

Required fields are shown with yellow backgrounds and asterisks.

Page 1 of * 67	SECURITIES AND EXCHANGE COMMISSION WASHINGTON, D.C. 20549 Form 19b-4		File No.* SR - 2020 - * 41	Amendment No. (req. for Amendments *)
Filing by Nasdaq PHLX LLC Pursuant to Rule 19b-4 under the Securities Exchange Act of 1934				
Initial * <input checked="" type="checkbox"/>	Amendment * <input type="checkbox"/>	Withdrawal <input type="checkbox"/>	Section 19(b)(2) * <input checked="" type="checkbox"/>	Section 19(b)(3)(A) * <input type="checkbox"/>
			Section 19(b)(3)(B) * <input type="checkbox"/>	
Pilot <input type="checkbox"/>	Extension of Time Period for Commission Action * <input type="checkbox"/>	Date Expires * <input type="text"/>	Rule <input type="checkbox"/> 19b-4(f)(1) <input type="checkbox"/> 19b-4(f)(4) <input type="checkbox"/> 19b-4(f)(2) <input type="checkbox"/> 19b-4(f)(5) <input type="checkbox"/> 19b-4(f)(3) <input type="checkbox"/> 19b-4(f)(6)	
Notice of proposed change pursuant to the Payment, Clearing, and Settlement Act of 2010			Security-Based Swap Submission pursuant to the Securities Exchange Act of 1934	
Section 806(e)(1) * <input type="checkbox"/>	Section 806(e)(2) * <input type="checkbox"/>		Section 3C(b)(2) * <input type="checkbox"/>	
Exhibit 2 Sent As Paper Document <input type="checkbox"/>	Exhibit 3 Sent As Paper Document <input type="checkbox"/>			
<b>Description</b>				
Provide a brief description of the action (limit 250 characters, required when Initial is checked *).				
<input type="text" value="A proposal to list and trade options on a Nasdaq 100 Volatility Index"/>				
<b>Contact Information</b>				
Provide the name, telephone number, and e-mail address of the person on the staff of the self-regulatory organization prepared to respond to questions and comments on the action.				
First Name *	<input type="text" value="Angela"/>	Last Name *	<input type="text" value="Dunn"/>	
Title *	<input type="text" value="Principal Associate General Counsel"/>			
E-mail *	<input type="text" value="angela.dunn@nasdaq.com"/>			
Telephone *	<input type="text" value="(215) 496-5692"/>	Fax	<input type="text"/>	
<b>Signature</b>				
Pursuant to the requirements of the Securities Exchange Act of 1934,				
has duly caused this filing to be signed on its behalf by the undersigned thereunto duly authorized.				
(Title *)				
Date	<input type="text" value="08/14/2020"/>	<input type="text" value="EVP and Chief Legal Counsel"/>		
By	<input type="text" value="John Zecca"/>	<input type="text"/>		
(Name *)				
NOTE: Clicking the button at right will digitally sign and lock this form. A digital signature is as legally binding as a physical signature, and once signed, this form cannot be changed.				
<input type="button" value="john.zecca@nasdaq.com"/>				

SECURITIES AND EXCHANGE COMMISSION  
WASHINGTON, D.C. 20549

For complete Form 19b-4 instructions please refer to the EFFF website.

**Form 19b-4 Information \***

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The self-regulatory organization must provide all required information, presented in a clear and comprehensible manner, to enable the public to provide meaningful comment on the proposal and for the Commission to determine whether the proposal is consistent with the Act and applicable rules and regulations under the Act.

**Exhibit 1 - Notice of Proposed Rule Change \***

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The Notice section of this Form 19b-4 must comply with the guidelines for publication in the Federal Register as well as any requirements for electronic filing as published by the Commission (if applicable). The Office of the Federal Register (OFR) offers guidance on Federal Register publication requirements in the Federal Register Document Drafting Handbook, October 1998 Revision. For example, all references to the federal securities laws must include the corresponding cite to the United States Code in a footnote. All references to SEC rules must include the corresponding cite to the Code of Federal Regulations in a footnote. All references to Securities Exchange Act Releases must include the release number, release date, Federal Register cite, Federal Register date, and corresponding file number (e.g., SR-[SRO]-xx-xx). A material failure to comply with these guidelines will result in the proposed rule change being deemed not properly filed. See also Rule 0-3 under the Act (17 CFR 240.0-3)

**Exhibit 1A- Notice of Proposed Rule Change, Security-Based Swap Submission, or Advance Notice by Clearing Agencies \***

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The Notice section of this Form 19b-4 must comply with the guidelines for publication in the Federal Register as well as any requirements for electronic filing as published by the Commission (if applicable). The Office of the Federal Register (OFR) offers guidance on Federal Register publication requirements in the Federal Register Document Drafting Handbook, October 1998 Revision. For example, all references to the federal securities laws must include the corresponding cite to the United States Code in a footnote. All references to SEC rules must include the corresponding cite to the Code of Federal Regulations in a footnote. All references to Securities Exchange Act Releases must include the release number, release date, Federal Register cite, Federal Register date, and corresponding file number (e.g., SR-[SRO]-xx-xx). A material failure to comply with these guidelines will result in the proposed rule change, security-based swap submission, or advance notice being deemed not properly filed. See also Rule 0-3 under the Act (17 CFR 240.0-3)

**Exhibit 2 - Notices, Written Comments, Transcripts, Other Communications**

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Exhibit Sent As Paper Document

Copies of notices, written comments, transcripts, other communications. If such documents cannot be filed electronically in accordance with Instruction F, they shall be filed in accordance with Instruction G.

**Exhibit 3 - Form, Report, or Questionnaire**

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Exhibit Sent As Paper Document

Copies of any form, report, or questionnaire that the self-regulatory organization proposes to use to help implement or operate the proposed rule change, or that is referred to by the proposed rule change.

**Exhibit 4 - Marked Copies**

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The full text shall be marked, in any convenient manner, to indicate additions to and deletions from the immediately preceding filing. The purpose of Exhibit 4 is to permit the staff to identify immediately the changes made from the text of the rule with which it has been working.

**Exhibit 5 - Proposed Rule Text**

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The self-regulatory organization may choose to attach as Exhibit 5 proposed changes to rule text in place of providing it in Item I and which may otherwise be more easily readable if provided separately from Form 19b-4. Exhibit 5 shall be considered part of the proposed rule change.

**Partial Amendment**

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If the self-regulatory organization is amending only part of the text of a lengthy proposed rule change, it may, with the Commission's permission, file only those portions of the text of the proposed rule change in which changes are being made if the filing (i.e. partial amendment) is clearly understandable on its face. Such partial amendment shall be clearly identified and marked to show deletions and additions.

1. Text of the Proposed Rule Change

(a) Nasdaq PHLX LLC (“Phlx” or “Exchange”), pursuant to Section 19(b)(1) of the Securities Exchange Act of 1934 (“Act”)<sup>1</sup> and Rule 19b-4 thereunder,<sup>2</sup> is filing with the Securities and Exchange Commission (“SEC” or “Commission”) a proposal to list and trade options on a Nasdaq-100<sup>®</sup> Volatility Index (Ticker Symbol: VOLQ), a new index that measures changes in 30-day implied volatility of the Nasdaq-100 Index. Options on the new index, also ticker symbol VOLQ, will be cash-settled and will have European-style exercise provisions.

A notice of the proposed rule change for publication in the Federal Register is attached as Exhibit 1. The text of the proposed rule change is attached as Exhibit 5.

(b) Not applicable.

(c) Not applicable.

2. Procedures of the Self-Regulatory Organization

The proposed rule change was approved by senior management of the Exchange pursuant to authority delegated by the Board of Directors (the “Board”) on September 25, 2019. Exchange staff will advise the Board of any action taken pursuant to delegated authority. No other action is necessary for the filing of the rule change.

Questions and comments on the proposed rule change may be directed to:

Angela Saccomandi Dunn  
Principal Associate General Counsel  
Nasdaq, Inc.  
215-496-5692

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<sup>1</sup> 15 U.S.C. 78s(b)(1).

<sup>2</sup> 17 CFR 240.19b-4.

3. Self-Regulatory Organization's Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

a. Purpose

The Exchange proposes to introduce a new options index product, the Nasdaq-100 Volatility Index (the "Volatility Index"). This product would enable retail and institutional investors to manage volatility versus price risk. This index will measure "at-the-money" volatility, a precise measure of volatility used by investors. Unlike other indexes, this proposed novel product isolates at-the-money volatility for precise trading and hedging strategies. This product will provide investors information on volatility index returns by allowing them to observe increases and decreases of the Volatility Index.

Specifically, the Exchange proposes to provide for the listing and trading on the Exchange of options on a new index that measures changes in 30-day implied volatility of the Nasdaq-100 Index (commonly known as and referred to by its ticker symbol, NDX). Options on the Volatility Index will be cash-settled and will have European-style exercise provisions. The Volatility Index, calculated using published real-time bid/ask quotes of NDX options, represents 30-day implied volatility and will be disseminated in annualized percentage points. The Exchange proposes to amend Options 4A, Section 12, "Terms of Option Contracts," at subparagraphs (b)(2), (b)(6) and (e) as well as Supplementary Material .01 to Options 4A, Section 12. The Exchange also proposes to amend Options 3. Section 3, "Minimum Increments" and Options 4A, Section 6, "Position Limits."

The Exchange proposes to list up to six weekly expirations and up to 12 standard (monthly) expirations in Volatility Index options. The six weekly expirations would be for the nearest weekly expirations from the actual listing date, and the weekly expirations

would not expire in the same week in which standard (monthly) Volatility Index options expire. Standard (monthly) expirations in the Volatility Index options would not be counted as part of the maximum six weekly expirations permitted for Volatility Index options.<sup>3</sup>

#### *Volatility Index Design and Composition*

The calculation of the Volatility Index is based on the methodology developed by NShares LLC, a firm that develops proprietary derivatives-based indexes and options enhanced indexes. The Volatility Index reflects changes in 30-day implied volatility, which measures magnitude of changes of the underlying broad-based securities index, NDX, calculated and maintained by Nasdaq, Inc., which is an affiliate of the Exchange. The Nasdaq-100 Index includes 100 of the largest<sup>4</sup> domestic and international non-financial companies listed on The Nasdaq Stock Market LLC based on market capitalization. The Index reflects companies across major industry groups including computer hardware and software, telecommunications, retail/wholesale trade and biotechnology. It does not contain securities of financial companies including investment companies.

The Volatility Index, which is a broad-based securities index pursuant to Phlx

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<sup>3</sup> See Options 4A, Section 12, Terms of Option Contracts, proposed new section (b)(viii)(A), which is based upon Cboe Exchange, Inc. (“Cboe”) Rule 4.13(a)(2) as applicable to Volatility Index (“VIX”) options.

