SPX options. Third, there is no spike in volume for the similar S&P 100 Index (OEX) or SPDR S&P 500 ETF (SPY) options that are unconnected to volatility index derivatives. Fourth, if traders sought to manipulate the VIX settlement, they would want to move the prices by optimally spreading their trades across the SPX strikes and increasing the number of trades in the deep OTM put options consistent with the VIX formula. Trading volume at settlement follows this pattern, whereas normally deep OTM options are rarely traded. Fifth, there are certain options that have discontinuously higher weight in the VIX formula but are otherwise very similar to other options. These options exhibit jumps in trading volume at settlement that are not present at normal times.

[26] Griffin, John M. and Shams, Amin, *Manipulation in the VIX*? (May 23, 2017), https://ssrn.com/abstract=2972979. As discussed above, the paper was later peer-reviewed and published by the Oxford University Press.

89. The Griffin and Shams paper also considered alternative—purportedly innocent—explanations for these suspicious trading patterns, such as potential hedging or "pent-up liquidity demand." Ultimately the paper rejected them all as inconsistent with the trading data.[27]

90. On February 12, 2018, the law firm Zuckerman Law wrote to the SEC and the CFTC on behalf of a whistleblower "who has held senior positions at some of the largest investment firms in the world." The letter alleges that CBOE was responsible for allowing "pervasive flaw[s]" in the VIX; for failing "[to] implement circuit breakers on the VIX futures" for failing "[to] plac[e] any safeguards around an unstable market structure for VIX products"; and for providing "woefully inadequate" disclosure in light of those flaws and lack of safeguards. The letter also alleges that unknown "trading firms with sophisticated algorithms [capable of moving] the VIX up or down by simply posting quotes on S&P options" were actively manipulating in this way. As explained in the letter, "VIX is highly subject to manipulation by market participants with the ability to rapidly post quotes in the market for [SPX Options]" and "because the VIX is a theoretical index, which does not rely on trading activity but mid-prices, [it] can be moved up or down by posting quotes without any physical trading taking place."

91. Between these academic analyses, the whistleblower allegations, and the public opinions of multiple former public regulators (including statements by former CFTC Commissioner Chilton and Former SEC Chairman Pitt), a clear consensus is emerging that, as alleged and demonstrated herein, the SOQ process was severely compromised. But members of the Class need not wait for the final results of any eventual government investigation. Plaintiffs' extensive economic analysis further demonstrates that the process has been routinely exploited.

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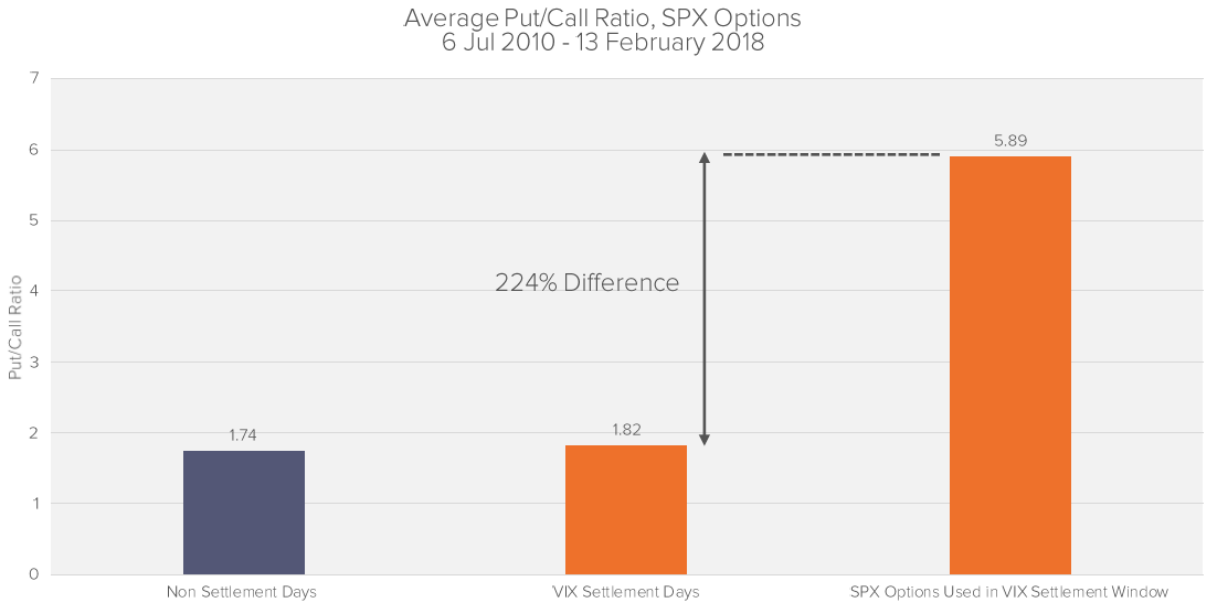
[27] *Id.*, at 3.

A. The Ratio of Trading Volume for SPX Option Puts to Calls Skewed Significantly on Settlement Days

92. As discussed above, SPX Option put trades have an outsized impact on the ultimate VIX settlement value. A uniquely disproportionate use of puts over calls thus provides evidence that manipulation was taking place, as it indicates that market actors just so happened to be preferring the type of order that would maximize a manipulative effect *during exactly the time* when such manipulative effect was possible.

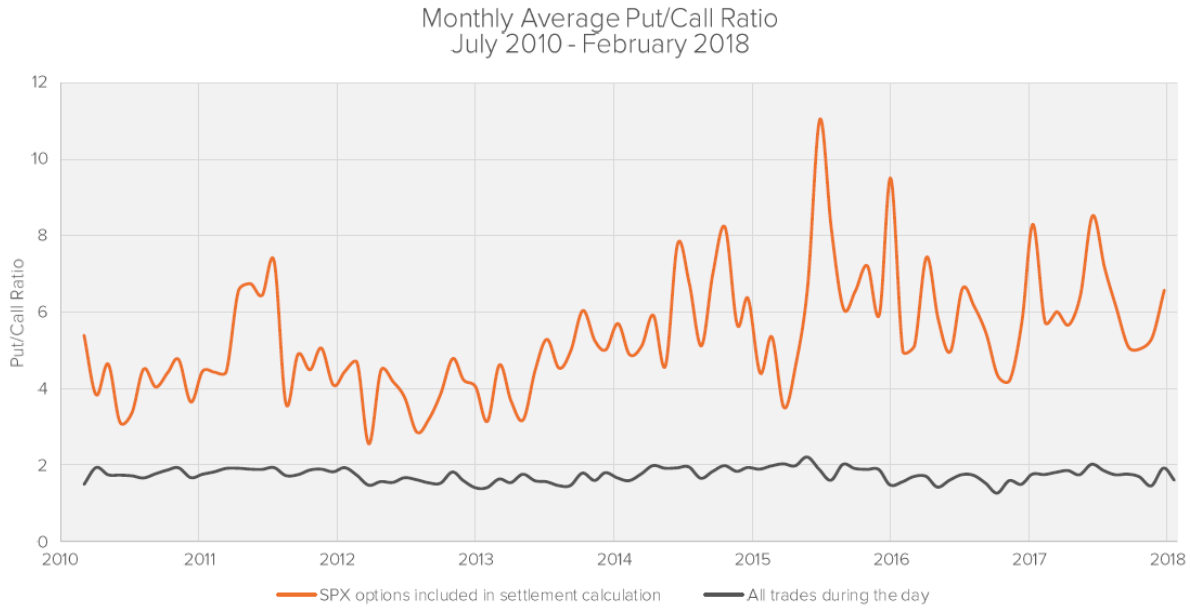
93. And this is precisely what the data show.[28] As seen in the following table, the ratio of put trades to call trades was relatively similar (1.74 to 1.82) when considered across the whole of expiry and non-expiry days, but it ballooned (to 5.93) during the SOQ settlement window:



94. That the strongest tool for manipulation was heavily favored during the time of day when manipulation was most likely to occur can also be seen by tracking the trend over time.

[28] Unless otherwise noted, all of the studies herein run as far back in time to the start of the Class Period as is possible based on the availability of sufficient data to run the analyses.

In the following chart, the blue-gray line represents the (relatively constant) ratio of puts to calls overall, while the (higher) orange line does so for SPX Options included in the SOQ process.



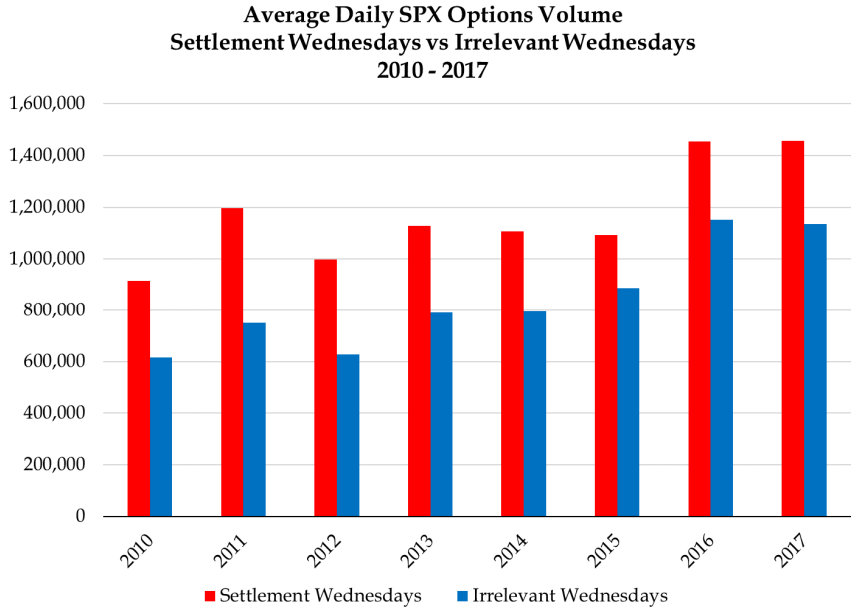
95. Again, the data show that market actors just so happened to be preferring the type of order that would maximize a manipulative effect *during exactly the time* when such manipulative effect was possible. But the ratio was much different (closer to even) at times when a settlement was not occurring. The consistency of this result across settlements provides plausible evidence not just that manipulation was taking place, but that CBOE—who watched, and had undeniable access to this and all other data discussed herein (and more)—knew about it, but did nothing, or recklessly disregarded it.

B. Trading Volume Increased On Settlement Days, Particularly for SPX Options That Would Have a Bigger Impact on the SOQ Process

1. Trading volume generally was higher on settlement days than on non-settlement days

96. If SPX Options were being used to manipulate the settlement process, one would expect there to be an abnormally high amount of SPX Options activity on settlement days,

specifically. Again, that is exactly what the data show. Year after year, the red bars (volume on settlement Wednesdays) are consistently higher than the blue bars (non-settlement Wednesdays).



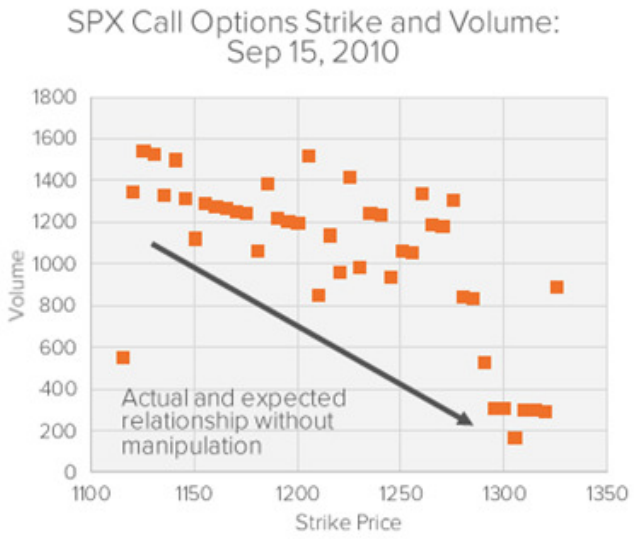
97. Rather than comparing volume on settlement Wednesdays to non-settlement Wednesdays, Plaintiffs also compared volume on settlement Wednesdays to the volume on *all* non-settlement days. The data there similarly show increased SPX Option trading volume on settlement days. Finally, Plaintiffs also compared the volume on settlement Wednesdays to the volume of the day *prior to* the settlement day. Again, the data show that SPX Options were traded more actively on settlement days. Indeed, 92% of settlements prior to February 13, 2018 saw a higher trading volume than the Tuesday that preceded them.

98. The fact that trading activity spiked on settlement days was, itself, a red flag. But a closer inspection of the data CBOE had—specifically, an analysis of the types of transactions driving that settlement-day volume spike—provides even more compelling evidence that CBOE knew or recklessly disregarded the fact that manipulation was occurring, as discussed below.

2. Put options were traded more often on settlement days the more out of the money they became

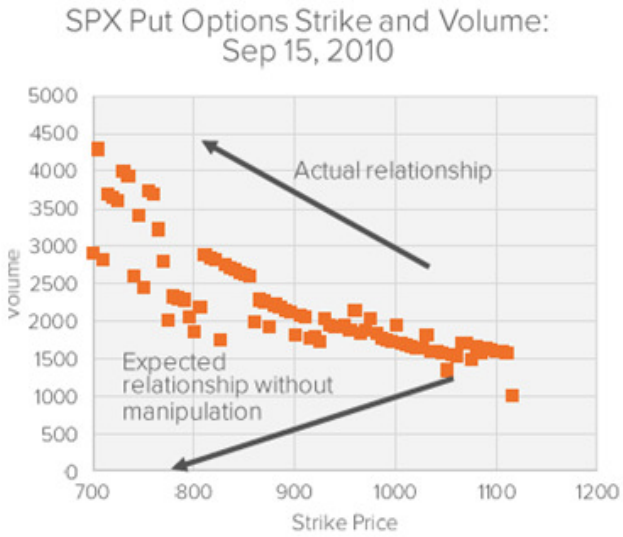
99. All things being equal, in a market free of manipulation, one would expect that the trading volume would decrease the further out of the money an option becomes. The option is less and less likely to be exercised, so there is less and less reason to pay for the option.

100. This expected relationship held true for SPX call options. This can be seen in the following chart, which depicts trading for SPX call options for September 15, 2010 within the SOQ window. For a call option, a higher strike price (more to the right in the chart) equates to being more out of the money. The expected relationship between moneyness and volume is thus seen in the chart below as a line running downhill from left to right, as the call option gets more out of the money. The more out of the money a call option is, the less likely it is to be traded. The actual trend follows that same line.



101. In contrast to SPX call options, SPX put options do *not* follow the pattern one would expect absent manipulation during the settlement process. The expected (absent manipulation) relationship between moneyness and volume is the same as with call options—

lower volume for more out-of-the-money options. But for put options, a *higher* strike price (more to the right in the chart) equates to being less out of the money. Thus, the expected relationship between moneyness and volume appears in the chart below as a line running *uphill* from left to right, as the put option gets more out of the money.