<sup>4</sup> As of June 30, 2020, there were 78 components in the bottom 25% of Nasdaq-100 Index weight. From January 1 through June 30, 2020, these components had an Average Daily Dollar Trading Volume of \$29.7 billion. The Average Daily Dollar Trading Volume of the least active component was \$41.1 million. The aggregate market capitalization of the 78 components was \$2.60 trillion.

Options 4A, Section 2(a)(13)<sup>5</sup>, measures the expectation for market volatility over the next 30 calendar days as expressed by options on NDX. The Volatility Index uses the prices of certain listed options on NDX to obtain the prices of synthetic precisely at-the-money (“ATM”) options. The ultimate Volatility Index component options used directly in the computation include a total of eight NDX options from each of four expirations for a total of thirty-two component options derived from observation of thirty-two NDX option bids and thirty-two NDX options offers (a total of sixty-four input observations). The synthetic ATM option prices are then used to calculate 30-day closed-form implied volatility. The result is a closed-form measure of implied volatility for the Nasdaq-100 Index that focuses on the options practitioners, hedgers, and traders use most, at-the-money options.

The generalized formula for Closed-Form Implied Volatility (CFIV) is:

$$\text{Closed Form Implied Volatility} = \frac{\sqrt{2\pi}}{\left(\frac{F}{e^{R*T}} * \sqrt{T}\right)} * \text{Precisely ATM Option Price}$$

Where:

F is the forward price for the underlying asset calculated using put/call parity;

R is the annualized risk free rate;

T is time to expiration expressed as a fraction of a year;

Precisely ATM Option Price is the calculated price for an option with a strike price exactly equal to the forward price.

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<sup>5</sup> Options 4A, Section 2(a)(13) define a “market index” and “broad-based index” to mean an index designed to be representative of a stock market as a whole or of a range of companies in unrelated industries. Like the Cboe Volatility Index (“VIX”), the Nasdaq-100 Volatility Index is an implied volatility index and not a realized volatility index.

The formula for the Volatility Index is:

$$VOLQ = 100 * CFIV_{30-Day}$$

Where:

CFIV<sub>30-Day</sub> is calculated using the Closed Form Implied Volatility for four weekly expirations as described in the methodology document attached as Exhibit 3-1.

The underlying asset for the Volatility Index is NDX. The thirty-two NDX component options used directly in the index calculation consist of the first and second in-the-money and the first and second out-of-the-money call and put options in the first-term, second-term, third-term, and fourth-term expirations (as described below). The price of any option is computed as the simple average of the best bid and ask prices (accordingly, thirty-two bids and thirty-two asks are observed for a total of sixty-four initial input observations to arrive at thirty-two Volatility Index components). The relevant NDX option prices used in the Volatility Index construction are the NBBO (National Best Bid and Offer).

This proposed broad-based product does not have single or aggregated component concentration risk. The methodology caps each single component as well as the top five weighted components. Specifically, no component security of the Volatility Index comprises more than 12.50% of the index's weighting. Further, the five highest weighted component securities of the Volatility Index in the aggregate do not comprise more than 43.75% of the index's weighting.

The options on NDX used in the Volatility Index calculation are the A.M.- and P.M.-settled options expiring on Friday, unless Friday is an exchange holiday. The A.M.-settled options are those which expire on the third Friday of the month. The P.M.-

settled options are those which expire on other Fridays during the month. At the beginning of regular trading hours (9:30 A.M. ET) each Thursday (or the commencement of trading on the next trading day if Thursday is an exchange holiday), the constituent options “roll” to new contract maturities. The new first-term options are those expiring on the Friday (or the expiration immediately prior to that Friday, if an exchange holiday), which is 22 days after the nominal Thursday roll date. The new second-term options are those expiring on the Friday (or the expiration immediately prior to that Friday, if an exchange holiday), which is 29 days after the nominal Thursday roll date. The new third-term options are those expiring on the Friday (or the expiration immediately subsequent to the Friday, if an exchange holiday), which is 36 days after the nominal Thursday roll date. The new fourth-term options are those expiring on the Friday (or the expiration immediately subsequent to the Friday, if an exchange holiday), which is 43 days after the nominal Thursday roll date.

The Volatility Index is quoted in annualized percentage points. For example, an Index level of 17.90 represents an annualized implied volatility of 17.90%.

#### *Index Calculation and Maintenance*

The level of the Volatility Index will reflect the current 30-day implied volatility of NDX. The Volatility Index will be updated on a real-time basis on each trading day beginning at 9:30 A.M. and ending at 4:15 P.M. (New York time). If the current published value of a component is not available, the last published value will be used in the calculation.

Values of the Volatility Index will be disseminated via the Nasdaq GIDS market data system every 15 seconds during the Exchange’s regular trading hours to market

information vendors such as Bloomberg and Thomson Reuters. In the event the Volatility Index ceases to be maintained or calculated the Exchange will not list any additional series for trading and will limit all transactions in such options to closing transactions only for the purpose of maintaining a fair and orderly market and protecting investors.

*Exercise and Settlement Value*

The exercise settlement value calculation used for Volatility Index option settlement would be calculated on the same day as the Volatility Index Options expiration date. The exercise settlement value of a Volatility Index option would be calculated on the specific date (usually a Wednesday) identified in the option symbol for the series. If that Wednesday or the Friday that is 30 days following that Wednesday is an Exchange holiday, the exercise settlement value would be calculated on the business day immediately preceding that Wednesday. The last trading day for a Volatility Index option would be the business day immediately preceding the expiration date of the Volatility Index option. When the last trading day is moved because of an Exchange holiday, the last trading day for an expiring Volatility Index option contract would be the day immediately preceding the last regularly scheduled business day.<sup>6</sup>

Monthly options on the Volatility Index would expire on the Wednesday that is thirty days prior to the third Friday of the calendar month immediately following the expiring month. Trading in expiring options on the Volatility Index would normally cease at 4:15 P.M. (New York time) on the Tuesday preceding an expiration Wednesday.

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<sup>6</sup> See Options 4A, Section 12, “Terms of Option Contracts,” proposed new section (b)(6)(B) and (C), which is based upon Cboe Rule 4.13(a)(5)(A)(2) and (C) as applicable to VIX options.

### Final Settlement

The final settlement price (Ticker Symbol: VOLS) would be calculated as described below on Wednesday commencing at 9:32:000 A.M. on the expiration day, and continuing each second for the next 300 seconds (New York time). The exercise settlement amount would be equal to the difference between the final settlement price and the exercise price of the option, multiplied by \$100. Exercise would result in the delivery of cash on the business day following expiration.

The Volatility Index's component NDX options are listed on Phlx as well as on the Exchange's affiliates, Nasdaq ISE, LLC ("ISE") and Nasdaq GEMX, LLC ("GEMX"). The settlement value for the Volatility Index options (ticker symbol "VOLS") will be the Closing Volume Weighted Average Price ("Closing VWAP"), to be determined by reference to the prices and sizes of executed transactions or quotes in the thirty-two underlying NDX component options<sup>7</sup> on the Exchange calculated at the opening of trading on the expiration date (usually a Wednesday).

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<sup>7</sup> Dependent upon movement in the Nasdaq-100 Index, all of the Closing Settlement Period index (VOLS) thirty-two underlying NDX component options can change every second making live market final settlement replication unfeasible over 300 seconds. The Exchange notes the Commission approved CBOE's change to the VIX settlement methodology to provide additional protection against manipulation by exact replication whereby CBOE will be solely responsible for determining the strike range of the settlement strip, making it impossible for anyone to attempt to manipulate the VIX settlement process by attempting to artificially affect which SPX series will have zero bids at the opening and thus potentially be included in the settlement strip. See Securities Exchange Act Release No. 86879 (September 5, 2019), 84 FR 47984 (September 11, 2019) (SR-CBOE-2019-034).

The following process is used to calculate the Closing VWAP of the Volatility Index options.<sup>8</sup> At the end of individual one-second time observations during a 300 second period of time (the “Closing Settlement Period”)<sup>9</sup> commencing at 9:32:000 on the expiration day (or 2.00.001 minutes after the open of trading in the event trading does not commence at 9:30:00 a.m. ET),<sup>10</sup> and continuing each second for the next 300 seconds, the number of contracts traded on Phlx at each price during the observation period is multiplied by that price to yield a Reference Number.<sup>11</sup> All Reference Numbers are then summed, and that sum is then divided by the total number of contracts traded during the observation period [Sum of (contracts traded at a price x price) ÷ total contracts traded] to calculate a Volume Weighted Average Price for that observation period (a “One Second VWAP”) for that component option. If no transactions occur on Phlx during any

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<sup>8</sup> The Exchange shall be the reporting authority for VOLQ Index Options. The term “reporting authority” in respect of a particular index means the institutions or reporting service designated by the Exchange as the official source for calculating and determining the current value or the closing index value of the index. See Phlx Options 4A, Section 2(a)(16).

<sup>9</sup> The Exchange notes the extensive five-minute length of the VOLS Closing Settlement Period is similar to final settlement construction of the EURO STOXX 50 VOLATILITY index (VSTOXX) (average of all valid ticks that index produced during an expanding time window starting at 11:30:00 CET up to the current calculation time and not later than 12:00:00 CET). Both VSTOXX and VOLS inject substantive randomization for which components may change and market participants cannot know index components on a forward-looking basis.

<sup>10</sup> If the Exchange is unable to publish a settlement value by 12:00 p.m. (New York Time) due to a trading halt, the Exchange will determine and publish a value on its website. In the event of a trading halt, the Exchange will commence the calculation of the settlement window beginning 2.00.001 minutes after the re-opening of trading.