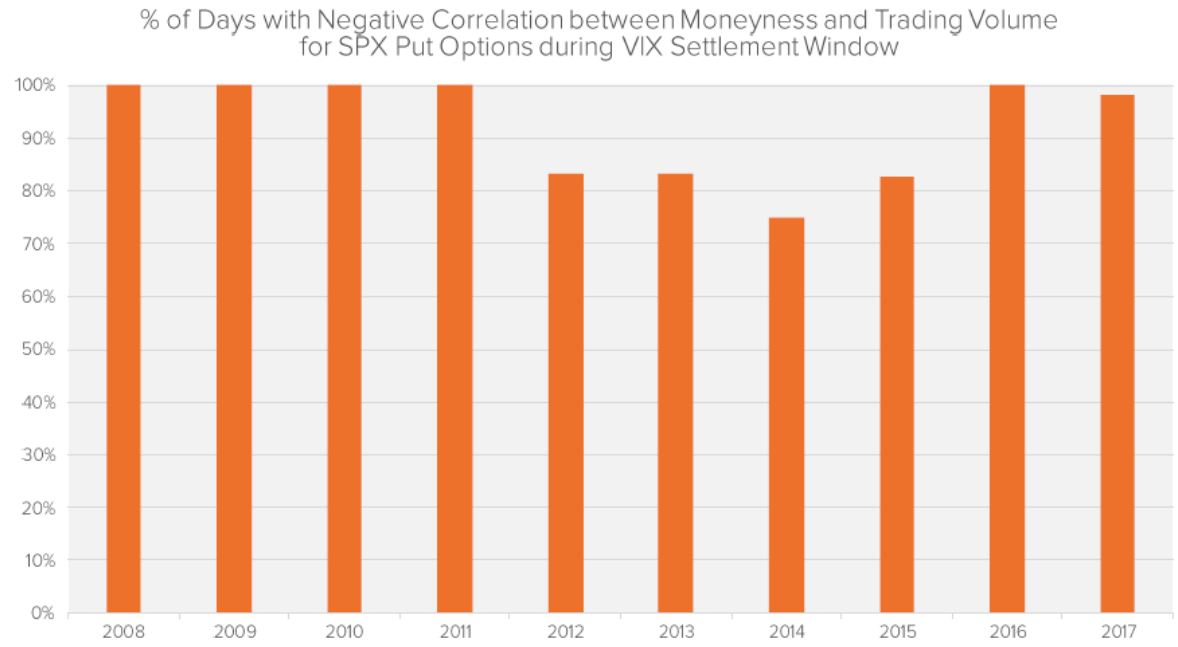


102. The real difference from the previous chart is not that the expected line changes from uphill to downhill going from left to right, which is just due to the basic differences between a put and call. Rather, it is the fact that for put options the expected and actual lines are no longer one and the same, as they were for call options. The data instead show that, counterintuitively, the more out of the money a SPX put option was (the further to the left on the chart) the more it was being traded (the higher up on the chart).

103. The difference is explained by the fact that, as discussed above in Section II.B, the weight assigned to the strike price for a SPX *put* option increases as the option is further and further out of the money. Thus, the fact trading volume unnaturally went up as the put options got more out of the money, but did not do so for call options, is further evidence that manipulation was occurring. The John Doe Defendants were only pricing the far out of the

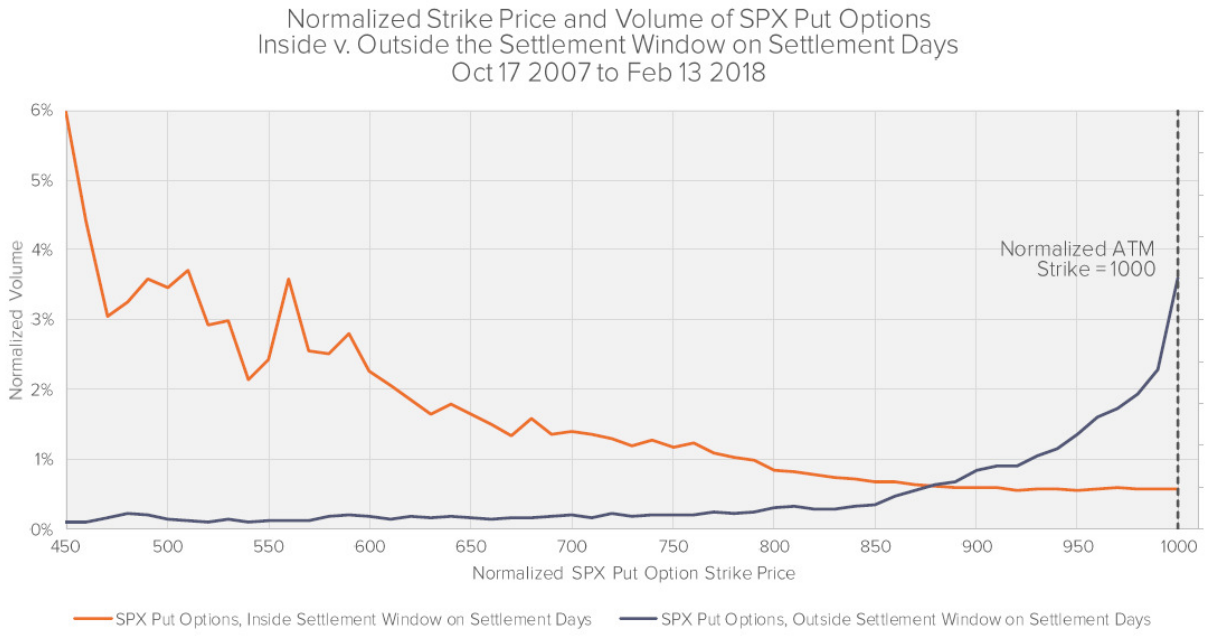
money puts because of their outsized impact on the SOQ process, not because of the normal forces of supply and demand.

104. This breakdown of expectations was not isolated to September 15, 2010, which was just used as an example to explain the gap between expectations and reality when it came to put option volume on settlement days. Rather, the break with expected patterns absent manipulation was seen on most *every* settlement day, as seen in the following chart. For many years, *every* settlement window saw SPX put options trading more often the further out of the money those put options were.



105. To see the consistency of the problem another way, the following graph plots the normalized volume of trading for SPX Options during the SOQ settlement window (orange line) and outside the settlement window (blue-gray line), for many years. As with the one-day chart above for put options, a lower strike price is more out of the money. Thus, movement from left to right would be expected to result in an 'uphill' plot, with volume increasing the less out of the money the strike price is. This is what the data show for trading outside the settlement window,

seen in the following chart as the gray-blue line.[29] In contrast, in the settlement window, the data show the opposite, with volume increasing the *more* out of the money the put option is. Once more, the data in CBOE's possession provided compelling evidence that SPX Options were not being traded for legitimate purposes, but instead to manipulate the settlement process.



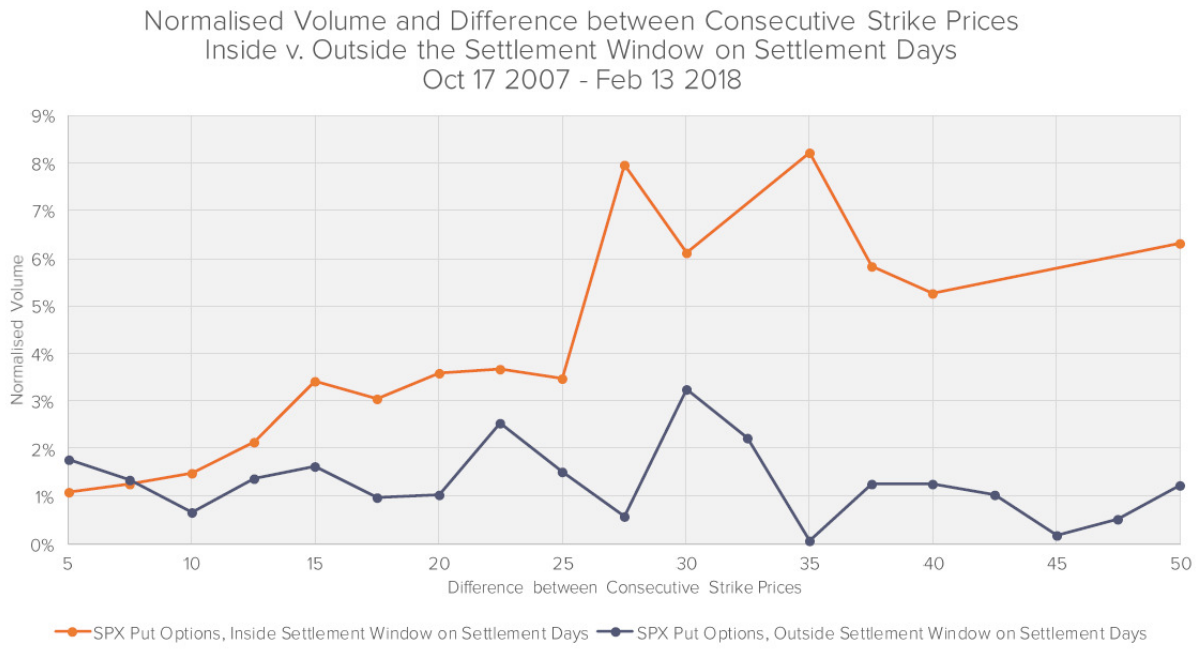
3. This abnormality was particularly present in those options that carry the most weight in the SOQ formula

106. As discussed in Section II.B above, ΔK_i is half the difference between the strike prices on either side of a given strike price K_i. This variable captures whether certain strikes were "skipped," and therefore whether trading across strike prices is more spread out. As also discussed above, ΔK_i plays an important part in the VIX weighting formula. Strike prices that have a larger ΔK_i will have a larger impact on the ultimate VIX value.

[29] Due to the volume of data in tracking intra-day pricing information, for comparison purposes only data from January 7, 2015 to August 31, 2016 was used to construct the blue-gray line in this chart and for the one in Section III.B.3.

107. Just as abnormal trading volume in puts (but not calls) is evidence that manipulation was taking place because traders just so happened to be focusing on trades that would cause the biggest impact on the VIX SOQ settlement process, an abnormal focus on strike prices with a larger ΔK_i would also indicate that manipulation was consistently taking place.

108. Yet again, that is what the data show. Trading volume was higher for options that had a wider gap between consecutive strike prices (i.e., had a higher ΔK_i). This is seen in the orange line, which rises (relative volume goes up) from left to right (as the gap between strike prices grows). Notably, this was *not* true outside the settlement window, as seen by the blue-gray line.[30]

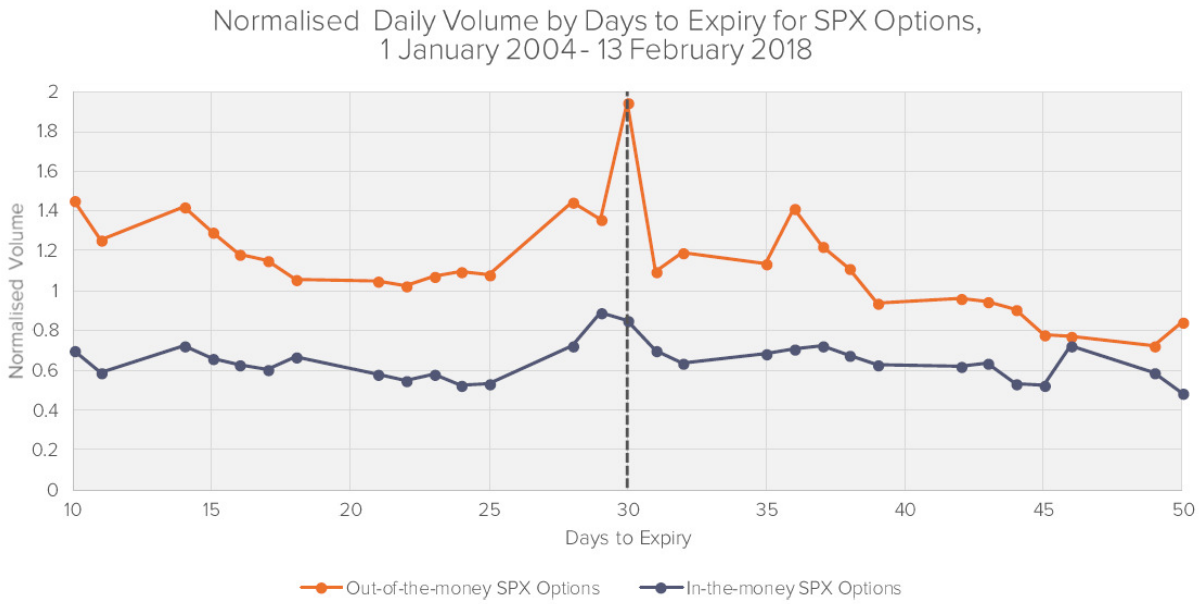


4. Trading volume increased right at the thirty-day mark

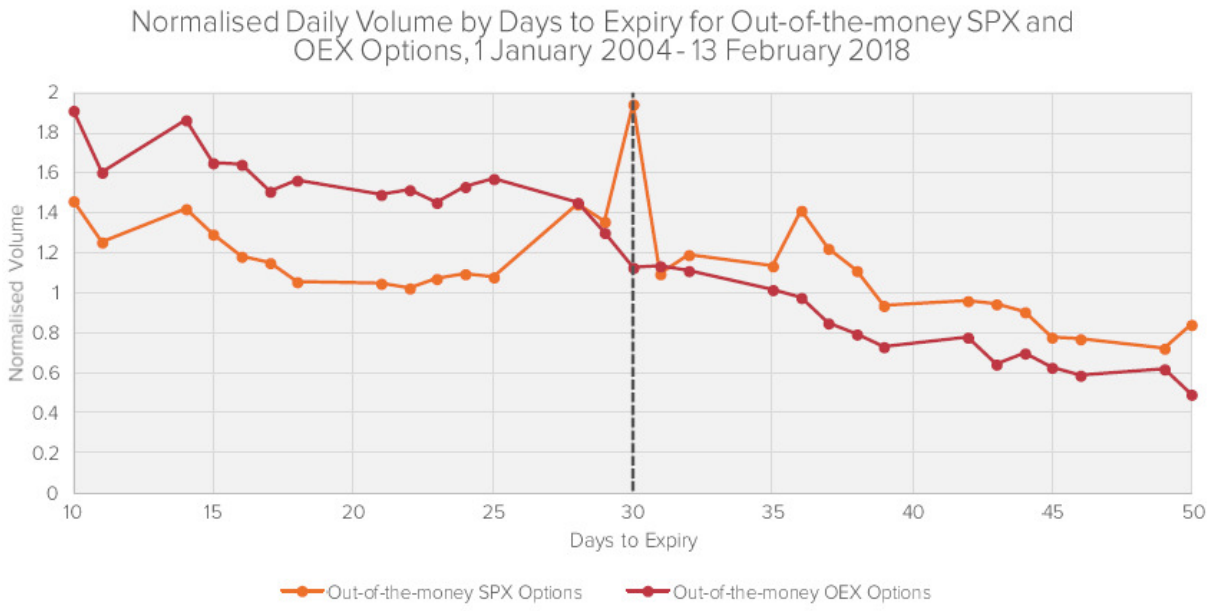
109. SPX Options were only included in the VIX SOQ calculation if they were, e.g., (a) 30 days to maturity and (b) out of the money. The data show that at exactly 30 days to

[30] *See* note 29 above (discussing data used for blue-gray line).

maturity, out-of-the-money options—but *only* out-of-the-money options—saw a spike in trading volume. In other words, the increased trading volume on settlement days was being driven by trading in the exact instruments that would impact the SOQ process, providing ever more compelling evidence of manipulation.



110. Further confirming this conclusion, rather than comparing out-of-the-money SPX Options to in-the-money SPX Options, Plaintiffs instead compared them to OEX options. OEX options are on the S&P 100 (rather than the S&P 500) and are not used in the SOQ process. As can be seen in the following chart, in a setting where being exactly at 30 days matters for a settlement calculation (SPX Options, orange line) there is a spike; in a setting where it does not (OEX options, red line), there is not.



111. Thus, again, the data show that the tools traders could use to manipulate the SOQ process were seeing increased usage on settlement days. On the other hand, traders paid no special attention to transactions that are irrelevant to the SOQ process. This all suggests plausibly that the SOQ process was being manipulated. As CBOE had this data and far more, it also shows that CBOE knew or recklessly disregarded that was the case.

C. The Data Also Show Routine Exploitation of the Two-Zero Bid Rule

112. As discussed above in Section II.B, the settlement process was prone to manipulation because traders could artificially fill the gaps in order to avoid triggering the two-zero bid rule. Filling the gaps forces the formula to take account prices further and further out of the money, where it was easier and easier to manipulate. The data show this is exactly what was occurring.

113. Plaintiffs studied all VIX-relevant SPX Options[31] that were being quoted at a given time and determined which ones would, given CBOE's criteria, be included in the VIX (and SOQ) formula. For instance, as discussed above, only options that are out of the money and have a non-zero bid are included, and the options cannot violate the two-zero bid rule. Plaintiffs analyzed how many SPX Options were being quoted at 8:30 a.m. that were and were not "VIX-eligible" because of such rules, then did so again at 8:40 a.m.

114. Prior to February 2018, the *total* number of actively quoted SPX Options (meaning options with a non-zero ask quote) did not change much from 8:30 a.m. to 8:40 a.m. on settlement days. However, the number of those SPX Options that were *VIX-eligible* (because, e.g., they did not violate the two-zero bid rule) was higher, to a statistically significant degree, at 8:30 a.m. than at 8:40 a.m.

115. Prior to February 2018, the total number of actively quoted SPX Options did not change much from 8:30 a.m. on Tuesday to 8:30 a.m. on a settlement Wednesday. However, the number of those SPX Options that were VIX-eligible was higher, to a statistically significant degree, on the settlement day.

116. Plaintiffs also analyzed whether there was a difference between the overall level of activity and the number of VIX-eligible options at 8:40 a.m. on a settlement day, and 8:40 a.m. on the day prior. There was not, either for all actively quoted SPX Options or for the VIX-eligible subset of options.

117. These three studies show that the John Doe Defendants were filling gaps such that more SPX Options were being included in the calculation. But they were doing this *only around*

[31] In the following analysis plaintiffs restrict their attention to SPX Options where were between 24 and 36 days from settlement. It is from this large group of options that the options used to determine the VIX are drawn. Note that VIX Settlement Dates are always 30 days before SPX Options settlement dates.

the settlement window. This shows an attempt to force the VIX SOQ calculation to include SPX Options that were further and further out of the money—options that were even easier to price at artificial levels and that had even greater weight in the VIX SOQ calculation.

118. Another way to see whether the gaps were being artificially filled to manipulate the settlement results was to study the likelihood that any given SPX Option would meet the criteria for being included in the VIX SOQ calculation process (a) when the settlement calculation was conducted, versus (b) at another point in time.

119. The data show that, in fact, a randomly chosen out-of-the-money, non-zero bid SPX Option is far more likely to be found to be VIX-eligible at 8:30 a.m. on a settlement day, than at 8:30 a.m. the day prior. The only reason such out of the money, non-zero bid SPX Options would not be VIX-eligible is because they are excluded by the two-zero bid rule; hence, as in the previous studies, this result holds because there were far fewer two-zero bid gaps during the settlement window. As with those previous studies, this is evidence the John Doe Defendants were filling the two-zero bid gaps only when doing so mattered for the settlement calculation. Which is to say, it is evidence they were manipulating the settlement process.[32]

120. The data also show that the strength of the relationship between the presence of a settlement window, and the probability a given SPX Option would be VIX-eligible (i.e., would not be excluded because of the two-zero bid rule) *increases* as the option gains more weight in the SOQ VIX formula.[33] This yet another sign that the gap-filling was done to manipulate the process.

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[32] As a robustness check, Plaintiffs also analyzed whether being VIX-eligible at 8:40 a.m. the day before was a good predictor of being VIX-eligible at 8:40 a.m. on a settlement day. It was not, again confirming it is the presence of the settlement process that drove the gaps to be filled.

[33] Here, the increased weight was because of a higher ratio of the midpoint price to the strike price.

D. Comparisons to VIX Itself Further Reveal Evidence of Manipulation

121. The intraday VIX benchmark figure and the VIX SOQ settlement process use the same input in a nearly identical fashion, one would expect that the settlement figure and the first intraday VIX benchmark figure would be almost always in sync.

122. The question here is not whether the VIX moved. It, like prices, always will. Rather, it is the comparison that is relevant. If the VIX moves differently when a settlement is involved, that would show that SPX Options—used for both the VIX figure itself and for the VIX SOQ process—were under unique pressures only around the settlement window. In other words, it would again show that the SOQ process was being made a target for manipulation.

123. In fact, looked at from many angles, the data do show the VIX acting differently around the settlement window. For instance: (a) VIX SOQ settlement values were statistically significantly different from the VIX opening values 65% of the time from May 2004 to February 13, 2018;[34] (b) there was a much larger gap between the VIX at the start and end of the day for settlement Wednesdays; (c) there was a much larger gap between the VIX at the start of the day and fifteen minutes later on settlement Wednesdays; and (d) the "coefficient of variation" for settlement Wednesdays was higher than for non-settlement Wednesdays as compared to either non-settlement Wednesdays or non-settlement days generally, meaning the VIX was not moving as smoothly on settlement days.[35] These differences were statistically significant.

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[34] This difference is not caused by the fact that the VIX index is based on a midpoint whereas the SOQ is based on actual trades. Across the many calculations that go into the SOQ, one would expect those differences in methodology to even out. Confirming that to be the case, the data show that the differences in traded prices versus the midpoint between the bid and offer prices is negligible (at the median, it is exactly zero).

[35] The coefficient of variation in effect measures the amount of change from minute to minute during the course of the day.

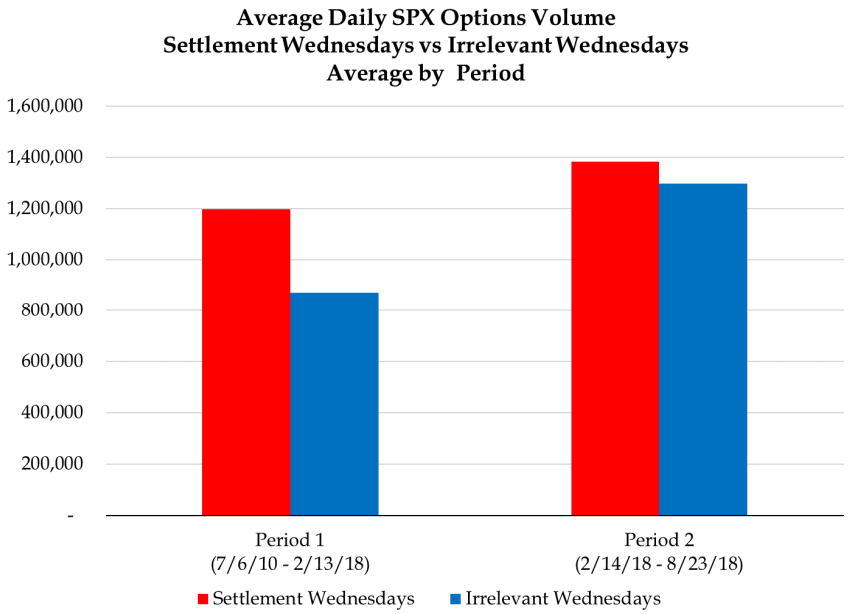
124. All these studies show that the VIX was not behaving the same on settlement days, as on non-settlement days—further supporting the conclusion that prices on settlement days were being made artificial and causing the market to react in unusual ways.

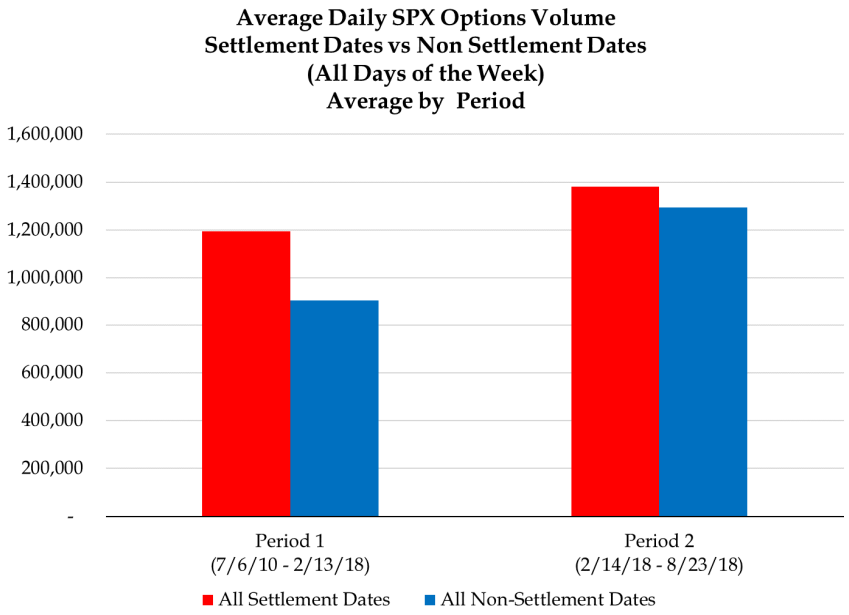
E. The Data Show Signs of Changing Behavior After it Was Reported That FINRA Was Investigating the VIX

125. On February 13, 2018, it was first publicly reported that the government—FINRA, specifically—was investigating the manipulation of VIX pricing. If the market was acting one way prior to a major event like the public announcement of FINRA's involvement, and a different way after that announcement, such change in activity would be consistent with a lessening of the abuses out of an increased fear of getting caught. That is, again, what the data show, as there was a "break" in, e.g., the metrics discussed above.

126. As discussed above in Section III.B, prior to February 2018, numerous ways of looking at the volume of trading found signs of "banging the close." After the FINRA investigation was announced, however, the volume anomalies surrounding settlement Wednesdays, specifically, abated. That is evidence the "banging" slowed down when traders feared more getting caught.

127. For instance, the following charts compare the volume of SPX Options trading on settlement Wednesdays with that on other days. The letting up of the banging the close efforts can be seen in the bigger difference between the red and blue bars on the left of the following two charts (pre-February 2018) as compared to the difference between the red and blue bars on the right (post-February 2018).





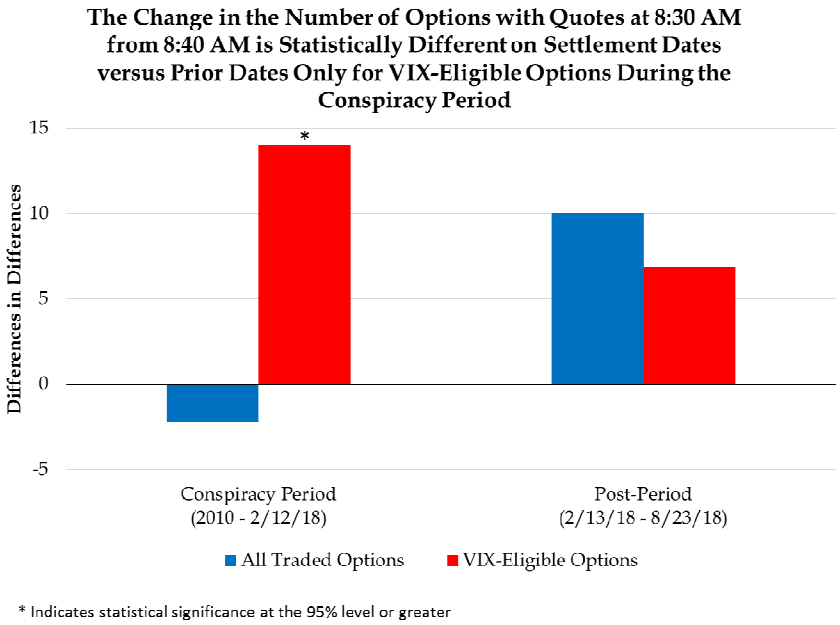
128. Another indication that the John Doe Defendants banged the close less often is that, after February 13, 2018, volume on settlement Wednesdays was higher than on the day before only about 57% of the time—which was (a) far less than the 92% prior to February 13, 2018, and (b) almost exactly in line with the 56% of times seen in the 'control' study, which looked at changes in volume between Tuesday and *non-settlement* Wednesdays.

129. Looking only at changes in volume for the most out-of-the-money SPX Options again finds a difference before and after FINRA's investigation was announced.[36] Prior to FINRA's announcement, there was a statistically significant difference in volume between settlement Wednesdays and non-settlement Wednesdays for the most out-of-the-money SPX Options. Following FINRA's announcement, there is no longer a statistically significant difference in volume.

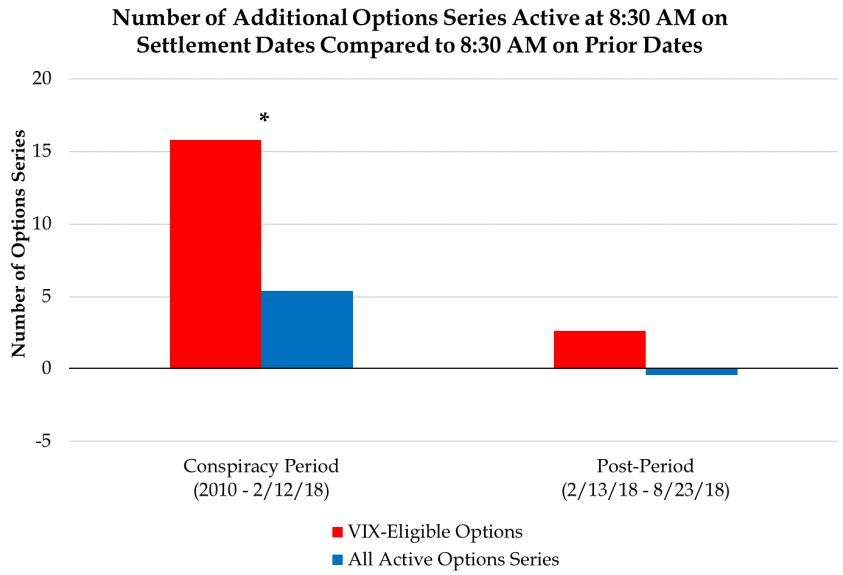
130. As discussed above in Section III.C, pricing gaps were being filled to avoid triggering the two-zero bid rule, as to force the VIX calculation to include options that were more and more out of the money. Evidencing this was the result of attempts to manipulate the SOQ process, this phenomenon appeared *only* in the settlement window. After February 13, 2018, however, these signs of manipulation also abated.