<sup>11</sup> The Volatility Index final settlement treats options inclusion prices largely similar to the EURO STOXX 50 VOLATILITY (VSTOXX) index whereby the options inclusion price is defined as first priority, the most recent trade price and then second, the midpoint bid/ask price.

one-second observation period, the NBBO midpoint<sup>12</sup> at the end of the one second observation period will be considered the One Second VWAP for that observation period for purposes of this settlement methodology. Specifically, VOLS would seek the best bid and best offer (which may consist of a quote or an order) from among the listing markets, Phlx, ISE and GEMX markets.<sup>13</sup> Each One Second VWAP for each component option is then used to calculate the Volatility Index, resulting in the calculation of 300 sequential Volatility Index values. Finally, all 300 Volatility Index values will be arithmetically averaged (i.e., the sum of 300 Volatility Index calculations is divided by 300) and the resulting figure is rounded to the nearest .01 to arrive at the settlement value disseminated under the ticker symbol VOLS.<sup>14</sup>

The Exchange notes the Volatility Index final settlement has exceedingly high hurdles for potential manipulation. First, the Volatility Index assesses each second of the entire field of NDX options prices to select certain listed options to obtain the prices of synthetic precisely at-the-money options. Accordingly, since the market is subject to constant change during three hundred individual one-second time periods for which listed options will be included in final settlement, market participants cannot predict which

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<sup>12</sup> The Volatility Index's component NDX options are listed on Phlx as well as on the Exchange's affiliates, ISE, GEMX. NDX average bid/ask spreads for all component options at each second for each of four expiration dates (11/21/2018, 12/19/2018, 1/16/2019, and 2/13/2019) commencing at 9:30:15 A.M. is 5.52%. Commencing at 9:32:010 A.M. the NDX average bid/ask spreads for all component options at each second for each of four expiration dates is 3.72%, demonstrating quote stability at 2 minutes after the opening.

<sup>13</sup> By considering the NBBO of all three markets, the Exchange believes the risk of manipulation is tempered by the consideration of a larger number of quotes from multiple Market Makers.

<sup>14</sup> See Options 4A, Section 12, "Terms of Option Contracts," proposed new section (b)(6)(D)(II).

components will be included, which would entail predicting where the Nasdaq-100 Index price level (a function of predicting the price of all one-hundred component stocks) will be at the end of each of the three hundred individual one-second time periods.

Second, in the event the number of contracts traded at each price during the observation period is limited or zero, traders are subject to highly competitive market forces of deep and established market liquidity. Streaming bid/ask quotes on notional total contract value [Number of Contracts on Bid (Offer) times \$100 multiplier times the Nasdaq-100 Index price level] during the final settlement observation often exceed one billion dollars, a figure which would require substantive capital to influence quotes. Taken together, during each second of the final settlement observation period on January 16, 2019 and February 13, 2019, the average notional value of each bid of the thirty-two components was \$21.1 million; the average notional value of each offer was \$13.5 million. The sum of all thirty-two component notional value bid quotes was \$675.9 million; the sum of all thirty-two component notional value ask quotes was \$432.89 million (a bid/ask notional value of \$1.1 billion).

Third, since the Volatility Index assesses each second of all listed NDX options, this is a continuous assessment of competitive price action and voluminous trading activity for all Nasdaq-100 Index stock components. During the final settlement observation period (five-minute period) on January 16, 2019 and February 13, 2019, the average summation of traded volume for all Nasdaq-100 Index component shares was 18.8 million shares. The average total value of all Nasdaq-100 Index shares traded during the final settlement observation period was \$1.93 billion. The corresponding

market capitalization for all Nasdaq-100 Index components during the final settlement period was \$7.8 trillion.

*Contract Specifications*

The contract specifications for options on the Volatility Index are set forth in Exhibit 3-2. As noted above, the Volatility Index is a market index or a broad-based index, as defined in Phlx Options 4A, Section 2(a)(13). Options on the Volatility Index are European-style and cash-settled. The Exchange's standard trading hours for broad-based index options (9:30 A.M. to 4:15 P.M., New York time) will apply to the Volatility Index options under Phlx Options 4A, Section 12 at Supplementary Material .01, as proposed to be amended. The Exchange proposes to apply margin requirements for the purchase and sale of options on the Volatility Index that are identical to those applied for its other broad-based index options.

The trading of options on the Volatility Index will be subject to the trading halt procedures applicable to other index options traded on the Exchange.<sup>15</sup> Options on the Index will be quoted and traded in U.S. dollars.<sup>16</sup> Accordingly, all Exchange and The Options Clearing Corporation members will be able to accommodate trading, clearance and settlement of the Volatility Index without alteration. All options on the index would have a minimum increment for options trading below 3.00 of 0.05 (\$5.00) and for all other series, 0.10 (\$10.00).

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<sup>15</sup> Phlx Options 4A, Section 18(c), "Trading Rotations, Halts or Reopenings."

<sup>16</sup> Phlx Options 4A, Section 12(a)(1) titled "Meaning of Premium Bids and Offers," provides that bids and offers shall be expressed in terms of dollars and decimal equivalents of dollars per unit of the index (e.g., a bid of 85.50 would represent a bid of \$85.50 per unit).

The Exchange proposes to set the minimum strike price interval for options on the Volatility Index at \$0.50 or greater where the strike price is less than \$75, \$1 or greater where the strike price is \$200 or less and \$5 or greater where the strike price is more than \$200.<sup>17</sup> The Exchange believes that these strike price intervals will provide investors with greater flexibility by allowing them to establish positions that are better tailored to meet their investment objectives.

The Exchange proposes that there shall be no position or exercise limits for options on the Volatility Index. As noted above, the Volatility Index will settle using published volume and / or quotes from NDX options. Given that there are currently no position limits for NDX options,<sup>18</sup> the Exchange believes it is appropriate for there to be no position or exercise limits<sup>19</sup> for options on the Volatility Index. The underlying Nasdaq-100 Index includes 100 of the largest domestic and international non-financial securities listed on The Nasdaq Stock Market LLC based on market capitalization. The Index reflects companies across major industry groups including computer hardware and software, telecommunications, retail/wholesale trade and biotechnology. It does not contain securities of financial companies including investment companies. As of June 30, 2020, the Nasdaq-100 Index contained 74.7 billion component shares representing \$11.42 trillion market value. By extension, the Exchange believes that the same reasoning applies to options on the Volatility Index since the value of options on the

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<sup>17</sup> Phlx Options 4A, Section 12 “Terms of Option Contracts,” proposed new section (b)(6)(E).

<sup>18</sup> See Phlx Options 4A, Section 6, “Position Limits,” section (a)(ii).

<sup>19</sup> Phlx Options 4A, Section 10, “Exercise Limits,” provides “In determining compliance with Options 9, Section 15, exercise limits for index option contracts shall be equivalent to the position limits described in Options 4A, Section 6.”

Volatility Index is derived from the volatility of NDX as implied by its options. The Exchange notes that options on the Miami International Securities Exchange LLC (“MIAX”) SPIKES Index, and options on the Cboe Volatility (“VIX”) Index are also not subject to any position or exercise limits.<sup>20</sup> SPX, which underlies the Cboe Volatility Index, is one of the most actively trading index option and is, therefore, subject to no position limits. Accordingly, NDX, which underlies the VOLQ Index, is also one of the most actively trading index option and is, therefore, subject to no position limits.

The trading of options on the Volatility Index would be subject to the same rules that presently govern the trading of Exchange index options, including sales practice rules, margin requirements, and trading rules. In addition, long term option series having up to sixty months to expiration could be traded.<sup>21</sup> The trading of long term options on the Volatility Index would also be subject to the same rules that govern the trading of all the Exchange’s index options, including sales practice rules, margin requirements, and trading rules.

Options 10, Section 6, “Opening of Accounts,” is designed to protect public customer trading and shall apply to trading in options on the Volatility Index. Specifically, Options 10, Section 6(a) prohibits members and member organizations from

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<sup>20</sup> See ISE Options 4A, Section 12, Cboe Rule 4.13 and MIAX Rule 1804. Additionally, the Exchange notes there are currently a number of other actively-traded broad-based index options, i.e., DJX and SPX, that are not subject to any position or exercise limits.

<sup>21</sup> Phlx Options 4A, Section 12(b)(2), as proposed to be amended. Phlx Rule Options 4A, Section 12(b)(2) currently applies only to stock index options and would be amended to permit listing of long term Volatility Index options. The Commission has previously approved long term options on the Nations VolDex Index. See Securities Exchange Act Release No. 71365, 79 FR 4512 (January 28, 2014) (approving SR-ISE- 2013-42).

accepting a customer order to purchase or write an option, including options on the Volatility Index, unless such customer's account has been approved in writing by an Options Principal. Additionally, Phlx Options 10, Section 8, "Suitability," is designed to ensure that options, including options on the Volatility Index, are only sold to customers capable of evaluating and bearing the risks associated with trading in this instrument. Further, Phlx Options 10, Section 9, "Discretionary Accounts," permits members and member organizations to exercise discretionary power with respect to trading options, including options on the Volatility Index, in a customer's account only if the customer has given prior written authorization and the account has been accepted in writing by a Registered Options Principal. Phlx Options 10, Section 9 also requires a record to be made of every option transaction for an account in respect to which a member or member organization or a partner, officer or employee of a member organization is vested with any discretionary authority, such record to include the name of the customer, the designation, number of contracts and premium of the option contracts, the date and time when such transaction took place and clearly reflecting the fact that discretionary authority was exercised. Finally, Phlx Options 10, Section 7, "Supervision of Accounts," Phlx Options 10, Section 10, "Confirmations to Customers," and Phlx Options 10, Section 13, "Delivery of Options Disclosure Documents," will also apply to trading in options on the Volatility Index.

#### *Surveillance and Capacity*

The Exchange has an adequate surveillance program in place for options traded on the Volatility Index and intends to apply those same program procedures that it applies to the Exchange's other options products. Further, the Phlx Market Surveillance

Department conducts routine surveillance in approximately 30 discrete areas. Index products and their respective symbols are integrated into the Exchange's existing surveillance system architecture and are thus subject to the relevant surveillance processes. This is true for both surveillance system processing and manual processes that support the Phlx's surveillance program. Additionally, the Exchange is also a member of the Intermarket Surveillance Group ("ISG") under the Intermarket Surveillance Group Agreement, dated June 20, 1994. ISG members work together to coordinate surveillance and investigative information sharing in the stock and options markets.

The consistent liquidity of NDX options as well as the underlying NDX component securities ensures a multitude of market participants at any given time.<sup>22</sup> Indeed, at least twelve Market Makers actively traded NDX options on Phlx during December 2018 on any given day, and there are now three options exchanges that list NDX options. The Exchange reiterates that it is unlikely that the Volatility Index settlement value could be manipulated. In particular, because the 32 component Volatility Index option inputs<sup>23</sup> are reviewed each second as the market changes to determine the ATM strikes (meaning that Volatility Index components could change 300

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<sup>22</sup> NDX options one year (July 2019 – June 2020) average daily volume was 11,678 contracts per day. For a comparative measure of liquidity, the Russell 2000 (RUT) index options one year (July 2019 – June 2020) average daily volume surpassed NDX (36,998 contracts versus 11,678 contracts). However, NDX options average daily portfolio notional value is greater than Russell 2000 (RUT) options average daily portfolio notional value (\$10.09 billion versus \$4.94 billion). The NDX options average daily portfolio notional value is the product of the average daily volume times the one year (July 2019 – June 2020) median index price times the one-hundred dollar options index multiplier divided by 253 trading days.