131. In the following chart, the small blue bar on the far left shows that, prior to February 13, 2018, the total number of actively quoted SPX Options 24 to 36 days from settlement did not change much from 8:30 a.m. to 8:40 a.m. The taller red chart next to it, however, indicates that the number of *VIX-eligible* (e.g., gaps-filled) SPX Options was different, to a statistically significant degree, between 8:30 a.m. and 8:40 a.m. This is evidence of the use of manipulating prices at 8:30 a.m. to fill the gap during the settlement process, then ceasing to support such artificial prices after the settlement process was complete. As seen in the blue and red bars on the right side of the chart, after FINRA's investigation was announced, there was no statistically significant difference in the number of VIX-eligible (gaps-filled) SPX Options around the settlement window. This is consistent with a slow-down in the efforts to artificially fill the gaps during the settlement window.

[36] As discussed above, the deeper out-of-the-money put options are the stronger tools for manipulation.



132. The above analysis identified the presence of gap-filling strategies by looking at the difference between 8:30 a.m. and 8:40 a.m. on settlement Wednesdays. The following chart does the same analysis, but instead compares 8:30 a.m. on Tuesday to 8:30 a.m. on a settlement Wednesday. The conclusion is the same. Prior to FINRA's investigation, there was a statistically significant indication that pricing gaps were being filled only around the settlement window. After its investigation was announced, there was not.



* Indicates statistical significance at the 95% level or greater.

133. Finally, as discussed above in Section III.D, multiple analyses of the behavior of the VIX itself on and around settlement days show that SPX Options (underlying both the VIX index and the VIX SOQ process) were under unique pressure on settlement days. Belying any claim this was benign, these signs abated after FINRA's investigation was announced. For instance: (a) after February 13, 2018, there were far fewer instances of statistically significant gaps between the VIX opening price and the SOQ settlement price (32%, down from 64%); (b) the size of those gaps was smaller, to a statistically significant degree, after February 13, 2018; (c) the difference in "normalized" intraday prices on settlement Wednesdays versus non-settlement Wednesdays was much less pronounced after February 13, 2018 than it was before; (d) there was no statistically significant difference in the behavior of the VIX from the beginning of the day to the end on settlement Wednesdays versus on other days after February 13, 2018;[37] and (e) there was no statistically significant difference in the behavior of the VIX from the

[37] This means that that on settlement Wednesdays prior to FINRA's investigation, the VIX opening was a much worse forecaster of the value at which the VIX was going to close on the same day, than on non-settlement Wednesdays. But such a difference in the forecasting accuracy of the opening VIX price no longer existed after February 13, 2018

beginning of the day to fifteen minutes later on settlement Wednesdays versus on other days after February 13, 2018. These studies show that there was a force pushing VIX prices towards artificial levels (i.e., manipulation) in the earlier period, that was less present once the FINRA investigation was announced.

134. In sum, across all of the types of analyses set forth herein—volume, gap-filling, and intraday VIX comparisons—the patterns seen as existing for many years disappear or are substantially reduced after FINRA's investigation was announced. This break in behavior confirms that the patterns were not the result of innocent trading activity, such as hedging or market-making. Rather, the patterns are evidence of the John Doe Defendants' manipulations of the VIX SOQ process—activities which were lessened when the regulatory spotlight was known to be shining on the VIX.

IV. CBOE KNEW OR RECKLESSLY DISREGARDED THE VIX SETTLEMENT PROCESS WAS BEING MANIPULATED

A. CBOE Was Aware of the Manipulation Because It Designed, Administered, and Marketed the Flawed Products and Processes

135. CBOE established the methodology for calculating VIX and the process that market participants must follow to set the VIX settlement value. CBOE was solely responsible for actually calculating VIX settlement values, and for publishing the final settlement prices to the market. The prices, in turn, determined how much money market participants (including the John Doe Defendants) gained or lost in holding VIX Options and VIX Futures on each settlement date.

136. As the administrator of SPX Options, VIX Options, VIX Futures, and the SOQ process, CBOE had a front-row seat for *every settlement* to see exactly who was doing what, when, and in what instruments. CBOE had access to all of the relevant data necessary to reveal the fact that manipulators were rigging the settlement values. Having viewed these data on the

relevant settlement dates in real-time as part of its SOQ process, CBOE knew the John Doe Defendants rigged the VIX settlement values, or recklessly disregarded that fact.

137. Rather than disclosing the fact of manipulation, CBOE affirmatively and knowingly (or recklessly) published the wrong, manipulated prices to the market. Thus, independent of CBOE's misleading qualitative statements about the integrity of its VIX Options and VIX Futures, CBOE knew or recklessly disregarded the fact that its quantification of the VIX settlement value was materially misleading during the Class Period (defined below).

138. CBOE also knows that there are many viable alternatives to its flawed process. For instance, other volatility-related products administered by other companies calculate prices for settlement value by using an average drawn from a three-hour window during normal market trading. Calculating settlement values during normal trading hours allows everyone equal access to the process, while taking an average from such a long period limits the ability for gamesmanship. CBOE has stuck with its flawed process both because its privileged customer base are profiting from the ability to manipulate, and because it wants to avoid losing the prestige of publishing its figure alongside other opening-market figures.

139. That the process has become more automated does not mean that CBOE was ignorant of the manipulations. It had the data to review, and had committees and departments responsible for monitoring these products, such as the SPX Market Performance Committee, the Business Conduct Committee, the Department of Market Regulation, the SPX Floor Procedure Committee, the Risk Committee, and others. CBOE Vice President William Speth has represented that "our regulatory group actively surveils for potential VIX settlement

manipulation."[38] CBOE's chief regulatory officer, Greg Hoogasian, assured the public that the CBOE "has a dedicated regulatory department that works with FINRA to monitor certain trading activity for our securities markets, including trading activity that could impact the VIX settlement."[39]

140. CBOE represented to the SEC and to the market, time and again, that it had in place surveillance to detect, and actively monitor for, violations of exchange trading rules. For example, in Forms 10-K throughout the relevant periods, CBOE reported in substantial form that:

> In order to ensure market integrity, we extensively regulate and monitor our Trading Permit Holders trading activities. Providing effective regulation is important for attracting and retaining the confidence and participation of market-makers, broker-dealers and institutional and retail investors. We expend considerable time, financial resources and effort to ensure that the exchanges' rules and regulations conform to regulatory 'best practices' within the securities exchange industry and within the regulatory regime overseen by the SEC, our primary regulator. In order to support our efforts and those of our market participants to comply with applicable law and our option exchange rules, we have developed our own automated market surveillance systems to monitor market activity on our option exchanges and across U.S. options markets.[40]

141. CBOE likewise touted: "Our exchanges are responsible for assessing the compliance of their TPHs with the respective exchange's rules and the applicable rules of the SEC and CFTC. The main activities that the exchanges, as applicable, are required to provide to measure compliance with these rules include . . . surveillance designed to detect violations of

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[38] Saqib Iqbal Ahmed, John McCrank, *Whistleblower alleges manipulation of Cboe volatility index*, Reuters (Feb. 13, 2018), https://uk.reuters.com/article/us-usa-stocks-volatility-manipulation/whistleblower-alleges-manipulation-of-cboe-volatility-index-idUKKBN1FX0ES.

[39] Elliot Blair Smith, *How S&P 500 options may be used to manipulate VIX 'fear gauge'*, MarketWatch (June 19, 2017), https://www.marketwatch.com/story/how-sp-500-options-may-be-used-to-manipulate-vix-fear-gauge-2017-06-19.

[40] *See* CBOE, Annual Report 2011.

exchange trading rules" and "surveillance designed to detect violations of other SEC and CFTC rules."[41]

142. These and related disclosures wherein CBOE assured investors that, among other things, the Company took active measures to "ensure fair dealing" make clear that CBOE could monitor and was monitoring the exact market activity alleged herein.

B. Many of CBOE's Rules Recognize Its Obligation to Police for and Prevent Manipulation

143. As a "board of trade," CBOE is required to "establish, monitor and enforce" certain types of rules under Section 7 of the CEA. Among other provisions, the CEA provides that boards of trade shall:

a. "establish, monitor, and enforce compliance with the rules of the contract market, including . . . rules prohibiting abusive trade practices on the contract market," 7 U.S.C. § 7(d)(2)(A);

b. "have the capacity to detect, investigate, and apply appropriate sanctions to any person that violates any rule of the contract market," 7 U.S.C. § 7(d)(2)(A);

c. "list on the contract market only contracts that are not readily susceptible to manipulation," 7 U.S.C. § 7(d)(3); and

d. "have the capacity and responsibility to prevent manipulation, price distortion, and disruptions of the delivery or cash-settlement process through market surveillance, compliance, and enforcement practices and procedures," 7 U.S.C. § 7(d)(4).

144. Examples of CBOE's rules include:

[41] *See* CBOE, Annual Report 2016.

a. Requirements on "Market Makers," "Registered Market Makers," and "Designated Primary Market Makers" to "contribute to the maintenance of a fair and orderly market, and [not to] enter into transactions or make bids or offers that are inconsistent with such a course of dealings." Rule 8.7.

b. Requirements that trading permit holders cannot "effect or induce the purchase, sale or exercise of any security for the purpose of creating or inducing a false, misleading, or artificial appearance of activity . . . or for the purpose of unduly or improperly influencing the market price of such security . . . or for the purpose of making a price which does not reflect the true state of the market[.]" Rule 4.7.

c. "Neither a Trading Privilege Holder nor any of its Related Parties shall engage or attempt to engage in any fraudulent act or engage or attempt to engage in any scheme to defraud, deceive or trick, in connection with or related to any trade on or other activity related to the Exchange or Clearing Corporation." Rule 601.

d. "Any manipulation of the market in any Contract is prohibited. Orders entered into the CFE System for the purpose of generating unnecessary volatility or creating a condition in which prices do not or will not reflect fair market values are prohibited and any Trading Privilege Holder (including its respective Related Parties) who makes or assists in entering any such Order with knowledge of the purpose thereof or who, with such knowledge, in any way assists in carrying out any plan or scheme for the

entering of any such Order, shall be deemed to have engaged in an act detrimental to the Exchange." Rule 603.

145. CBOE's knowledge or reckless disregard for the truth is supported by the existence of many such rules. Such rules serve as further indications of the importance to signaling (falsely) to the market that CBOE's proprietary products were trustworthy products. They also serve as further indicators that CBOE had—or, was reckless not to have—processes in place to tell it that its products were anything but.

C. CBOE Was Motivated to Protect Its "Crown Jewels"

146. VIX is central to CBOE's business. According to CBOE, VIX is "the premier benchmark for U.S. stock market volatility" and a "homerun" product.[42]

147. CBOE's main website features the VIX ticker before any other. CBOE even named April 2018 as "VIX Month" to celebrate the 25th anniversary of VIX, claiming "[t]he growth of VIX and volatility trading has been an amazing story."[43]

148. Despite the overwhelming evidence of manipulation, CBOE was motivated to hide (or, at the very least, to turn a blind eye to) the flaws in its VIX Options and VIX Futures because they were in fact its "crown jewels"—without which CBOE's revenues and shareholder profits would fall, and its market share would decline.

149. Certain regulations taking effect in 2005 required brokers to direct their orders to venues that display the best prices. This made it difficult for trading venues to attract business for standardized products that were already available across multiple trading venues. This made

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[42] *See* White Paper, CBOE Volatility Index—VIX, Chicago Board Options Exchange, at 2, http://www.cboe.com/micro/vix/vixwhite.pdf; CBOE Holdings, Inc., Form S-4 (filed Feb. 8, 2017), https://www.sec.gov/Archives/edgar/data/1374310/000110465917007806/a16-23690_24425.htm.

[43] *See* CBOE Blog, CBOE Declares April VIX Month (Apr. 6, 2018), http://www.cboe.com/blogs/options-hub/2018/04/06/cboe-declares-april-vix-month.

it important for individual exchanges like CBOE to provide proprietary products which—unlike generic securities that can and sometimes must be traded at other exchanges—are listed or traded at CBOE exclusively.

150. CBOE has thus long promoted and prioritized order flow directed towards its proprietary products over its multiply-listed products because its proprietary products generate far higher revenue per contract.[44] CBOE's multiply-listed options, in particular, have lost earning potential due to the expanding number of options exchanges, which have grown from five exchanges to fifteen—a trend which shows no sign of abating, as CBOE expects its competitors and new entrants may continue to open more exchanges.[45]

151. CBOE has a lock on the SPX and VIX markets because of its exclusive licensing relationship with Standard & Poor's, which permits only CBOE to list SPX Options.[46] As a consequence, CBOE recognizes that its chief business risk, if not its entire profit structure and survival, is bound to two related threats: first, the loss of CBOE's "right to exclusively list and trade certain index options and futures," and in particular "exclusive licenses to list securities index options . . . granted to us by the owners of such indexes and based on which we have developed our proprietary VIX methodology"[47]; and second, market participants moving order flow from CBOE to other exchanges.

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[44] CBOE, Annual Report 2016, at 7 (emphasis added), https://www.cboe.com/framed/pdfframed?content=/aboutcboe/annualreportarchive/annual-report-2016.pdf&section=SEC_ABOUT_CBOE&title=CBOE+Annual+Report+2016.