<sup>23</sup> The Exchange notes that due to the number of proposed components, the mathematical formula would prevent the Volatility Index from exceeding 12.5% in any single component and 43.5% for the top 5 components.

times during the settlement period), market participants could manipulate the settlement value only if they could replicate such value by guessing exact market moves over an extended period of 300 million microseconds. Because the likelihood of replication is extremely low, the Exchange believes that it is unlikely the settlement value could be manipulated.

Nonetheless, the Exchange, in its normal course of surveillance, will monitor for any potential manipulation of the Volatility Index settlement value according to the Exchange's current procedures. Additionally, the Exchange would monitor the integrity of the Volatility Index by analyzing trades, quotations, and orders that affect any of the 300 calculated reference prices for any of the 32 NDX option series used for the final settlement calculation for potential manipulation on the Exchange.

In the context of surveillance, the Exchange will monitor all NDX NBBO quotes and trades (including but not limited to NDX quotes and trades on the Exchange) during the opening (from 09:32:01 A.M. to 09:37:00 A.M.) for each of the 32 at-the-money series utilized in the final settlement calculation for possible manipulation. It would also surveil for open interest manipulation by monitoring NDX positions prior to settlement to identify the economic interest (long and short), account type (customer, firm or market maker) and clearing members to evaluate customer, and firm interest in the Volatility Index options. Additionally, the Exchange will evaluate all trades in the NDX option series on the Phlx, ISE and GEMX options exchanges from one second after the Closing Settlement Period through end of the trading day for possible wash trading or related artificial activity. Finally, the Exchange will monitor for manipulation by comparing quotes for settlement against quotes for non-settlement in the 32 NDX option series used

for settlement between the opening, and a period of time thereafter, with a focus on identifying deviations of the midpoint, the bid-ask spread and other market elements compared to the Nasdaq-100 Index value.

The Exchange believes that its surveillance procedures currently in place, coupled with the additional measures proposed above, will allow it to adequately surveil for any potential manipulation in the trading of Volatility Index options.

The Exchange represents that it has the necessary system capacity to support additional quotations and messages that will result from the listing and trading of options on the Volatility Index.

#### Implementation

The Exchange proposes to issue an Options Trader Alert announcing the day it will launch options on Nasdaq-100 Volatility Index. The Exchange will launch these options by Q3 2021. The Exchange will issue an Options Trader Alert to announce the launch date.

The Exchange also proposes minor technical amendments within Options 4A, Sections 6 and 12 to update the name of the Nasdaq-100 Index.

#### b. Statutory Basis

The Exchange believes that its proposal is consistent with Section 6(b) of the Act,<sup>24</sup> in general, and furthers the objectives of Section 6(b)(5) of the Act,<sup>25</sup> in particular, in that it will permit options trading in the Volatility Index pursuant to rules designed to prevent fraudulent and manipulative acts and practices and promote just and equitable

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<sup>24</sup> 15 U.S.C. 78f(b).

<sup>25</sup> 15 U.S.C. 78f(b)(5).

principles of trade. In particular, the Exchange believes the proposed rule change will further the Exchange's goal of introducing new and innovative products to the marketplace. The Exchange believes that listing options on the Volatility Index will provide an opportunity for investors to hedge, or speculate on, the market risk associated with changes in 30-day implied volatility.

Volatility-focused products have become more prominent over the past few years, and in a number of different formats and types, including ETFs, exchange-traded notes, exchange-traded options, and exchange-traded futures. Such products offer investors the opportunity to manage their volatility risks associated with an underlying asset class. Currently, most of the products focus on underlying equity indexes or equity-based portfolios. The Exchange proposes to introduce a cash-settled options contract on a new volatility index, which focuses on equity exposure using options on the NDX, which are actively traded equity option products. The Exchange believes that because the Volatility Index is derived from published NDX options prices, and given the immense liquidity found in the individual security components of NDX as well as the aggregate index market value of \$7.24 trillion, the concern that the Volatility Index will be subject to market manipulation is greatly reduced. Therefore, the Exchange believes that the proposed rule change to list options on the Volatility Index is appropriate.

The Exchange further notes that Phlx rules that apply to the trading of other index options currently traded on the Exchange would also apply to the trading of options on the Volatility Index. The Exchange proposes to utilize nickel and dime increments for trading the Volatility Index options. The Exchange believes that these trading increments will enable traders to make the most effective use of the product for trading and hedging

purposes. Additionally, the trading of options on the Volatility Index would be subject to, among others, Exchange rules governing margin requirements and trading halt procedures. Finally, the Exchange represents that it has an adequate surveillance program in place to detect manipulative trading in options on the Volatility Index. The Exchange also represents that it has the necessary systems capacity to support the new options series. And as stated in the filing, the Exchange has rules in place designed to protect public customer trading.

Phlx's proposal to initiate the Closing Settlement Period at 2 minutes after the underlying market opens is intended to permit the price of the underlying NDX component security to settle down and not flicker back and forth among prices after its opening. It is common for options to fluctuate in price immediately upon opening; such volatility reflects a natural uncertainty about the ultimate opening price of all Nasdaq-100 Index component stocks while the buy and sell interest is matched. The Exchange notes that this delay ensures more stability in the marketplace prior to initiating the settlement. The Exchange's decision to initiate the Closing Settlement Period at 2 minutes after the underlying market opens ensures that it has the ability for Market Makers to gain information and certainty after the underlying market has opened before submitting quotes. This 2 minute delay before the Closing Settlement Period commences permits Market Makers to submit informed quotes which the Exchange believes would be tighter given the added certainty. Market Makers provide necessary liquidity to the marketplace.

#### 4. Self-Regulatory Organization's Statement on Burden on Competition

This proposed rule change does not impose any burden on competition that is not necessary or appropriate in furtherance of the purposes of the Act. The Exchange notes that the proposed rule change will facilitate the listing and trading of an index option

product with a novel structure that will enhance competition among market participants, to the benefit of investors and the marketplace.

5. Self-Regulatory Organization's Statement on Comments on the Proposed Rule Change Received from Members, Participants, or Others

No written comments were either solicited or received.

6. Extension of Time Period for Commission Action

Not Applicable.

7. Basis for Summary Effectiveness Pursuant to Section 19(b)(3) or for Accelerated Effectiveness Pursuant to Section 19(b)(2)

Not Applicable.

8. Proposed Rule Change Based on Rules of Another Self-Regulatory Organization or of the Commission

Not Applicable.

9. Security-Based Swap Submissions Filed Pursuant to Section 3C of the Act

Not Applicable.

10. Advance Notices Filed Pursuant to Section 806(e) of the Payment, Clearing and Settlement Supervision Act

Not Applicable.

11. Exhibits

1. Notice of Proposed Rule Change for publication in the Federal Register.

5. Text of the proposed rule change.

**EXHIBIT 1**

SECURITIES AND EXCHANGE COMMISSION  
(Release No. \_\_\_\_\_ ; File No. SR-Phlx-2020-41)

August \_\_, 2020

Self-Regulatory Organizations; Nasdaq PHLX LLC; Notice of Filing of Proposed Rule Change to List and Trade Options on a Nasdaq-100<sup>®</sup> Volatility Index

Pursuant to Section 19(b)(1) of the Securities Exchange Act of 1934 (“Act”)<sup>1</sup>, and Rule 19b-4 thereunder,<sup>2</sup> notice is hereby given that on August 14, 2020, Nasdaq PHLX LLC (“Phlx” or “Exchange”) filed with the Securities and Exchange Commission (“SEC” or “Commission”) the proposed rule change as described in Items I, II, and III, below, which Items have been prepared by the Exchange. The Commission is publishing this notice to solicit comments on the proposed rule change from interested persons.

I. Self-Regulatory Organization’s Statement of the Terms of Substance of the Proposed Rule Change

The Exchange proposes to list and trade options on a Nasdaq-100<sup>®</sup> Volatility Index (Ticker Symbol: VOLQ), a new index that measures changes in 30-day implied volatility of the Nasdaq-100 Index. Options on the new index, also ticker symbol VOLQ, will be cash-settled and will have European-style exercise provisions.

The text of the proposed rule change is available on the Exchange’s Website at <https://listingcenter.nasdaq.com/rulebook/phlx/rules>, at the principal office of the Exchange, and at the Commission’s Public Reference Room.

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<sup>1</sup> 15 U.S.C. 78s(b)(1).

<sup>2</sup> 17 CFR 240.19b-4.

II. Self-Regulatory Organization's Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

In its filing with the Commission, the Exchange included statements concerning the purpose of and basis for the proposed rule change and discussed any comments it received on the proposed rule change. The text of these statements may be examined at the places specified in Item IV below. The Exchange has prepared summaries, set forth in sections A, B, and C below, of the most significant aspects of such statements.

A. Self-Regulatory Organization's Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

1. Purpose

The Exchange proposes to introduce a new options index product, the Nasdaq-100 Volatility Index (the "Volatility Index"). This product would enable retail and institutional investors to manage volatility versus price risk. This index will measure "at-the-money" volatility, a precise measure of volatility used by investors. Unlike other indexes, this proposed novel product isolates at-the-money volatility for precise trading and hedging strategies. This product will provide investors information on volatility index returns by allowing them to observe increases and decreases of the Volatility Index.

Specifically, the Exchange proposes to provide for the listing and trading on the Exchange of options on a new index that measures changes in 30-day implied volatility of the Nasdaq-100 Index (commonly known as and referred to by its ticker symbol, NDX). Options on the Volatility Index will be cash-settled and will have European-style exercise provisions. The Volatility Index, calculated using published real-time bid/ask quotes of NDX options, represents 30-day implied volatility and will be disseminated in annualized percentage points. The Exchange proposes to amend Options 4A, Section 12, "Terms of Option Contracts," at subparagraphs (b)(2), (b)(6) and (e) as well as

Supplementary Material .01 to Options 4A, Section 12. The Exchange also proposes to amend Options 3. Section 3, “Minimum Increments” and Options 4A, Section 6, “Position Limits.”