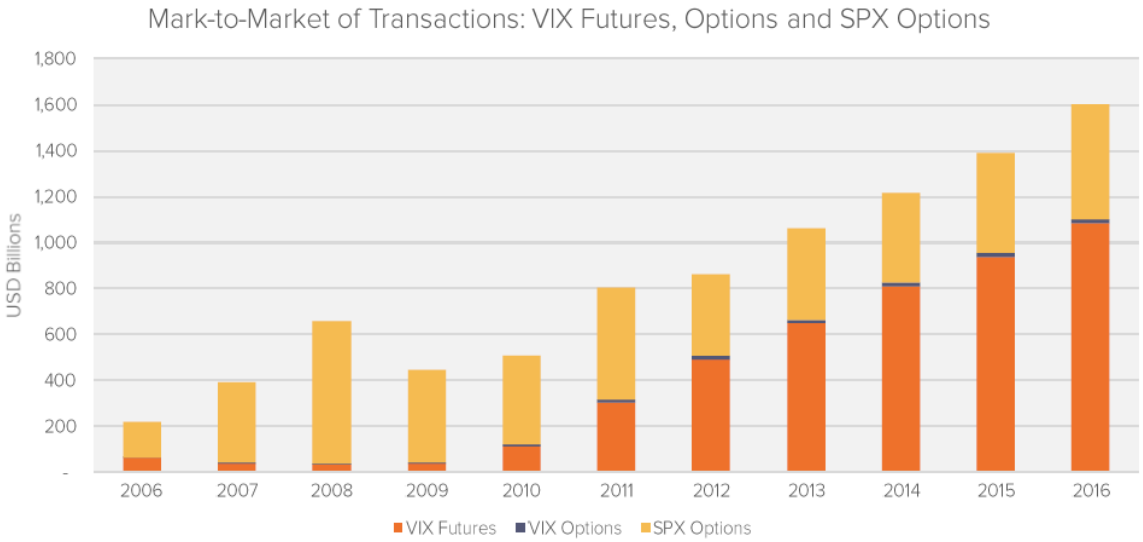
[45] *Id.* at 8.

[46] "We have the *exclusive* right to offer options contracts on the S&P 500 Index and the S&P 100 Index as a result of a licensing arrangement with S&P OPCO LLC ("S&P) . . . . We are also authorized to use the S&P 500 Index and S&P 100 Index for *the creation of CBOE volatility indexes, such as the VIX Index, and tradable products on those volatility indexes.*" *Id.* at 11 (emphasis added).

[47] *Id.* at 3, 26.

152. CBOE Chairman and CEO Edward T. Tilly confirmed the importance of these proprietary offerings, and specifically of its SPX/VIX line of products, on an earnings call on February 8, 2017. He stated that "CBOE's proprietary index and volatility market data, it is a unique offering, much more value [sic] than our competitors because of primarily of the VIX and S&P." On the same call, CBOE's CFO Alan J. Dean echoed these comments, adding: "I think there's a lot of opportunity, a lot of ways we can continue that growth from that VIX futures product which, as Ed said, was really designed for the options traders and has turned out to be a homerun."[48]

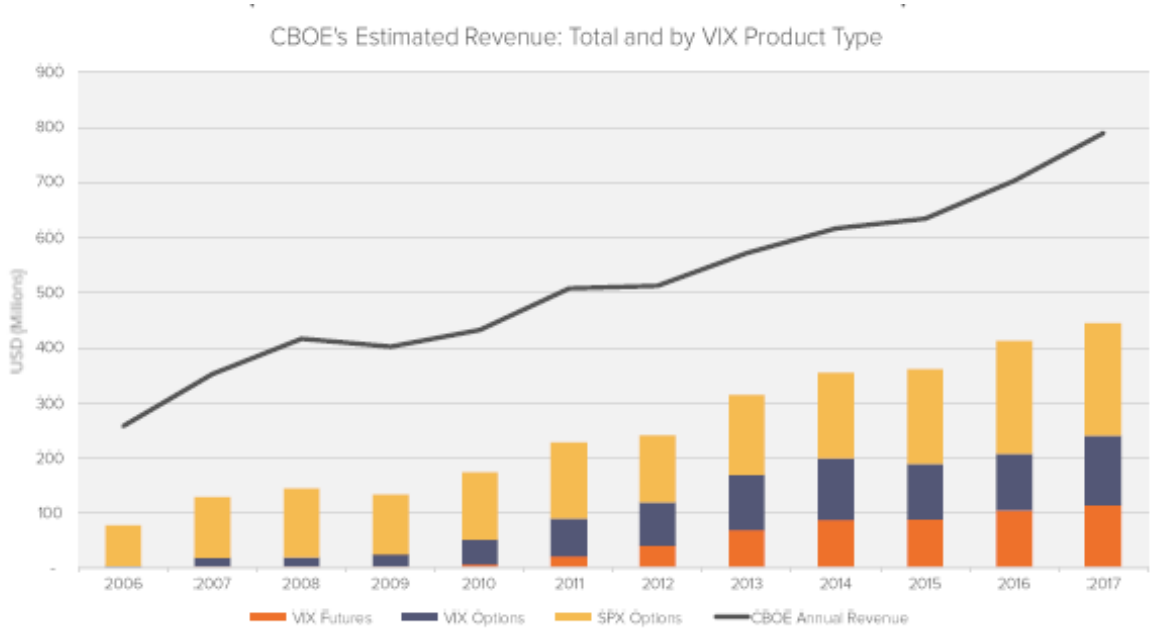
153. As the following graph demonstrates, the market for VIX Options, VIX Futures, and SPX Options has increased significantly in recent years, ballooning from just over $200 billion in 2006 to $1.6 trillion in 2016:

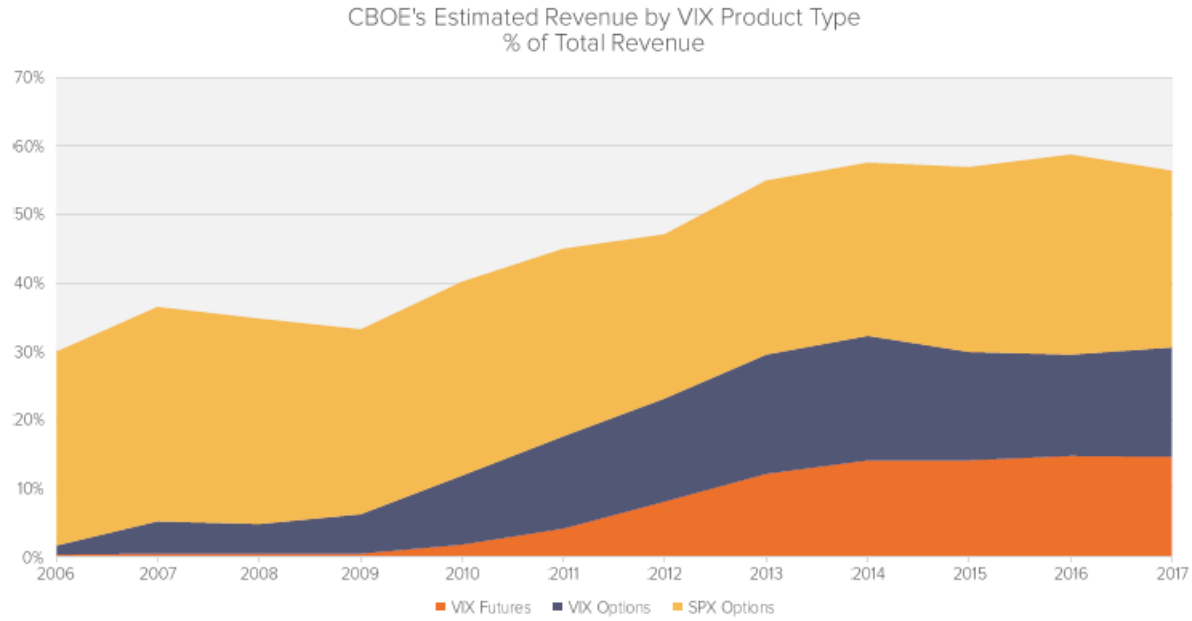


154. Because SPX Options, VIX Options, and VIX Futures are all proprietary to CBOE—and thus are traded exclusively on CBOE's exchanges—as the market has grown, so too have CBOE's revenues from the fees it collects on this trading. As a result, these three products

[48] *See* https://www.sec.gov/Archives/edgar/data/1374310/000110465917007806/a16-23690_24425.htm.

are now "cash cows" for CBOE, collectively generating over $400 million dollars in annual revenue in 2017 and consistently representing about half of CBOE's total revenues:[49]





[49] For consistency of comparison, Plaintiffs have removed the effects of CBOE's unrelated, recent acquisition of Bats Global Markets from the 2017 figures from the following two charts.

155. CBOE has celebrated and encouraged this growth. For example, it has declared that "2016 was our sixth consecutive year of record revenues and solid financial results, led by record index trading, with new all-time highs in trading volume for our S&P 500 (SPX) options and CBOE Volatility Index (VIX) futures."[50]

156. Trading fees on these products have led CBOE's revenue and profit streams in recent years, fueled by vigorous marketing and promotion by CBOE officials, such that CBOE is now "dependent" on these products for its continued success:

> In 2016, approximately 88.2% of our transaction fees were generated by our futures and index options, the overwhelming majority of which were generated by our exclusively-licensed products and products based on the VIX methodology. The bulk of this revenue is attributable to our S&P 500 Index options and VIX Index options and futures. *As a result, our operating revenues are dependent in large part on the exclusive licenses we hold for these products and our ability to maintain our exclusive VIX methodology.*[51]

157. CBOE's growing revenues from transaction fees also contributed to its growing stock price. From mid-2010 to mid-2018, CBOE's stock price increased over 300%. An April 6, 2017 CBOE Notice of Proxy Meeting Statement reveals that CBOE's directors and officers collectively held over 2 million shares of CBOE common stock.[52]

158. In sum, CBOE's motive to hide or recklessly disregard the manipulation of its flawed SOQ process and the related VIX Options and VIX Futures was no mere ordinary profit motive. Anything that threatened the market's confidence in CBOE's "flagship" VIX

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[50] CBOE, Annual Report 2016, at 7 (emphasis added), https://www.cboe.com/framed/pdfframed?content=/aboutcboe/annualreportarchive/annual-report-2016.pdf&section=SEC_ABOUT_CBOE&title=CBOE+Annual+Report+2016.

[51] *Id.*

[52] *See* CBOE Holdings, Inc. Notice of Annual Meeting of Stockholders, http://ir.cboe.com/~/media/Files/ C/CBOE-IR-V2/documents/annual-proxy/2017-cboe-holdings-proxystatement.pdf.

products—or gave Standard & Poor's reason to reconsider its exclusive licensing agreement—could kill CBOE's cash cows, and bring the company to ruin.

D. CBOE Has Previously Been Sanctioned for Prioritizing Profits Over Its Regulatory Responsibilities

159. The plausibility that CBOE so elevated its desire for profits here is further evidenced by the fact it would not be the first time CBOE wholly abandoned its regulatory role. To the contrary, CBOE has recently been sanctioned for precisely such bad-faith failures.

160. Specifically, in 2013, CBOE settled charges brought by the SEC by paying a penalty of $6 million, and agreeing to "major remedial measures," after the SEC found that CBOE had failed to detect, investigate, and discipline naked short selling in violation of Regulation SHO by one of its member firms, optionsXpress, Inc. ("optionsXpress").

161. As the SEC put it, there is a conflict of interest "between the regulation of [an exchange's] members and [the exchange's] business interests," and "[t]his matter concerns the failure of a self-regulatory organization to police and control this conflict and prevent the advancement of its business interests, and the interests of its member firms, ahead of its regulatory obligations."[53]

162. Specifically, the SEC found that "*CBOE put the interests of [optionsXpress] ahead of its regulatory obligations* by failing to properly investigate [optionsXpress's] compliance with Regulation SHO and then interfering with the SEC investigation of [optionsXpress]."[54] Indeed:

> not only did CBOE fail to adequately detect violations and investigate and discipline [optionsXpress], but it also took misguided and unprecedented steps to assist [optionsXpress] when it became the subject of an SEC investigation in December 2009. CBOE failed to provide information to SEC staff when

[53] https://www.sec.gov/litigation/admin/2013/34-69726.pdf.
[54] https://www.sec.gov/news/press-release/2013-2013-107htm.

> requested, and went so far as to assist [optionsXpress] by providing information for its Wells submission to the SEC. *The CBOE actually edited [optionsXpress's] draft submission, and some of the information and edits provided by CBOE were inaccurate and misleading.*

163. More specifically, the SEC found:

> CBOE's failures were not mere oversights or technical violations, *but a systemic breakdown in several of its regulatory and compliance responsibilities as an exchange*. Not only did it fail to enforce the Commission's rules by not adequately investigating [optionsXpress's] compliance with Regulation SHO of the Exchange Act ("Reg. SHO"), CBOE's conduct also interfered with the Commission's Division of Enforcement ("Enforcement Division") staff's Reg. SHO investigation of [optionsXpress]. *This conduct was egregious.* CBOE assisted [optionsXpress] by taking the unprecedented step of providing information for, and edits to, the [optionsXpress's] Wells submission to the Commission—even more troubling, the information and edits provided by CBOE resulted in [optionsXpress] providing the Commission with inaccurate and misleading information. When questioned by Enforcement Division staff about the underlying matter, *CBOE failed to disclose that it had assisted [optionsXpress] with its Wells submission*. CBOE also failed to enforce Reg. SHO because it employed a Reg. SHO surveillance program that failed to detect a single violation, despite numerous red flags that its members engaged in violative conduct.
>
> *CBOE's failures cut across all aspects of its regulatory, business and exchange operations.* In addition to failing to adequately enforce the Commission's rules, *CBOE failed to adequately enforce its own rules*, including its firm quote and priority rules, as well as rules governing registration of persons associated with proprietary trading member firms. In addition, by making unauthorized "customer accommodations," rebates, and other credits to certain member firms and not others without an applicable rule in place that was consistent with the applicable statutory standards, CBOE failed to provide for the equitable allocation of fees and other charges and engaged in unfair discrimination between member firms. Furthermore, CBOE and C2 failed to file proposed rule changes or filed proposed rule changes long after, and in some instances years after, certain trading functions had been in effect. Lastly, CBOE failed to promptly furnish complete and accurate business records on a timely basis at Commission staff's request.

164. The SEC further found that "CBOE demonstrated an overall inability to enforce Reg. SHO with an ineffective surveillance program that failed to detect wrongdoing despite numerous red flags that its members were engaged in abusive short selling. CBOE also fell short in its regulatory and compliance responsibilities in several other areas during a four-year period."

E. CBOE's Denials Ring Hollow, Particularly as It Eventually Tried to Fix the Problems it Says Did Not Exist

165. In response to the Griffin and Shams paper, CBOE "vehemently denied the paper's conclusions," saying that the authors "didn't consider the full range of possible reasons other than manipulation that could explain the moves they observed."[55] CBOE's chief regulatory officer, Greg Hoogasian, assured the public that the CBOE "has a dedicated regulatory department that works with FINRA to monitor certain trading activity for our securities markets, including trading activity that could impact the VIX settlement."[56] With regard to the integrity of the VIX itself, CBOE officials said the VIX is a "transparent, closely regulated, and highly reliable gauge of market sentiment with no history of failure."[57]

166. CBOE similarly issued public denials of the whistleblower letter sent to the SEC and CFTC. CBOE Vice President Speth said that the whistleblower's letter contains "a lot of mistakes and a lot of misconceptions" and reinforced the integrity of the entire VIX settlement process: "There are structural safeguards built into the process of the calculation of the VIX settlement value that would hinder the type of manipulation the letter alleges. Our regulatory group actively surveils for potential VIX settlement manipulation."[58]

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[55] Nick Baker, Cecile Vannucci, *What If Somebody Really Is Gaming the VIX?*, Bloomberg (Feb. 13, 2018), https://www.bloomberg.com/news/articles/2018-02-14/billions-in-vix-rigging-profits-a-battered-index-takes-new-hit.