The Exchange proposes to list up to six weekly expirations and up to 12 standard (monthly) expirations in Volatility Index options. The six weekly expirations would be for the nearest weekly expirations from the actual listing date, and the weekly expirations would not expire in the same week in which standard (monthly) Volatility Index options expire. Standard (monthly) expirations in the Volatility Index options would not be counted as part of the maximum six weekly expirations permitted for Volatility Index options.<sup>3</sup>

#### *Volatility Index Design and Composition*

The calculation of the Volatility Index is based on the methodology developed by NShares LLC, a firm that develops proprietary derivatives-based indexes and options enhanced indexes. The Volatility Index reflects changes in 30-day implied volatility, which measures magnitude of changes of the underlying broad-based securities index, NDX, calculated and maintained by Nasdaq, Inc., which is an affiliate of the Exchange. The Nasdaq-100 Index includes 100 of the largest<sup>4</sup> domestic and international non-financial companies listed on The Nasdaq Stock Market LLC based on market

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<sup>3</sup> See Options 4A, Section 12, Terms of Option Contracts, proposed new section (b)(viii)(A), which is based upon Cboe Exchange, Inc. (“Cboe”) Rule 4.13(a)(2) as applicable to Volatility Index (“VIX”) options.

<sup>4</sup> As of June 30, 2020, there were 78 components in the bottom 25% of Nasdaq-100 Index weight. From January 1 through June 30, 2020, these components had an Average Daily Dollar Trading Volume of \$29.7 billion. The Average Daily Dollar Trading Volume of the least active component was \$41.1 million. The aggregate market capitalization of the 78 components was \$2.60 trillion.

capitalization. The Index reflects companies across major industry groups including computer hardware and software, telecommunications, retail/wholesale trade and biotechnology. It does not contain securities of financial companies including investment companies.

The Volatility Index, which is a broad-based securities index pursuant to Phlx Options 4A, Section 2(a)(13)<sup>5</sup>, measures the expectation for market volatility over the next 30 calendar days as expressed by options on NDX. The Volatility Index uses the prices of certain listed options on NDX to obtain the prices of synthetic precisely at-the-money (“ATM”) options. The ultimate Volatility Index component options used directly in the computation include a total of eight NDX options from each of four expirations for a total of thirty-two component options derived from observation of thirty-two NDX option bids and thirty-two NDX options offers (a total of sixty-four input observations). The synthetic ATM option prices are then used to calculate 30-day closed-form implied volatility. The result is a closed-form measure of implied volatility for the Nasdaq-100 Index that focuses on the options practitioners, hedgers, and traders use most, at-the-money options.

The generalized formula for Closed-Form Implied Volatility (CFIV) is:

$$\text{Closed Form Implied Volatility} = \frac{\sqrt{2\pi}}{\left(\frac{F}{e^{R*T}} * \sqrt{T}\right)} * \text{Precisely ATM Option Price}$$

Where:

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<sup>5</sup> Options 4A, Section 2(a)(13) define a “market index” and “broad-based index” to mean an index designed to be representative of a stock market as a whole or of a range of companies in unrelated industries. Like the Cboe Volatility Index (“VIX”), the Nasdaq-100 Volatility Index is an implied volatility index and not a realized volatility index.

F is the forward price for the underlying asset calculated using put/call parity;

R is the annualized risk free rate;

T is time to expiration expressed as a fraction of a year;

Precisely ATM Option Price is the calculated price for an option with a strike price exactly equal to the forward price.

The formula for the Volatility Index is:

$$VOLQ = 100 * CFIV_{30-Day}$$

Where:

CFIV<sub>30-Day</sub> is calculated using the Closed Form Implied Volatility for four weekly expirations as described in the methodology document attached as Exhibit 3-1.

The underlying asset for the Volatility Index is NDX. The thirty-two NDX component options used directly in the index calculation consist of the first and second in-the-money and the first and second out-of-the-money call and put options in the first-term, second-term, third-term, and fourth-term expirations (as described below). The price of any option is computed as the simple average of the best bid and ask prices (accordingly, thirty-two bids and thirty-two asks are observed for a total of sixty-four initial input observations to arrive at thirty-two Volatility Index components). The relevant NDX option prices used in the Volatility Index construction are the NBBO (National Best Bid and Offer).

This proposed broad-based product does not have single or aggregated component concentration risk. The methodology caps each single component as well as the top five weighted components. Specifically, no component security of the Volatility Index comprises more than 12.50% of the index's weighting. Further, the five highest weighted

component securities of the Volatility Index in the aggregate do not comprise more than 43.75% of the index's weighting.

The options on NDX used in the Volatility Index calculation are the A.M.- and P.M.-settled options expiring on Friday, unless Friday is an exchange holiday. The A.M.-settled options are those which expire on the third Friday of the month. The P.M.-settled options are those which expire on other Fridays during the month. At the beginning of regular trading hours (9:30 A.M. ET) each Thursday (or the commencement of trading on the next trading day if Thursday is an exchange holiday), the constituent options "roll" to new contract maturities. The new first-term options are those expiring on the Friday (or the expiration immediately prior to that Friday, if an exchange holiday), which is 22 days after the nominal Thursday roll date. The new second-term options are those expiring on the Friday (or the expiration immediately prior to that Friday, if an exchange holiday), which is 29 days after the nominal Thursday roll date. The new third-term options are those expiring on the Friday (or the expiration immediately subsequent to the Friday, if an exchange holiday), which is 36 days after the nominal Thursday roll date. The new fourth-term options are those expiring on the Friday (or the expiration immediately subsequent to the Friday, if an exchange holiday), which is 43 days after the nominal Thursday roll date.

The Volatility Index is quoted in annualized percentage points. For example, an Index level of 17.90 represents an annualized implied volatility of 17.90%.

#### *Index Calculation and Maintenance*

The level of the Volatility Index will reflect the current 30-day implied volatility of NDX. The Volatility Index will be updated on a real-time basis on each trading day

beginning at 9:30 A.M. and ending at 4:15 P.M. (New York time). If the current published value of a component is not available, the last published value will be used in the calculation.

Values of the Volatility Index will be disseminated via the Nasdaq GIDS market data system every 15 seconds during the Exchange's regular trading hours to market information vendors such as Bloomberg and Thomson Reuters. In the event the Volatility Index ceases to be maintained or calculated the Exchange will not list any additional series for trading and will limit all transactions in such options to closing transactions only for the purpose of maintaining a fair and orderly market and protecting investors.

#### *Exercise and Settlement Value*

The exercise settlement value calculation used for Volatility Index option settlement would be calculated on the same day as the Volatility Index Options expiration date. The exercise settlement value of a Volatility Index option would be calculated on the specific date (usually a Wednesday) identified in the option symbol for the series. If that Wednesday or the Friday that is 30 days following that Wednesday is an Exchange holiday, the exercise settlement value would be calculated on the business day immediately preceding that Wednesday. The last trading day for a Volatility Index option would be the business day immediately preceding the expiration date of the Volatility Index option. When the last trading day is moved because of an Exchange

holiday, the last trading day for an expiring Volatility Index option contract would be the day immediately preceding the last regularly scheduled business day.<sup>6</sup>

Monthly options on the Volatility Index would expire on the Wednesday that is thirty days prior to the third Friday of the calendar month immediately following the expiring month. Trading in expiring options on the Volatility Index would normally cease at 4:15 P.M. (New York time) on the Tuesday preceding an expiration Wednesday.

#### Final Settlement

The final settlement price (Ticker Symbol: VOLS) would be calculated as described below on Wednesday commencing at 9:32:000 A.M. on the expiration day, and continuing each second for the next 300 seconds (New York time). The exercise settlement amount would be equal to the difference between the final settlement price and the exercise price of the option, multiplied by \$100. Exercise would result in the delivery of cash on the business day following expiration.

The Volatility Index's component NDX options are listed on Phlx as well as on the Exchange's affiliates, Nasdaq ISE, LLC ("ISE") and Nasdaq GEMX, LLC ("GEMX"). The settlement value for the Volatility Index options (ticker symbol "VOLS") will be the Closing Volume Weighted Average Price ("Closing VWAP"), to be determined by reference to the prices and sizes of executed transactions or quotes in the thirty-two underlying NDX component options<sup>7</sup> on the Exchange calculated at the opening of trading on the expiration date (usually a Wednesday).

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<sup>6</sup> See Options 4A, Section 12, "Terms of Option Contracts," proposed new section (b)(6)(B) and (C), which is based upon Cboe Rule 4.13(a)(5)(A)(2) and (C) as applicable to VIX options.

<sup>7</sup> Dependent upon movement in the Nasdaq-100 Index, all of the Closing Settlement Period index (VOLS) thirty-two underlying NDX component options

The following process is used to calculate the Closing VWAP of the Volatility Index options.<sup>8</sup> At the end of individual one-second time observations during a 300 second period of time (the “Closing Settlement Period”)<sup>9</sup> commencing at 9:32:000 on the expiration day (or 2.00.001 minutes after the open of trading in the event trading does not commence at 9:30:00 a.m. ET),<sup>10</sup> and continuing each second for the next 300 seconds, the number of contracts traded on Phlx at each price during the observation period is

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can change every second making live market final settlement replication unfeasible over 300 seconds. The Exchange notes the Commission approved CBOE’s change to the VIX settlement methodology to provide additional protection against manipulation by exact replication whereby CBOE will be solely responsible for determining the strike range of the settlement strip, making it impossible for anyone to attempt to manipulate the VIX settlement process by attempting to artificially affect which SPX series will have zero bids at the opening and thus potentially be included in the settlement strip. See Securities Exchange Act Release No. 86879 (September 5, 2019), 84 FR 47984 (September 11, 2019) (SR-CBOE-2019-034).

- <sup>8</sup> The Exchange shall be the reporting authority for VOLQ Index Options. The term “reporting authority” in respect of a particular index means the institutions or reporting service designated by the Exchange as the official source for calculating and determining the current value or the closing index value of the index. See Phlx Options 4A, Section 2(a)(16).
- <sup>9</sup> The Exchange notes the extensive five-minute length of the VOLS Closing Settlement Period is similar to final settlement construction of the EURO STOXX 50 VOLATILITY index (VSTOXX) (average of all valid ticks that index produced during an expanding time window starting at 11:30:00 CET up to the current calculation time and not later than 12:00:00 CET). Both VSTOXX and VOLS inject substantive randomization for which components may change and market participants cannot know index components on a forward-looking basis.
- <sup>10</sup> If the Exchange is unable to publish a settlement value by 12:00 p.m. (New York Time) due to a trading halt, the Exchange will determine and publish a value on its website. In the event of a trading halt, the Exchange will commence the calculation of the settlement window beginning 2.00.001 minutes after the re-opening of trading.

multiplied by that price to yield a Reference Number.<sup>11</sup> All Reference Numbers are then summed, and that sum is then divided by the total number of contracts traded during the observation period [Sum of (contracts traded at a price x price) ÷ total contracts traded] to calculate a Volume Weighted Average Price for that observation period (a “One Second VWAP”) for that component option. If no transactions occur on Phlx during any one-second observation period, the NBBO midpoint<sup>12</sup> at the end of the one second observation period will be considered the One Second VWAP for that observation period for purposes of this settlement methodology. Specifically, VOLS would seek the best bid and best offer (which may consist of a quote or an order) from among the listing markets, Phlx, ISE and GEMX markets.<sup>13</sup> Each One Second VWAP for each component option is then used to calculate the Volatility Index, resulting in the calculation of 300 sequential Volatility Index values. Finally, all 300 Volatility Index values will be arithmetically averaged (i.e., the sum of 300 Volatility Index calculations is divided by 300) and the

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<sup>11</sup> The Volatility Index final settlement treats options inclusion prices largely similar to the EURO STOXX 50 VOLATILITY (VSTOXX) index whereby the options inclusion price is defined as first priority, the most recent trade price and then second, the midpoint bid/ask price.