[56] Elliot Blair Smith, *How S&P 500 options may be used to manipulate VIX 'fear gauge'*, MarketWatch (June 19, 2017), https://www.marketwatch.com/story/how-sp-500-options-may-be-used-to-manipulate-vix-fear-gauge-2017-06-19.

[57] *Id.* (emphasis added).

[58] Saqib Iqbal Ahmed, John McCrank, *Whistleblower alleges manipulation of Cboe volatility index*, Reuters (Feb. 13, 2018), https://uk.reuters.com/article/us-usa-stocks-volatility-manipulation/whistleblower-alleges-manipulation-of-cboe-volatility-index-idUKKBN1FX0ES.

167. Nonetheless, faced with mounting allegations of manipulation and increasing public scrutiny of the SOQ process, CBOE CEO Tilly admitted that CBOE was seeking to 'enhance' the VIX settlement process and to attract more liquidity to the settlement auction.

168. In June 2018, Bloomberg reported that CBOE had made changes so that it "now offers more and faster data to market participants about the evolution of the monthly auction" and that "its recent migration to a hybridization trading platform is also designed to help elicit more bids and offers from market makers."[59]

169. These changes were reported as being "designed to lure more participation to the monthly auction, which in particular has come under fire for being antiquated and prone to spitting out unusual results," and to "boost[] the number of times the exchange sends signals to traders pertaining to S&P 500 options orders to encourage participation in the auction and responses to buy and sell orders."[60]

170. On September 19, 2018, it was further reported that, "hard pressed to quash allegations its popular 'fear gauge' is being manipulated," with its stock down about 15 percent this year, "CBOE is working with FINRA, its regulatory services provider, to develop machine learning techniques to tell whether market conditions surrounding the VIX settlement are potentially anomalous." "Cboe declined to elaborate on when it began using machine learning techniques to monitor VIX settlements."[61]

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[59] Bloomberg, *CBOE Finds More Ways to Fix the VIX, Builds on Prior Tweaks* (June 20, 2018), https://www.bloomberg.com/news/articles/2018-06-20/cboe-reveals-more-ways-to-fix-the-vix-after-first-tweaks-helped.

[60] Financial News, *In a Year of Controversy, Cboe Seeks to Improve the VIX* (June 20, 2018), https://www.fnlondon.com/articles/in-a-year-of-controversy-cboe-seeks-to-improve-the-vix-20180620.

[61] Reuters, *CBOE Exchange turns to machines to police its 'fear gauge'*, (Sept. 19, 2018), https://www.reuters.com/article/us-cboe-vix/cboe-exchange-turns-to-machines-to-police-its-fear-gauge-idUSKCN1M00HX.

171. These belated attempts are further evidence that the SOQ process—based on the manipulated trading of illiquid SPX Options—was fundamentally flawed and in need of reform.

F. CBOE Admitted to Knowing of Certain Instances of Manipulation In These and Related Products

1. CBOE's actions with respect to the VIX

172. The problems identified herein were systemic. CBOE did nothing to address or prevent those routine problems from occurring. However, when the problems became so apparent not even CBOE could deny them anymore, it took some token actions in certain limited instances. These instances confirm CBOE's ability to identify manipulative acts, and knowledge that manipulation of VIX products was taking place.

a. On August 10, 2015, CBOE fined Ronin Capital $175,000 and ordered disgorgement of $128,000 for violating CBOE rules prohibiting strategy orders after 8:15 a.m.

b. On September 24, 2012, CBOE censured Morgan Stanley and fined it $20,000 for violating CBOE rules prohibiting the entry of VIX future-related strategy orders after 8:15 a.m., and for failing to supervise its employees to ensure compliance with the rules.

c. On April 12, 2012, CBOE fined Sparta Group and a former trader Andrew Smyth $50,000 and suspended Mr. Smyth's trading permissions for two weeks for violating various CBOE rules, including conduct concerning VIX Options.

d. On August 17, 2010, CBOE censured Ivan Tchorbadjiyski, fined him $25,000, and suspended his trading permissions for two weeks for violating various CBOE rules, including conduct concerning VIX Options.

e. On August 13, 2010, CBOE censured Steven Berman, fined him $50,000, and suspended his trading permissions for three weeks for violating various CBOE rules, including conduct concerning VIX Options.[62]

2. CBOE's actions with respect to products with similar settlement processes

173. CBOE would also have known that sophisticated traders were taking advantage of the VIX SOQ process because they had done the same thing for identical SOQ processes in respect for similar CBOE proprietary volatility products that were also traded on CBOE's exchanges.

174. On June 28, 2016, CBOE imposed a $400,000 fine and $152,664 disgorgement on Morgan Stanley and individual Ari D. Litan for manipulating the CBOE Emerging Markets Volatility Index ("VXEM"), and on December 21, 2017, it imposed a $450,000 fine and $157,056 disgorgement on DRW for manipulating the VXEM. In both cases, the methods of manipulation that resulted in the fines were *the same methods* as the John Doe Defendants used in respect of the VIX.

175. In the case of Morgan Stanley, the settlement and fine included an admission that a spike in orders can drive up the value of the index: "[A]s a result of these option market orders . . . approximately half of the strike prices used to calculate VXEM settlement opened at prices

[62] *See also In re Wolverine Execution Servs. LLC*, File No. 15-0100 (Dec. 29, 2015) (censuring Wolverine and imposing $50,000 fine for submitting SPX option strategy orders after the cut-off time, and for failing to supervise and prevent the violations), https://www.cboe.com/publish/DisDecision/15-0100.pdf; *In re Wolverine Execution Servs. LLC*, File No. 14-0161 (Feb. 12, 2015) (censuring Wolverine and imposing $15,000 fine for submitting SPX strategy order after the cut-off time), http://www.cboedirect.com/ publish/DisDecision/14-0161%20(WEX).pdf.

significantly lower than where they had been the previous day, and where they closed that same day."[63]

176. Similarly in the case of DRW, where the misconduct involved manipulating the identical two-zero bid rule that exists in the VIX settlement process: [64]

> [O]n nine trade dates, DRW . . . submitted minimum increment option orders, or 'safety bids,' in addition to its 'strategy orders,' ensuring that certain option series were included in the final settlement calculations of the SOQ. This conduct impacted the final settlement calculation of the VXEM, VXEW, and OV futures contracts. As a result of this conduct, the final settlement calculations . . . included additional options series in the SOQ settlement calculation that otherwise would not have been included due to the Two Zero Bid rule.

177. It is telling that, in both cases, CBOE waited *until years after the manipulation had occurred* before it publicly published its conclusions regarding manipulation or imposed any penalties upon the manipulators. In the case of Morgan Stanley, CBOE delayed from November 2012 until June 2016 (three and a half years). In the case of DRW, CBOE delayed from February 2014 to December 2017 (more than two and a half years). Conveniently, during this period of delay, the volume of SPX Options and VIX Options and VIX Futures traded on CBOE's exchanges nearly doubled, and CBOE never disclosed the systemic manipulation at issue in this case.

3. CBOE knew there were many superior settlement processes available

178. While the flaws discussed herein are largely unique to CBOE's SOQ process, they make it susceptible to manipulation for many of the same reasons as have now been proven for many other financial benchmarks (e.g., LIBOR, the London Gold Fix, ISDAfix, and others,

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[63] Business Conduct Committee Panel of the CBOE Futures Exchange, *Decision Accepting Offer of Settlement*, CFE 15-0003, https://cfe.cboe.com/publish/CFEDisDecision/CFE%2015-0003.pdf.

[64] Business Conduct Committee Panel of the CBOE, *Decision Accepting Letter of Consent*, CFE 17-0010, http://cfe.cboe.com/publish/CFEDisDecision/CFE%2017-0010%20DRW%20620%20Decision1.pdf.

which have all been found to lack adequate safeguards to prevent price manipulation). Indeed, Timothy Klassen, a member of the Goldman Sachs team that assisted CBOE in the development of the VIX, said that "trying to manipulate the VIX is not conceptually different from trying to manipulate any other index" that is dependent on underlying financial contracts.[65]

179. A comparison of the VIX SOQ process to other now-known-to-be-flawed benchmarks shows it has similar flaws. And a comparison of the SOQ process to best-practices shows where the VIX falls far short.

180. *VSTOXX:* The VSTOXX index, which is a European volatility index equivalent to the VIX and is traded through options and futures, does not use a single opening price. Instead, settlement of VSTOXX options and futures is based on the average of VSTOXX values calculated every five seconds over the course of a 30-minute window. In addition, VSTOXX options and futures are settled only using trades that have a premium of at least 0.5 euros. As a consequence, anyone wishing to manipulate the VSTOXX has to maintain the price discrepancy for a longer period of time at a higher cost, and at greater risk than they need to in order to manipulate the VIX.

181. The final VSTOXX settlement price is the average of the VSTOXX index values calculated every five seconds over the course of 30 minutes from 11:30-12:00 CET. The calculation occurs during normal market trading hours. In contrast, the VIX Futures settlement occurs during an SOQ period prior to the opening of the market, which renders it more prone to collusive manipulation by a small number of SPX Options traders and market makers.

[65] *See* Elliot Blair Smith, *How S&P 500 options may be used to manipulate VIX 'fear gauge'*, MarketWatch (June 19, 2017), https://www.marketwatch.com/story/how-sp-500-options-may-be-used-to-manipulate-vix-fear-gauge-2017-06-19.

182. Given these additional safeguards, it is not surprising that while there are *some* alleged signs of manipulation with the VSOTXX, they pale in comparison to what has been uncovered by Plaintiffs here with respect to the VIX.

183. *IOSCO Principles:* The VIX Settlement also falls far short when compared to the IOSCO Principles for Financial Benchmarks. Published by the Board of the International Organization of Securities Commissions, these principles describe mechanisms and processes for the administration of benchmarks that will be free of manipulation.

184. IOSCO Principle 3 states that Benchmark Administrators should ensure "existing or potential conflicts of interest do not inappropriately influence Benchmark determinations." This principle is violated here because CBOE derives revenue from the trading activity that constitutes input to the benchmark as well as from trading activity that is connected to the benchmark. CBOE therefore has an incentive to design the VIX and related products in a way that will encourage additional trading so that CBOE can generate additional revenues or profit.

185. IOSCO Principle 7(a) states that data used to construct a benchmark should "be based on prices, rates, indices or values that have been formed by the competitive forces of supply and demand." This principle is not met here because, e.g., the data used to construct the VIX settlement is drawn from illiquid instruments that lack trading depth.

186. IOSCO Principle 7(b) states that data used to construct a benchmark should "be anchored by observable transactions entered into at arm's length between buyers and sellers in the market for the Interest the Benchmark measures." This principle is similarly violated. The benchmark is not constructed from transactions in the highly liquid VIX market, but from transactions in an illiquid period of the SPX Option market, in special processes in which CBOE's self-appointed market makers have preferential trading powers.

187. *ICE Swap Rate:* The VIX Settlement also sharply contrasts with the ICE SWAP Rate. The ICE Swap Rate was introduced in its current form on March 31, 2015 in response to investigations conducted by the CFTC and the United Kingdom Financial Conduct Authority into manipulation of what was previously known as the ISDAfix benchmark.

188. Rather than conducting a specialized procedure, pre-opening, with a limited group of participants as was done here by CBOE, the ICE Swap Rate directly relies on live trading activity from a number of different swap trading platforms. The benchmark administrator, the ICE Benchmark Administration Limited ("IBA"), receives data feeds from a number of different swap platforms, capturing two minutes of tick update data of the top 10 levels of each trading venue's order book.[66]

189. For the ICE Swap Rate, after the data files provided by the various trading platforms are verified by the IBA, the IBA combines all of the order books at 24 randomized points in time into snapshots by ranking the different prices available across all venues at a given time and aggregating the volumes at each of the price levels. The snapshots are therefore based on tradable quotes formed by the competitive forces of supply and demand.

190. Because the ICE Swap Rate relies on live trading in the actual instruments associated with the benchmark, where those instruments are highly liquid and their trading data is gathered from a spectrum of trading platforms. All of these features make the ICE Swap Rate far more reliable than the VIX SOQ settlement process.

191. *Oil and other commodities benchmarks:* Some of the issues present in the VIX Settlement process parallel concerns regulators and others have had about pricing in the commodities markets. Specifically, regulators in the United States and European Union became

[66] ICE Benchmark Administration, *IOSCO Assessment Report*, https://www.theice.com/publicdocs/ISR_IOSCO_Principles.pdf.

concerned that oil benchmark prices were based on "incomplete information from unregulated, illiquid markets."[67]

192. These benchmark prices have "long been under fire from regulators" because the benchmark administrators operate in a shroud of secrecy while generating profit from selling gathered market information to subscribers. The relevant benchmarks are often generated from submissions or reports, rather than from live trading activity.

193. The exact same concerns are present here. The SPX Options market employed in the SOQ process is illiquid in the same way as the commodity markets subject to scrutiny by the U.S. and E.U. regulators. CBOE is also subject to the same conflict of interest concerns raised in those markets—it stands to benefit from manipulative activity in the form of increased trading revenues.

V. PLAINTIFFS AND MEMBERS OF THE CLASS WERE HARMED BY DEFENDANTS' MISCONDUCT

194. In essence, CBOE used, among other things, its image to stoke demand for its products, while disguising the reality that its desire for fees and commercial self-interest had undermined the integrity of the market.

195. Because CBOE assured the market that CBOE's VIX Options and VIX Futures products were fair and orderly, investors have poured billions of dollars into them, believing that the prices at which they bought, sold, and settled were determined by natural market forces of supply and demand, and not rigged by manipulators who CBOE enabled to game the obscure VIX settlement process. Similarly, based on these same assurances by CBOE, investors traded

[67] Economist Magazine, *Fixing the Fix* (Feb. 10, 2014), https://www.economist.com/news/finance-and-economics/21595943-european-union-wants-change-how-commodity-benchmarks-are-set-fixing-fix.

SPX Options, and VIX ETPs, believing that prices for these products were also determined by natural market forces.

196. Plaintiffs and members of the class were thus harmed because they were transacting in products that were not the result of regular forces of supply and demand. Rather, Plaintiffs and members of the class were tricked into trading SPX Options, VIX Options, VIX Futures, and VIX ETPs that were mispriced due to CBOE and the John Doe Defendants' manipulative conduct. As a result, class members were forced to pay more (or to accept less) from these products than they would have in a fair and orderly market.

197. Specifically, but without limitation, Plaintiffs and the class were harmed in the following ways:

198. *Class members who held VIX Options and VIX Futures through to settlement* were harmed because VIX Options and VIX Futures cash-settle based on the SOQ settlement process. The manipulation of the SOQ process thus directly impacted whether and how much class members would be paid. Further, the manipulation pushed some VIX Options and VIX Futures into the money when they would have otherwise expired out of the money, and pushed some VIX Options and VIX Futures out of the money when they would have otherwise expired in the money.

199. *Class members who transacted in VIX Options and VIX Futures* were also harmed because the prices of such instruments are correlated to their expected settlement value, the VIX index, and the price of SPX Options, all of which were directly impacted by the manipulation of the SOQ process. Thus, the manipulation of the SOQ process also made the prices of VIX Options and VIX Futures artificial.

200. *Class members who transacted in SPX Options* were also harmed because these were used as the tool to manipulate the SOQ process. Defendants' manipulation of the SOQ process made SPX Option prices artificial. Though the SOQ process only included SPX Options expiring in 30 days' time, the harm of the manipulative trades was not so confined. This is because prices for SPX Options are correlated (as they are for VIX Options and VIX Futures) across related tenors and strikes.

201. *Class members who transacted in VIX ETPs* were also harmed because such products derive their value from movements in VIX, VIX Futures, VIX Options, and/or SPX Options.

202. Plaintiffs and Class members relied upon the fairness of the VIX SOQ process when they, e.g., accepted CBOE's calculations for the cash settlement of their VIX Options and VIX Futures. They would not have done so if they had known it was the product of a manipulated process.

203. Plaintiffs and Class members are entitled to a presumption of reliance under *Affiliated Ute Citizens of Utah v. U.S.*, 406 U.S. 128 (1972), because the claims asserted herein against Defendants are predicated in part upon material omissions of fact (e.g., the manipulation of the SOQ settlement process) that Defendants had a duty to disclose.

204. In the alternative, Plaintiffs and Class members are entitled to a presumption of reliance pursuant to the fraud-on-the-market doctrine. Throughout the Class Period, Plaintiffs and the Class relied upon an assumption of an efficient market free of manipulation. Investors believed they were trading in competitive markets where prices were driven by supply and demand and were not tainted by manipulation.

VI. DEFENDANTS AFFIRMATIVELY CONCEALED THEIR INHERENTLY SELF-CONCEALING MANIPULATION

205. Manipulation of the VIX and the VIX-related products at issue was material to Plaintiffs and Class members at all relevant times.

206. Within the time period of any applicable statutes of limitations, Plaintiffs and Class members could not have discovered through the exercise of reasonable diligence that Defendants were manipulating the VIX or VIX-linked instruments. Until recently, as a result of Defendants' hidden misconduct, affirmative misstatements and acts of concealment, Plaintiffs and Class members did not discover and did not know of any facts that would have caused a reasonable person to suspect that Defendants were manipulating the VIX or VIX-linked instruments. Plaintiffs had no prior knowledge of their claims, or of facts or information that would have caused a reasonably diligent person to investigate them.

207. Throughout the Class Period, Defendants engaged in conduct that was inherently self-concealing to those who, unlike CBOE, did not have full access to the data. The John Doe Defendants engaged in manipulative activities that were carried out at least in part, through means and methods specifically designed to avoid public detection and which, until very recently, successfully eluded public detection. The very nature and structure of the SOQ process made it impossible for Plaintiffs to discover facts comprising their claims until recently. For instance, trading of VIX Options, SPX Options, and of VIX Futures is anonymous. The John Doe Defendants planned and executed their conduct in private, shielded from public view.

208. Further, Defendants knowingly, actively, and affirmatively concealed the facts alleged herein, including their manipulation of the VIX or VIX-linked instruments. Plaintiffs and Class members reasonably relied on Defendants' knowing, active, and affirmative concealment.

209. For instance, CBOE Defendants took affirmative steps to conceal its misconduct and, by extension, those of the John Doe Defendants. CBOE affirmatively misrepresented or failed to disclose that manipulation had occurred to any meaningful degree, much less to the systemic degree that Plaintiffs' investigation has uncovered. Through its conduct, CBOE actively misled Plaintiffs as to the true nature of VIX Options and VIX Futures, as well as the SOQ process. The CBOE's conduct was undertaken with the purpose and effect of masking the previously-hidden manipulation described above.

210. On June 19, 2017, for example, CBOE's chief regulatory officer Greg Hoogasian assured the public that the CBOE "has a dedicated regulatory department that works with FINRA to monitor certain trading activity for our securities markets, including trading activity that could impact the VIX settlement."[68] With regard to the integrity of the VIX itself, CBOE officials said the VIX is a "transparent, closely regulated, and highly reliable gauge of market sentiment with no history of failure."[69] In further response to the Griffin and Shams paper, on February 13, 2018, CBOE "vehemently denied the paper's conclusions," saying that the authors "didn't consider the full range of possible reasons other than manipulation that could explain the moves they observed."[70]

211. CBOE similarly issued public denials of the whistleblower letter sent to the SEC and CFTC. CBOE Vice President Speth said that the whistleblower's letter contains "a lot of mistakes and a lot of misconceptions" and reinforced the integrity of the entire VIX settlement

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[68] Elliot Blair Smith, *How S&P 500 options may be used to manipulate VIX 'fear gauge'*, MarketWatch (June 19, 2017), https://www.marketwatch.com/story/how-sp-500-options-may-be-used-to-manipulate-vix-fear-gauge-2017-06-19.

[69] *Id.* (emphasis added).

[70] Nick Baker, Cecile Vannucci, *What If Somebody Really Is Gaming the VIX?*, Bloomberg (Feb. 13, 2018), https://www.bloomberg.com/news/articles/2018-02-14/billions-in-vix-rigging-profits-a-battered-index-takes-new-hit.

process: "There are structural safeguards built into the process of the calculation of the VIX settlement value that would hinder the type of manipulation the letter alleges. Our regulatory group actively surveils for potential VIX settlement manipulation."[71]

212. Plaintiffs have exercised due diligence in uncovering their claims. This includes but is not limited to trying to identify the specific traders behind the manipulation by, through counsel, seeking discovery from CBOE. With respect to the identity of the John Doe Defendants, however, to date their efforts have been unsuccessful.

213. For these reasons, all applicable statutes of limitation have been tolled based on the discovery rule, the doctrine of equitable tolling, and/or Defendants' fraudulent concealment. Defendants are also estopped from relying on any statutes of limitations in defense of this action.[72]

CLASS ACTION ALLEGATIONS

214. Plaintiffs bring this action on behalf of themselves and as a class action under Rules 23(a) and (b)(3) of the Federal Rules of Civil Procedure, seeking monetary damages on behalf of the following class (the "Class"):

> All persons or entities who held VIX Options or VIX Futures to expiry, or traded SPX Options, VIX Options, VIX Futures, or VIX ETPs, during the following time periods:
>
> - From March 26, 2004 to the present in the case of VIX Futures, SPX Options, and VIX ETPs; and

[71] Saqib Iqbal Ahmed, John McCrank, *Whistleblower alleges manipulation of Cboe volatility index*, Reuters (Feb. 13, 2018), https://uk.reuters.com/article/us-usa-stocks-volatility-manipulation/whistleblower-alleges-manipulation-of-cboe-volatility-index-idUKKBN1FX0ES.

[72] Further, the foregoing allegations constitute a continuing violation of the antitrust laws, including misconduct and recurring injuries within the limitations period. Accordingly, Plaintiffs and the proposed Class can recover for damages suffered throughout the limitations period, even absent a finding of equitable tolling or fraudulent concealment.

- From February 24, 2006 to the present in the case of VIX Options (together, the "Class Period").[73]

215. Plaintiffs believe there are thousands of members of the Class as described above, the exact number and their identities being known by CBOE, making Class members so numerous and geographically dispersed that joinder of all members is impracticable.

216. There are numerous questions of law and fact common to each Class member, including, but not limited to:

a. whether the SOQ settlement process for VIX Options and VIX Futures was flawed in a way that made it susceptible to manipulation and market monopolization;

b. whether CBOE knew or recklessly disregarded that the settlement process for VIX Options and VIX Futures was flawed in a way that made it susceptible to manipulation;

c. whether the SOQ process was in fact manipulated and subject to market monopolization by the John Doe Defendants, in violation of the Exchange Act, the CEA, and the Sherman Act;

d. whether CBOE knew or recklessly disregarded that the SOQ settlement process was manipulated;

e. whether manipulation and market monopolization of the SOQ process had an impact upon the prices of SPX Options and VIX Options and VIX Futures, and upon the cash settlement value of VIX Options and VIX Futures;

[73] Excluded from the Class are Defendants and their employees, affiliates, parents, subsidiaries, whether or not named in this Complaint, and the United States government.

f. whether manipulation and market monopolization of the SOQ process had an impact on the value or prices of shares or notes in VIX ETPs;

g. whether CBOE had a duty of care in respect of the design, maintenance, and administration of the SOQ process, and/or in the design and sale of VIX Options and VIX Futures;

h. the identity of the John Doe Defendants;

i. the duration of the manipulation and market monopolization;

j. the nature and character of the acts performed in furtherance of the manipulation and market monopolization;

k. whether the conduct of Defendants, as alleged in this Complaint, caused damages to Plaintiffs and other members of the Class and the amount and extent of those damages; and

l. the appropriate measure of damages sustained by Plaintiffs and other members of the Class.

217. Plaintiffs are members of the Class, have claims that are typical of the claims of the Class members, have interests coincident with and not antagonistic to those of the other members of the Class, and will fairly and adequately protect the interests of the members of the Class. In addition, Plaintiffs are represented by counsel who are competent and experienced in the prosecution of securities, antitrust, and class action litigation.

218. The prosecution of separate actions by individual members of the Class would create a risk of inconsistent or varying adjudications.

219. The questions of law and fact common to the members of the Class predominate over any questions affecting only individual members, including legal and factual issues relating to liability and damages.

220. A class action is superior to other available methods for the fair and efficient adjudication of this controversy. Treatment as a class action will permit a large number of similarly situated persons to adjudicate their common claims in a single forum simultaneously, efficiently and without the duplication of effort and expense that numerous individual actions would engender. The Class is readily definable and is one for which records should exist in the files of CBOE or others, and a class action will eliminate the possibility of repetitious litigation.

221. Class treatment will also permit the adjudication of relatively small claims by many members of the Class who otherwise could not afford to litigate claims such as those asserted in this Complaint. This class action presents no difficulties of management that would preclude its maintenance as a class action.

CAUSES OF ACTION

CLAIM ONE

VIOLATION OF 15 U.S.C. § 78a, et seq. MANIPULATION IN VIOLATION OF RULE 10(B) OF THE SECURITIES EXCHANGE ACT OF 1934 AND RULE 10B-5 PROMULGATED THEREUNDER (AGAINST CBOE)

222. Plaintiffs incorporate each preceding and succeeding paragraph as though fully set forth herein.

223. This Claim is brought with respect to SPX Options and VIX Options.

224. By its misconduct, CBOE violated § 10(b) of the Exchange Act and Rule 10b-5 promulgated thereunder.

225. CBOE employed devices, schemes, or artifices to defraud, and engaged in acts, practices, and a course of business which operated as a fraud and deceit upon the Class, in violation of Section 10(b) of the Exchange Act and Rule 10b-5 promulgated thereunder. CBOE has undertaken a number of manipulative acts in furtherance of a fraudulent scheme. In so doing, CBOE acted with scienter. CBOE knew or recklessly disregarded that its proprietary products were vulnerable to manipulation—and were in fact being manipulated. CBOE never disclosed such facts to the market. Investors were deceived into believing that prices at which they purchased and sold CBOE's proprietary securities were determined by the natural interplay of supply and demand, not rigged by manipulators.

226. The VIX and VIX-related products at issue were central to CBOE's profit-seeking enterprise. But CBOE knew or recklessly disregarded that these products were flawed, and those flaws were being exploited in a way that CBOE allowed or disregarded as it sought commercial gain, and to maintain its dominance in the market for volatility derivatives.

227. In creating, designing, and marketing a slew of proprietary products that had flaws known only to it and the John Doe Defendants, CBOE went far beyond its role as an exchange platform. CBOE's creation of these products—and its successful attempt, through its contracts with S&P, to make its VIX-related products proprietary to CBOE and unique in the marketplace—was undertaken solely to maximize its profits. Likewise, CBOE created and promoted the products that were used to manipulate the market in order to increase trading volume on CBOE's exchange and increase company profit. Thus, CBOE embarked deliberately in commercial conduct by acting as a for-profit enterprise.

228. By way of further example, CBOE's grant of special powers and even rewards to certain traders during the VIX SOQ process was also not a regulatory function, but instead was

also was commercial in nature, designed to increase CBOE's profits by generating increased trading volumes (and thus increased trading fees) for products CBOE knew or should have known were flawed.

229. CBOE's fraudulent scheme caused damage to Plaintiffs and the Class, who lost money trading SPX Options and trading and cash-settling VIX Options in reliance on the integrity of the markets for those securities and the belief the products were. As a direct and proximate result of CBOE's deceptive and manipulative conduct, Plaintiffs and Class members have suffered damages in connection with their transactions.

230. CBOE's acts and the damage caused by them were done in connection with the purchase or sale of securities. VIX Options and SPX Options are securities that were central to CBOE's manipulative scheme. These acts and the damage caused by CBOE were also furthered by CBOE's use of the mails or any facility of a national securities exchange.

CLAIM TWO

VIOLATION OF 7 U.S.C. § 1, et seq.
FAILURE TO ENFORCE RULES AND PREVENT PRICE MANIPULATION
IN VIOLATION OF THE COMMODITY EXCHANGE ACT
(AGAINST CBOE)

231. Plaintiffs incorporate each preceding and succeeding paragraph as though fully set forth herein.

232. This Claim is brought with respect to VIX Futures.

233. By failing to enforce bylaws, rules, regulations, and resolutions despite its status as a registered entity, CBOE violated the CEA, specifically 7 U.S.C. §§ 7 and 25(b), hence allowing prices of VIX Futures to be artificial during the Class Period.

234. CBOE, as a registered entity under the CEA (7 U.S.C. § 1a), engaged in actions and omissions that constitute a failure to enforce the mandatory rules that it was required to follow under the CEA, in violation of 7 U.S.C. §§ 7 and 25(b).

235. CBOE was on notice that many such rules were violated. Among other things, CBOE knew or recklessly disregarded, throughout the Class Period, that the VIX settlement value was actively manipulated. CBOE's refusal to address the manipulation taking place in the relevant markets constitutes a failure to enforce bylaws, rules, regulations, and resolutions.

236. CBOE's failure to do so was in bad faith. CBOE earned millions in profits from the manipulative scheme, including from transaction fees on manipulative trades, and for that reason turned a blind eye to the manipulative activities of the John Doe Defendants throughout the Class Period.

237. CBOE's failure to enforce such rules was conducted with knowledge or with reckless disregard of the violations, thus depriving Plaintiffs and the Class of a lawfully operating market during the Class Period.

238. Plaintiffs and the Class transacted at artificial and unlawful prices resulting from CBOE's failure to enforce the rules in violation of the CEA, 7 U.S.C. § 1, *et seq*., and as a direct result were injured and suffered actual damages.