<sup>12</sup> The Volatility Index’s component NDX options are listed on Phlx as well as on the Exchange’s affiliates, ISE, GEMX. NDX average bid/ask spreads for all component options at each second for each of four expiration dates (11/21/2018, 12/19/2018, 1/16/2019, and 2/13/2019) commencing at 9:30:15 A.M. is 5.52%. Commencing at 9:32.010 A.M. the NDX average bid/ask spreads for all component options at each second for each of four expiration dates is 3.72%, demonstrating quote stability at 2 minutes after the opening.

<sup>13</sup> By considering the NBBO of all three markets, the Exchange believes the risk of manipulation is tempered by the consideration of a larger number of quotes from multiple Market Makers.

resulting figure is rounded to the nearest .01 to arrive at the settlement value disseminated under the ticker symbol VOLS.<sup>14</sup>

The Exchange notes the Volatility Index final settlement has exceedingly high hurdles for potential manipulation. First, the Volatility Index assesses each second of the entire field of NDX options prices to select certain listed options to obtain the prices of synthetic precisely at-the-money options. Accordingly, since the market is subject to constant change during three hundred individual one-second time periods for which listed options will be included in final settlement, market participants cannot predict which components will be included, which would entail predicting where the Nasdaq-100 Index price level (a function of predicting the price of all one-hundred component stocks) will be at the end of each of the three hundred individual one-second time periods.

Second, in the event the number of contracts traded at each price during the observation period is limited or zero, traders are subject to highly competitive market forces of deep and established market liquidity. Streaming bid/ask quotes on notional total contract value [Number of Contracts on Bid (Offer) times \$100 multiplier times the Nasdaq-100 Index price level] during the final settlement observation often exceed one billion dollars, a figure which would require substantive capital to influence quotes. Taken together, during each second of the final settlement observation period on January 16, 2019 and February 13, 2019, the average notional value of each bid of the thirty-two components was \$21.1 million; the average notional value of each offer was \$13.5 million. The sum of all thirty-two component notional value bid quotes was \$675.9

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<sup>14</sup> See Options 4A, Section 12, “Terms of Option Contracts,” proposed new section (b)(6)(D)(II).

million; the sum of all thirty-two component notional value ask quotes was \$432.89 million (a bid/ask notional value of \$1.1 billion).

Third, since the Volatility Index assesses each second of all listed NDX options, this is a continuous assessment of competitive price action and voluminous trading activity for all Nasdaq-100 Index stock components. During the final settlement observation period (five-minute period) on January 16, 2019 and February 13, 2019, the average summation of traded volume for all Nasdaq-100 Index component shares was 18.8 million shares. The average total value of all Nasdaq-100 Index shares traded during the final settlement observation period was \$1.93 billion. The corresponding market capitalization for all Nasdaq-100 Index components during the final settlement period was \$7.8 trillion.

#### *Contract Specifications*

The contract specifications for options on the Volatility Index are set forth in Exhibit 3-2. As noted above, the Volatility Index is a market index or a broad-based index, as defined in Phlx Options 4A, Section 2(a)(13). Options on the Volatility Index are European-style and cash-settled. The Exchange's standard trading hours for broad-based index options (9:30 A.M. to 4:15 P.M., New York time) will apply to the Volatility Index options under Phlx Options 4A, Section 12 at Supplementary Material .01, as proposed to be amended. The Exchange proposes to apply margin requirements for the purchase and sale of options on the Volatility Index that are identical to those applied for its other broad-based index options.

The trading of options on the Volatility Index will be subject to the trading halt procedures applicable to other index options traded on the Exchange.<sup>15</sup> Options on the Index will be quoted and traded in U.S. dollars.<sup>16</sup> Accordingly, all Exchange and The Options Clearing Corporation members will be able to accommodate trading, clearance and settlement of the Volatility Index without alteration. All options on the index would have a minimum increment for options trading below 3.00 of 0.05 (\$5.00) and for all other series, 0.10 (\$10.00).

The Exchange proposes to set the minimum strike price interval for options on the Volatility Index at \$0.50 or greater where the strike price is less than \$75, \$1 or greater where the strike price is \$200 or less and \$5 or greater where the strike price is more than \$200.<sup>17</sup> The Exchange believes that these strike price intervals will provide investors with greater flexibility by allowing them to establish positions that are better tailored to meet their investment objectives.

The Exchange proposes that there shall be no position or exercise limits for options on the Volatility Index. As noted above, the Volatility Index will settle using published volume and / or quotes from NDX options. Given that there are currently no position limits for NDX options,<sup>18</sup> the Exchange believes it is appropriate for there to be

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<sup>15</sup> Phlx Options 4A, Section 18(c), “Trading Rotations, Halts or Reopenings.”

<sup>16</sup> Phlx Options 4A, Section 12(a)(1) titled “Meaning of Premium Bids and Offers,” provides that bids and offers shall be expressed in terms of dollars and decimal equivalents of dollars per unit of the index (e.g., a bid of 85.50 would represent a bid of \$85.50 per unit).

<sup>17</sup> Phlx Options 4A, Section 12 “Terms of Option Contracts,” proposed new section (b)(6)(E).

<sup>18</sup> See Phlx Options 4A, Section 6, “Position Limits,” section (a)(ii).

no position or exercise limits<sup>19</sup> for options on the Volatility Index. The underlying Nasdaq-100 Index includes 100 of the largest domestic and international non-financial securities listed on The Nasdaq Stock Market LLC based on market capitalization. The Index reflects companies across major industry groups including computer hardware and software, telecommunications, retail/wholesale trade and biotechnology. It does not contain securities of financial companies including investment companies. As of June 30, 2020, the Nasdaq-100 Index contained 74.7 billion component shares representing \$11.42 trillion market value. By extension, the Exchange believes that the same reasoning applies to options on the Volatility Index since the value of options on the Volatility Index is derived from the volatility of NDX as implied by its options. The Exchange notes that options on the Miami International Securities Exchange LLC (“MIAX”) SPIKES Index, and options on the Cboe Volatility (“VIX”) Index are also not subject to any position or exercise limits.<sup>20</sup> SPX, which underlies the Cboe Volatility Index, is one of the most actively trading index option and is, therefore, subject to no position limits. Accordingly, NDX, which underlies the VOLQ Index, is also one of the most actively trading index option and is, therefore, subject to no position limits.

The trading of options on the Volatility Index would be subject to the same rules that presently govern the trading of Exchange index options, including sales practice rules, margin requirements, and trading rules. In addition, long term option series having

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<sup>19</sup> Phlx Options 4A, Section 10, “Exercise Limits,” provides “In determining compliance with Options 9, Section 15, exercise limits for index option contracts shall be equivalent to the position limits described in Options 4A, Section 6.”

<sup>20</sup> See ISE Options 4A, Section 12, Cboe Rule 4.13 and MIAX Rule 1804. Additionally, the Exchange notes there are currently a number of other actively-traded broad-based index options, *i.e.*, DJX and SPX, that are not subject to any position or exercise limits.

up to sixty months to expiration could be traded.<sup>21</sup> The trading of long term options on the Volatility Index would also be subject to the same rules that govern the trading of all the Exchange's index options, including sales practice rules, margin requirements, and trading rules.

Options 10, Section 6, "Opening of Accounts," is designed to protect public customer trading and shall apply to trading in options on the Volatility Index. Specifically, Options 10, Section 6(a) prohibits members and member organizations from accepting a customer order to purchase or write an option, including options on the Volatility Index, unless such customer's account has been approved in writing by an Options Principal. Additionally, Phlx Options 10, Section 8, "Suitability," is designed to ensure that options, including options on the Volatility Index, are only sold to customers capable of evaluating and bearing the risks associated with trading in this instrument. Further, Phlx Options 10, Section 9, "Discretionary Accounts," permits members and member organizations to exercise discretionary power with respect to trading options, including options on the Volatility Index, in a customer's account only if the customer has given prior written authorization and the account has been accepted in writing by a Registered Options Principal. Phlx Options 10, Section 9 also requires a record to be made of every option transaction for an account in respect to which a member or member organization or a partner, officer or employee of a member organization is vested with any discretionary authority, such record to include the name of the customer, the

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<sup>21</sup> Phlx Options 4A, Section 12(b)(2), as proposed to be amended. Phlx Rule Options 4A, Section 12(b)(2) currently applies only to stock index options and would be amended to permit listing of long term Volatility Index options. The Commission has previously approved long term options on the Nations VolDex Index. See Securities Exchange Act Release No. 71365, 79 FR 4512 (January 28, 2014) (approving SR-ISE- 2013-42).

designation, number of contracts and premium of the option contracts, the date and time when such transaction took place and clearly reflecting the fact that discretionary authority was exercised. Finally, Phlx Options 10, Section 7, “Supervision of Accounts,” Phlx Options 10, Section 10, “Confirmations to Customers,” and Phlx Options 10, Section 13, “Delivery of Options Disclosure Documents,” will also apply to trading in options on the Volatility Index.

#### *Surveillance and Capacity*

The Exchange has an adequate surveillance program in place for options traded on the Volatility Index and intends to apply those same program procedures that it applies to the Exchange’s other options products. Further, the Phlx Market Surveillance Department conducts routine surveillance in approximately 30 discrete areas. Index products and their respective symbols are integrated into the Exchange’s existing surveillance system architecture and are thus subject to the relevant surveillance processes. This is true for both surveillance system processing and manual processes that support the Phlx’s surveillance program. Additionally, the Exchange is also a member of the Intermarket Surveillance Group (“ISG”) under the Intermarket Surveillance Group Agreement, dated June 20, 1994. ISG members work together to coordinate surveillance and investigative information sharing in the stock and options markets.