CLAIM THREE

ORDINARY NEGLIGENCE (AGAINST CBOE)

239. Plaintiffs incorporate each preceding and succeeding paragraph as though fully set forth herein.

240. This Claim is brought with respect to VIX Futures, VIX Options, and SPX Options.

241. CBOE owed Plaintiffs and the Class a duty of reasonable care with respect to the design and testing of the VIX calculation process, the SOQ settlement process, VIX Futures, VIX Options, and SPX Options. VIX, VIX Futures, VIX Options, and SPX Options are proprietary commercial products that CBOE created for profit and with the expectation that Plaintiffs and the Class would purchase VIX Futures, VIX Options, and SPX Options.

242. CBOE also owed Plaintiffs and the Class a duty of reasonable care with respect to the promotion of the VIX, VIX Futures, VIX Options, and SPX Options. CBOE has promoted the VIX, VIX Futures, VIX Options, and SPX Options as fundamentally sound and appropriate investment vehicles. It did so to induce Plaintiffs and the Class to purchase VIX Futures, VIX Options, and SPX Options.

243. CBOE negligently performed these duties. It failed to use reasonable care in its designing and testing to ensure that VIX Futures, VIX Options, and SPX Options were not susceptible to manipulation. It also failed to use reasonable care in its promotional activities to ensure that investors were apprised of the risk of manipulation of VIX Futures, VIX Options, and SPX Options.

244. Plaintiffs and the Class suffered damages as a result of CBOE's breach of its duties of care.

CLAIM FOUR

VIOLATION OF 15 U.S.C. § 78a, et seq.
MANIPULATION IN VIOLATION OF RULE 10(B) OF THE SECURITIES EXCHANGE ACT OF 1934 AND RULE 10B-5 PROMULGATED THEREUNDER
(AGAINST JOHN DOE DEFENDANTS)

245. Plaintiffs incorporate each preceding and succeeding paragraph as though fully set forth herein.

246. This Claim is brought with respect to SPX Options, VIX Options, and VIX ETPs.

247. By their misconduct, the John Doe Defendants violated §10(b) of the Exchange Act and Rule 10b-5 promulgated thereunder.

248. The John Doe Defendants employed devices, schemes, and artifices to defraud, and engaged in acts, practices, and a course of business which operated as a fraud and deceit upon the Class, in violation of Section 10(b) of the Exchange Act and Rule 10b-5 promulgated thereunder.

249. The John Doe Defendants have undertaken a number of manipulative acts in furtherance of a fraudulent scheme. The John Doe Defendants have, for example, banged the close, manipulated the two-zero bid rule, and submitted false bids and offers throughout the Class Period. These actions systematically manipulated SPX Options prices, VIX Options prices and settlements, and VIX ETP values throughout the Class Period.

250. The manipulative acts of the John Doe Defendants caused damage to the Plaintiffs and the Class. Specifically, the John Doe Defendants manipulated settlement values so that they could gain large cash windfalls, or avoid large cash expenses, or both. These illicit gains were made at the expense of the Class. As a direct and proximate result of the John Doe Defendants' wrongful conduct the Class has suffered damages in connection with the settlement of VIX Options. Similarly, the manipulative acts of the John Doe Defendants had a direct impact upon prices for SPX Options and VIX Options, and the value of shares and notes in VIX ETPs, again at the direct and proximate expense of the Class.

251. Throughout the Class Period, Plaintiffs and the Class relied on an assumption of an efficient market free of manipulation. Investors believed they were trading in competitive markets where prices driven by supply and demand. The John Doe Defendants employed

devices, schemes, and artifices to defraud while in possession of material, adverse, non-public information, specifically, they improperly manipulated the VIX settlement value, and the prices of VIX Options, the prices of SPX Options, and the prices of notes and shares in VIX ETPs, as detailed in this Complaint.

252. The John Doe Defendants, individually and in concert, directly and indirectly, by the use, means or instrumentalities of interstate commerce and/or of the mails, engaged and participated in a continuous course of conduct to conceal their manipulation.

CLAIM FIVE

VIOLATION OF 7 U.S.C. § 1, et seq.
MANIPULATION IN VIOLATION
OF THE COMMODITY EXCHANGE ACT
(AGAINST JOHN DOE DEFENDANTS)

253. Plaintiffs incorporate each preceding and succeeding paragraph as though fully set forth herein.

254. This Claim is brought with respect to VIX Futures.

255. By their intentional misconduct, the John Doe Defendants violated the CEA, specifically 7 U.S.C. §§ 6b(a), 6c(a), 9(3), 13(a)(2), 25(a), and CFTC rules adopted under the CEA (17 C.F.R. § 180.2), and caused prices of VIX Futures to be artificial during the Class Period.

256. The John Doe Defendants' trading and other activities alleged herein constitute market manipulation of prices of VIX Futures, in violation of 7 U.S.C. §§ 6b(a), 6c(a), 9(3), 13(a)(2), 25(a), and 17 C.F.R. § 180.2.

257. The John Doe Defendants had the motive and the opportunity to manipulate the VIX settlement process.

258. The John Doe Defendants also possessed an ability to influence market prices through the manipulative schemes described above. Specifically, the John Doe Defendants banged the close on VIX settlement days, manipulated the two-zero bid rule to ensure certain strikes would be used in the settlement computation, and submitted false bids and offers to manipulate the VIX settlement price.

259. The John Doe Defendants caused the artificial prices through their manipulative activities. They did so manipulating the prices of the SPX Options that CBOE used in its VIX settlement calculation, and by influencing the levels of bids and asks associated with each of those SPX Options.

260. The John Doe Defendants specifically intended to cause the artificial VIX Futures prices. The John Doe Defendants knew they would experience large cash windfalls or prevent large cash payouts if they were successfully able to shift the settlement value. This provided ample motivation for the John Doe Defendants to purposefully shift the settlement value artificially upwards or downwards. The John Doe Defendants also had the opportunity to do so because they executed their SPX Option trades in the narrow time window of the SOQ auction, which had a large influence on the ultimate VIX price.

261. The John Doe Defendants' manipulation deprived the Class of a lawfully operating market during the Class Period.

262. Plaintiffs and the Class transacted at artificial and unlawful prices resulting from the John Doe Defendants' manipulations in violation of the CEA, 7 U.S.C. § 1, *et seq*., and Rule 180.2, and as a direct result thereof were injured and suffered damages. Plaintiffs and the Class sustained and are entitled to actual damages for the violations of the CEA alleged therein.

CLAIM SIX

VIOLATION OF 7 U.S.C. § 1, et seq.
EMPLOYMENT OF MANIPULATIVE OR DECEPTIVE DEVICE OR CONTRIVANCE IN VIOLATION OF THE COMMODITY EXCHANGE ACT (AGAINST JOHN DOE DEFENDANTS)

263. Plaintiffs incorporate each preceding and succeeding paragraph as though fully set forth herein.

264. This Claim is brought with respect to VIX Futures.

265. By their intentional misconduct, from August 15, 2011 to present, the John Doe Defendants each violated the CEA, specifically 7 U.S.C. §§ 9(1), 13(a), and CFTC rules adopted under the CEA (17 C.F.R. § 180.1), and caused prices of VIX Futures to be artificial during the Class Period.

266. The John Doe Defendants' trading and other activities alleged herein constitute market manipulation of prices of VIX Futures, in violation of the CEA, 7 U.S.C. §§ 9(1), 13(a), 25(a), and 17 C.F.R. § 180.1.

267. The John Doe Defendants have delivered or transmitted numerous false, misleading, or inaccurate reports relating to their activities in the markets for VIX Futures. Specifically, the John Doe Defendants have submitted false bids and offers into the SOQ process with the intent of sending false market information to buyers and sellers of VIX Futures. They have done so on every occasion where they have manipulated the VIX settlement value to benefit their financial positions.

268. The John Doe Defendants had knowledge of the impact these false reports would have on the marketplace. In fact, the John Doe Defendants intended to mislead the market in this manner to benefit their financial positions. There would be no reason to undertake the manipulative scheme described herein if there would be no impact on the relevant markets.

269. There is also no legitimate justification for the false reports. The only reason to manipulate the SOQ process, and thus the VIX settlement value, was to introduce artificiality into, e.g., the prices for VIX Futures.

270. The John Doe Defendants' manipulation deprived the Class of a lawfully operating market during the Class Period.

271. Plaintiffs and the Class transacted at artificial and unlawful prices resulting from the John Doe Defendants' manipulations in violation of the CEA, 7 U.S.C. § 1, *et seq*., and Rule 180.1, and as a direct result thereof were injured and suffered damages. Plaintiffs and the Class also suffered damages under 17 C.F.R. 180.1(a)(1).

CLAIM SEVEN

VIOLATION OF 7 U.S.C. § 1, et seq.
PRINCIPAL-AGENT LIABILITY
IN VIOLATION OF THE COMMODITY EXCHANGE ACT
(AGAINST ALL DEFENDANTS)

272. Plaintiffs incorporate each preceding and succeeding paragraph as though fully set forth herein.

273. This Claim is brought with respect to VIX Futures.

274. Each Defendant is liable under the CEA (7 U.S.C. § 2(a)(1)(B)), for the manipulative acts of their agents, representatives, and/or other persons acting for them in the scope of their employment.

275. Plaintiffs and the Class sustained and are entitled to actual damages for the violations of the CEA alleged herein.

CLAIM EIGHT

VIOLATION OF 7 U.S.C. § 1, et seq.
AIDING AND ABETTING LIABILITY
IN VIOLATION OF THE COMMODITY EXCHANGE ACT
(AGAINST ALL DEFENDANTS)

276. Plaintiffs incorporate each preceding and succeeding paragraph as though fully set forth herein.

277. This Claim is brought with respect to VIX Futures.

278. Defendants knowingly aided, abetted, counseled, induced, and/or procured the violations of the CEA alleged herein. Defendants did so knowingly of each other's manipulation of VIX Futures, and willfully intended to assist these manipulations, which resulted in the prices of VIX Futures becoming artificial during the Class Period in violation of the CEA (7 U.S.C. §§ 13c(a) and 25(a)(1)).

279. Plaintiffs and the Class sustained and are entitled to actual damages for the violations of the CEA alleged herein.

CLAIM NINE

VIOLATION OF §1 OF THE SHERMAN ACT, 15 U.S.C § 1
(AGAINST JOHN DOE DEFENDANTS)

280. Plaintiffs incorporate each preceding and succeeding paragraph as though fully set forth herein.

281. This claim is brought with respect to VIX Options, VIX Futures, SPX Options, and VIX ETPs.

282. The John Doe Defendants combined, conspired, and agreed to manipulate the prices of VIX Options, VIX Futures, SPX Options, and VIX ETPs. This combination,

conspiracy, and/or agreement unreasonably restrained trade in violation of the federal antitrust laws.

283. Specifically, the anticompetitive combination, conspiracy, and/or agreement alleged herein is a per se violation of Section 1 of the Sherman Act, 15 U.S.C. § 1 ("Section 1"). Alternatively, the anticompetitive combination, conspiracy, and/or agreement alleged herein resulted in substantial anticompetitive effects in the market for VIX Options, VIX Futures, SPX Options, and VIX ETPs in the United States in violation of Section 1.

284. The John Doe Defendants intended to restrain trade and actually restrained trade in violation of Section 1. These Defendants shared a conscious commitment to the common scheme designed to achieve the unlawful objective of manipulating the prices of VIX Options, VIX Futures, SPX Options, and VIX ETPs.

285. The anticompetitive combination, conspiracy, and/or agreement alleged herein unreasonably restrained trade, and there is no legitimate business justification for, or procompetitive benefits of, the John Doe Defendants' unreasonable restraint of trade. Any alleged procompetitive benefit or business justification is pretextual and/or could have been achieved through less restrictive means.

286. The anticompetitive combination, conspiracy, and/or agreement alleged herein occurred within the flow of and substantially affected interstate commerce.

287. As a direct and proximate result of these Defendants' anticompetitive scheme and concrete acts in furtherance of that scheme, Plaintiffs and members of the Class have been injured in their business and property by reason of Defendants' violation of Section 1, within the meaning of Section 4 of the Clayton Antitrust Act, 15 U.S.C. § 15.

288. Plaintiffs' and the Class's injuries are of the type the antitrust laws were designed to prevent and are a direct result of the John Doe Defendants' unlawful anticompetitive conduct.

289. Plaintiffs and the Class are entitled to treble damages for the violations of the Sherman Act alleged herein.

CLAIM TEN

VIOLATION OF § 2 OF THE SHERMAN ACT, 15 U.S.C. § 2 (AGAINST JOHN DOE DEFENDANTS)

290. Plaintiffs incorporate each preceding and succeeding paragraph as though fully set forth herein.

291. This Claim is brought with respect to VIX Options, VIX Futures, SPX Options, and VIX ETPs.

292. Each of the John Doe Defendants traded and placed orders for SPX Options to manipulate the SOQ settlement process for expiring VIX Options and VIX Futures so that they could gain large cash windfalls, or avoid large cash expenses, or both.

293. The John Doe Defendants' trades and orders for SPX Options were at non-competitive prices that purposely inflated or depressed prices for SPX Options, VIX Options, VIX Futures, and VIX ETPs, in a direction that benefited the John Doe Defendants.

294. The John Doe Defendants possessed monopoly power and willfully maintained that power, through their intent and ability to dictate the SOQ settlement prices.

295. The John Doe Defendants used their monopoly power to dictate the SOQ settlement prices, including to set those prices at artificial levels by trading SPX Options, in order to prevent free markets from operating, and in order to move the prices for SPX Options, VIX Options, VIX Futures, and VIX ETPs in a direction that benefited the John Doe Defendants.

296. The John Doe Defendants' ability to control prices is demonstrated by the anomalous patterns demonstrated in Plaintiffs' experts' economic analyses.

297. The John Doe Defendants' conduct has no legitimate business purpose or procompetitive effect.

298. Plaintiffs and the Class have suffered and will suffer economic injury of the type that the antitrust law were intended to prevent.

299. Plaintiffs and the Class have been injured and will be injured by the harm to competition as a result of the John Doe Defendants' conduct.

PRAYER FOR RELIEF

300. WHEREFORE, Plaintiffs, on behalf of themselves and the proposed Class of similarly situated persons and entities, respectfully request:

a. That the Court certify this lawsuit as a class action under Rules 23(a) and (b)(3) of the Federal Rules of Civil Procedure, that Plaintiffs be designated as class representatives, and that Plaintiffs' counsel be appointed as Class counsel for the Class;

b. For a judgment awarding Plaintiffs and the Class damages, as well as punitive or exemplary damages, against Defendants for their violations of the Exchange Act, and the CEA, together with prejudgment interest at the maximum rate allowable by law;

c. For an award to Plaintiffs and the Class of their costs of suit, including reasonable attorneys' and experts' fees and expenses; and

d. For such other and further relief as the Court may deem just and proper.

JURY DEMAND

Pursuant to Federal Rule of Civil Procedure 38, Plaintiffs, on behalf of themselves and the proposed Class, demand a trial by jury on all issues so triable.

Dated: September 28, 2018

Respectfully submitted,

By: */s/ Jonathan C. Bunge*

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