The consistent liquidity of NDX options as well as the underlying NDX component securities ensures a multitude of market participants at any given time.<sup>22</sup>

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<sup>22</sup> NDX options one year (July 2019 – June 2020) average daily volume was 11,678 contracts per day. For a comparative measure of liquidity, the Russell 2000 (RUT) index options one year (July 2019 – June 2020) average daily volume surpassed NDX (36,998 contracts versus 11,678 contracts). However, NDX options average daily portfolio notional value is greater than Russell 2000 (RUT)

Indeed, at least twelve Market Makers actively traded NDX options on Phlx during December 2018 on any given day, and there are now three options exchanges that list NDX options. The Exchange reiterates that it is unlikely that the Volatility Index settlement value could be manipulated. In particular, because the 32 component Volatility Index option inputs<sup>23</sup> are reviewed each second as the market changes to determine the ATM strikes (meaning that Volatility Index components could change 300 times during the settlement period), market participants could manipulate the settlement value only if they could replicate such value by guessing exact market moves over an extended period of 300 million microseconds. Because the likelihood of replication is extremely low, the Exchange believes that it is unlikely the settlement value could be manipulated.

Nonetheless, the Exchange, in its normal course of surveillance, will monitor for any potential manipulation of the Volatility Index settlement value according to the Exchange's current procedures. Additionally, the Exchange would monitor the integrity of the Volatility Index by analyzing trades, quotations, and orders that affect any of the 300 calculated reference prices for any of the 32 NDX option series used for the final settlement calculation for potential manipulation on the Exchange.

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options average daily portfolio notional value (\$10.09 billion versus \$4.94 billion). The NDX options average daily portfolio notional value is the product of the average daily volume times the one year (July 2019 – June 2020) median index price times the one-hundred dollar options index multiplier divided by 253 trading days.

<sup>23</sup> The Exchange notes that due to the number of proposed components, the mathematical formula would prevent the Volatility Index from exceeding 12.5% in any single component and 43.5% for the top 5 components.

In the context of surveillance, the Exchange will monitor all NDX NBBO quotes and trades (including but not limited to NDX quotes and trades on the Exchange) during the opening (from 09:32:01 A.M. to 09:37:00 A.M.) for each of the 32 at-the-money series utilized in the final settlement calculation for possible manipulation. It would also surveil for open interest manipulation by monitoring NDX positions prior to settlement to identify the economic interest (long and short), account type (customer, firm or market maker) and clearing members to evaluate customer, and firm interest in the Volatility Index options. Additionally, the Exchange will evaluate all trades in the NDX option series on the Phlx, ISE and GEMX options exchanges from one second after the Closing Settlement Period through end of the trading day for possible wash trading or related artificial activity. Finally, the Exchange will monitor for manipulation by comparing quotes for settlement against quotes for non-settlement in the 32 NDX option series used for settlement between the opening, and a period of time thereafter, with a focus on identifying deviations of the midpoint, the bid-ask spread and other market elements compared to the Nasdaq-100 Index value.

The Exchange believes that its surveillance procedures currently in place, coupled with the additional measures proposed above, will allow it to adequately surveil for any potential manipulation in the trading of Volatility Index options.

The Exchange represents that it has the necessary system capacity to support additional quotations and messages that will result from the listing and trading of options on the Volatility Index.

#### Implementation

The Exchange proposes to issue an Options Trader Alert announcing the day it

will launch options on Nasdaq-100 Volatility Index. The Exchange will launch these options by Q3 2021. The Exchange will issue an Options Trader Alert to announce the launch date.

The Exchange also proposes minor technical amendments within Options 4A, Sections 6 and 12 to update the name of the Nasdaq-100 Index.

## 2. Statutory Basis

The Exchange believes that its proposal is consistent with Section 6(b) of the Act,<sup>24</sup> in general, and furthers the objectives of Section 6(b)(5) of the Act,<sup>25</sup> in particular, in that it will permit options trading in the Volatility Index pursuant to rules designed to prevent fraudulent and manipulative acts and practices and promote just and equitable principles of trade. In particular, the Exchange believes the proposed rule change will further the Exchange's goal of introducing new and innovative products to the marketplace. The Exchange believes that listing options on the Volatility Index will provide an opportunity for investors to hedge, or speculate on, the market risk associated with changes in 30-day implied volatility.

Volatility-focused products have become more prominent over the past few years, and in a number of different formats and types, including ETFs, exchange-traded notes, exchange-traded options, and exchange-traded futures. Such products offer investors the opportunity to manage their volatility risks associated with an underlying asset class. Currently, most of the products focus on underlying equity indexes or equity-based portfolios. The Exchange proposes to introduce a cash-settled options contract on a new

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<sup>24</sup> 15 U.S.C. 78f(b).

<sup>25</sup> 15 U.S.C. 78f(b)(5).

volatility index, which focuses on equity exposure using options on the NDX, which are actively traded equity option products. The Exchange believes that because the Volatility Index is derived from published NDX options prices, and given the immense liquidity found in the individual security components of NDX as well as the aggregate index market value of \$7.24 trillion, the concern that the Volatility Index will be subject to market manipulation is greatly reduced. Therefore, the Exchange believes that the proposed rule change to list options on the Volatility Index is appropriate.

The Exchange further notes that Phlx rules that apply to the trading of other index options currently traded on the Exchange would also apply to the trading of options on the Volatility Index. The Exchange proposes to utilize nickel and dime increments for trading the Volatility Index options. The Exchange believes that these trading increments will enable traders to make the most effective use of the product for trading and hedging purposes. Additionally, the trading of options on the Volatility Index would be subject to, among others, Exchange rules governing margin requirements and trading halt procedures. Finally, the Exchange represents that it has an adequate surveillance program in place to detect manipulative trading in options on the Volatility Index. The Exchange also represents that it has the necessary systems capacity to support the new options series. And as stated in the filing, the Exchange has rules in place designed to protect public customer trading.

Phlx's proposal to initiate the Closing Settlement Period at 2 minutes after the underlying market opens is intended to permit the price of the underlying NDX component security to settle down and not flicker back and forth among prices after its opening. It is common for options to fluctuate in price immediately upon opening; such

volatility reflects a natural uncertainty about the ultimate opening price of all Nasdaq-100 Index component stocks while the buy and sell interest is matched. The Exchange notes that this delay ensures more stability in the marketplace prior to initiating the settlement. The Exchange's decision to initiate the Closing Settlement Period at 2 minutes after the underlying market opens ensures that it has the ability for Market Makers to gain information and certainty after the underlying market has opened before submitting quotes. This 2 minute delay before the Closing Settlement Period commences permits Market Makers to submit informed quotes which the Exchange believes would be tighter given the added certainty. Market Makers provide necessary liquidity to the marketplace.

B. Self-Regulatory Organization's Statement on Burden on Competition

This proposed rule change does not impose any burden on competition that is not necessary or appropriate in furtherance of the purposes of the Act. The Exchange notes that the proposed rule change will facilitate the listing and trading of an index option product with a novel structure that will enhance competition among market participants, to the benefit of investors and the marketplace.

C. Self-Regulatory Organization's Statement on Comments on the Proposed Rule Change Received from Members, Participants, or Others

No written comments were either solicited or received.

III. Date of Effectiveness of the Proposed Rule Change and Timing for Commission Action

Within 45 days of the date of publication of this notice in the Federal Register or within such longer period (i) as the Commission may designate up to 90 days of such date if it finds such longer period to be appropriate and publishes its reasons for so finding or (ii) as to which the Exchange consents, the Commission shall: (a) by order approve or

disapprove such proposed rule change, or (b) institute proceedings to determine whether the proposed rule change should be disapproved.

IV. Solicitation of Comments

Interested persons are invited to submit written data, views, and arguments concerning the foregoing, including whether the proposed rule change is consistent with the Act. Comments may be submitted by any of the following methods:

Electronic comments:

- Use the Commission's Internet comment form (<http://www.sec.gov/rules/sro.shtml>); or
- Send an e-mail to [rule-comments@sec.gov](mailto:rule-comments@sec.gov). Please include File Number SR-Phlx-2020-41 on the subject line.

Paper comments:

- Send paper comments in triplicate to Secretary, Securities and Exchange Commission, 100 F Street, NE, Washington, DC 20549-1090.

All submissions should refer to File Number SR-Phlx-2020-41. This file number should be included on the subject line if e-mail is used. To help the Commission process and review your comments more efficiently, please use only one method. The Commission will post all comments on the Commission's Internet Web site (<http://www.sec.gov/rules/sro.shtml>).

Copies of the submission, all subsequent amendments, all written statements with respect to the proposed rule change that are filed with the Commission, and all written communications relating to the proposed rule change between the Commission and any person, other than those that may be withheld from the public in accordance with the provisions of 5 U.S.C. 552, will be available for website viewing and printing in the

Commission's Public Reference Room, 100 F Street, NE, Washington, DC 20549, on official business days between the hours of 10:00 a.m. and 3:00 p.m. Copies of the filing also will be available for inspection and copying at the principal office of the Exchange. All comments received will be posted without change; the Commission does not edit personal identifying information from submissions. You should submit only information that you wish to make available publicly.

All submissions should refer to File Number SR-Phlx-2020-41 and should be submitted on or before [insert date 21 days from publication in the Federal Register].

For the Commission, by the Division of Trading and Markets, pursuant to delegated authority.<sup>26</sup>

J. Matthew DeLesDernier  
Assistant Secretary

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<sup>26</sup> 17 CFR 200.30-3(a)(12).

## EXHIBIT 3-1

# The Nasdaq-100® Volatility Index: VOLQ

## A Methodology Reference Guide for Retail and Institutional Investors

### Introduction

**Volatility is a measure of the magnitude of price movement—up or down—of a financial instrument like an index or an equity. Historical volatility is a measure of the standard deviation of price changes over a past, fixed time period. In contrast, implied volatility estimates the expected future movement of prices over a specified time horizon of one month, or even one day.**

**This reference guide answers the questions: What is implied volatility and how is it calculated?**

### Volatility Products

Volatility products (cash-settled options and futures) have become more prominent over the past decade. They provide investors with tools to manage portfolio volatility risk. A common way to observe volatility is with an index, which tracks the implied volatility of an underlying equity index by using exchange-listed options prices.

Index options are a type of financial product that give the holder the right to buy or sell the price level of the underlying index at a predetermined price (strike price), within a specific time interval (time to expiration). The price of an option is calculated as a function of the current index price, strike price, risk-free interest rate, time to expiration, and volatility; these collective values are used as inputs to various options pricing models. Since index option prices are publicly available in the open market, they can be used to solve for the future index volatility implied by those option prices.

Forward looking, expected volatility is a central driver of index options prices—the higher the expected volatility, the higher the index option price, all else being equal. Using this approach, the market's assessment of future volatility rests on observation of index options prices.

### Introducing the Nasdaq-100 Volatility Index: VOLQ

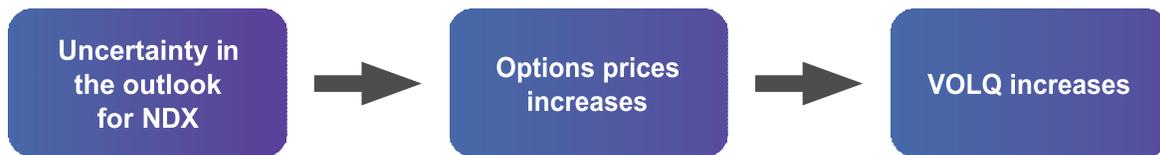
The Nasdaq-100 Volatility Index ("VOLQ") measures 30-day implied volatility of the Nasdaq-100 Index (ticker symbol NDX).

VOLQ is expressed as an annualized percentage and is positively correlated to NDX options prices (both calls and puts). The resulting value broadcasts the expected NDX index trading range over the next 30 consecutive days.

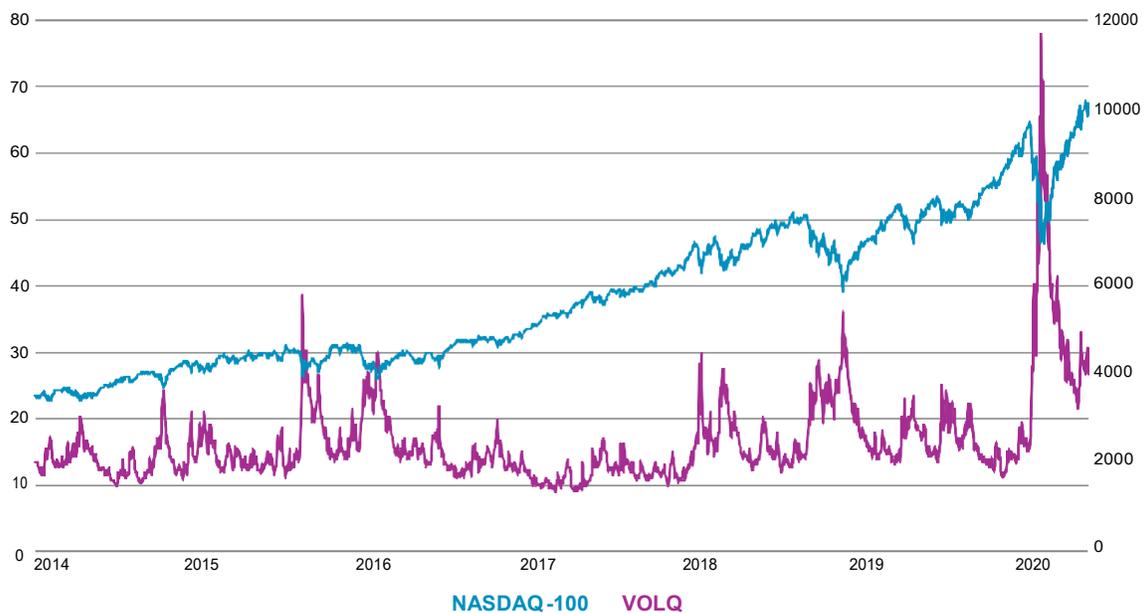
The VOLQ methodology is provided by Nations Indexes, Inc. in partnership with Nasdaq.

For example, if VOLQ is at a price level of 17.90, dividing by the square root of 12 (reflecting the number of 30-day periods in one year) implies an NDX trading range unlikely (with 68% certainty) to rise or fall more than 5.17% over the next 30-day period. Assuming NDX is at a price level of 9000, VOLQ indicates that the aggregate marketplace view is that NDX will have a potential trading range over the next 30 days contained within a range of up 5.17% (9465) to down 5.17% (8535).

Generally, more uncertainty in the outlook for NDX tends to cause options prices to rise. This is because there is a greater probability that the price will move above or below the strike price. In addition, options are used as insurance to protect against large movements in NDX price; investors buy options to hedge their portfolio positions against these large price movements (volatility movements), causing options prices to increase. As such, when NDX options prices are higher, VOLQ will be higher, and vice-versa.



Nasdaq -100 vs VOLQ



In the chart above, for the period 2014-2019, VOLQ movement is negatively correlated to NDX (-81.49%). VOLQ tends to spike during market downturns and generally declines steadily during bull market moves.

**Methodology**

VOLQ is calculated throughout the trading day using published, real-time bid and ask quotes on 32 of the most liquid NDX options. VOLQ is based on options with a strike price exactly equal to the forward price of the underlying instrument. These options are considered precisely at-the-money, what traders look at most.

## VOLQ Step-by-Step Calculation

The calculation of VOLQ is a function of at-the-money (ATM) NDX options prices, the forward price, the risk-free rate, and the time to expiration. The following steps explain these concepts and illustrate how to calculate the value of the Nasdaq-100 Volatility Index.

### STEP 1: CALCULATE THE TIME TO EXPIRATION FOR FOUR CONSECUTIVE WEEKLY EXPIRING OPTIONS.

Time to expiration is critical in the pricing of any option. For American-style exercise options, the holder of the option has the right to exercise the option at any time before this date. If they do this, it likely means they are speculating on or hedging against price fluctuation before the option expires. In contrast, VOLQ uses only European-style exercise options, which confer the right to exercise the option expressly on the exact expiration date.

VOLQ measures 30-day implied volatility—the expected volatility over the next 30 days. However, options expiring exactly 30 days from the current date with a strike price exactly equal to the index price (“at-the-money”) are not always available; prices are continually fluctuating throughout the day. As such, other listed options are used in the calculation of a 30-day at-the-money option price. VOLQ evaluates all NDX options throughout the trading day to select certain listed options; these options are then used to calculate the synthetic price of a 30-day precisely at-the-money option.

There are eight selected options—four calls and four puts—for each of four consecutive weekly expirations used in this calculation. Two expiries are less than 30 days from the current date and two expiries are greater than 30 days from the current date. Accordingly, the constituent options expire in the following manner:

OPTION	TIME TO EXPIRATION DAY (FROM CURRENT DATE)
First-Term Expiration	16-22 days
Second-Term Expiration	23-29 days
Third-Term Expiration	30-36 days
Fourth-Term Expiration	37-43 days

The number of days from the current date to the date of the first-term expiration is a range because options expire on Fridays. This means that the amount of time until the first-term expiration varies based on the current day of the week.

For example, to calculate VOLQ at 11:28 A.M. ET on Monday, July 30, 2018, the first-term expiration would be the close of trading on Friday, August 17. This is the standard monthly expiration, which occurs at 9:30 A.M. on the third Friday of the month. The second- (seven days from August 17), third- (14 days), and fourth- (21 days) term expirations would be the next consecutive weekly expiries, respectively. For those weekly expirations not expiring on the third Friday of the month, options are set to expire at 4:00 P.M. ET.

1. Friday, August 17, 2018 (first term)
2. Friday, August 24, 2018 (second term)  
**August 29, 2018 – 30 days from July 30, 2018**
3. Friday, August 31, 2018 (third term)
4. Friday, September 7, 2018 (fourth term)

Specifically, the calculation of implied volatility uses the time to expiration expressed as a fraction of the number of minutes in a year. The first step to solving for the value of VOLQ is to calculate the fractions (T1 below) representing the time to each of the four expirations.

To calculate VOLQ on Monday, July 30, 2018, at 11:28A.M. ET whereby the first term expiration is Friday, August 17, 2018, the number of minutes ( $M_1$  below) to expiration of the first term option would be:

$$M_1 = 752 \text{ (minutes remaining on July 30)} + 24,480 \text{ (17 full days remaining * 1440 minutes per day)} + 570 \text{ (minutes from midnight to 9:30 am ET on August 17)} = 25,802$$

Represented as a fraction of the number of minutes in a year, we find  $T_1$ :

$$T_1 = \frac{25,802}{525,600} = 0.0490906$$

This calculation is repeated for each of the four expirations.

**STEP 2: CALCULATE THE FORWARD PRICE FOR EACH TERM.**

The forward price represents the expected future price of an asset based on put/call parity. It is calculated for each of the four expiries used in step one.

The relevant NDX option prices used in VOLQ construction are determined by the NBBO (National Best Bid and Offer) mid-point between the best bid (highest bid price) and best ask (lowest ask price) in the NDX options market. NDX options are listed on the options exchanges: Nasdaq PHLX LLC (“PHLX”), Nasdaq ISE LLC (“ISE”), and Nasdaq GEMX LLC (“GEMX”). Only strike prices divisible by 25 are used in the calculation of VOLQ because these strikes are more consistently available and attract the most investors.

The first step to calculating the forward price is to identify the strike price for which the absolute difference between the price of the call and the price of the put is smallest. This strike price and the price of the associated options are used in the equation:

$$F = K^* + e^{R \cdot T} * (call(K^*) - put(K^*))$$

F is the forward price for the given term.  $K^*$  is the strike price which displays the smallest absolute difference between the price of the call option and the price of the put option. R is the risk-free rate. T is the time to expiration (calculated in step 1).  $Call(K^*)$  is the price of the call option for strike price K and  $put(K^*)$  is the price of the put option for strike price K.

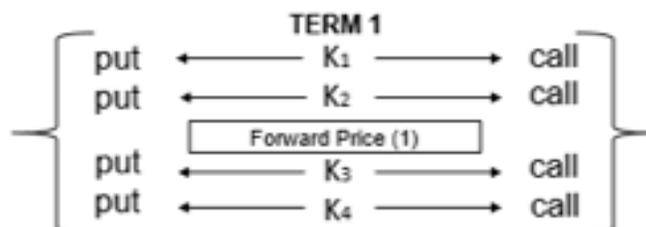
Continuing with the example in step one, for the first-term expiration, the strike price with the smallest absolute difference between put price and call price is the 7200 strike (see August 17 expiration table below). Applying a risk-free rate of 1.950%, the forward price calculation for the first term expiry is:

$$F_1 = 7200 + e^{(0.01950 * 0.0490906)} * (122.250 - 114.350) = 7207.9076$$

Where 122.25 is the price of the call option with a 7200 strike and 114.35 is the price of the put option with a 7200 strike.

**STEP 3. DETERMINE THE PRECISELY AT-THE-MONEY CALL AND PUT OPTION PRICES.**

To get to the precisely at-the-money option price, a total of 32 options are used—16 calls and 16 puts. For each term, four different strike prices are used for both a call and a put as shown in the diagram below:



The forward price (step two) informs which options are used to get to the synthetic precisely at-the-money option price. The two strike prices immediately below the forward price ( $K_1$  and  $K_2$ ) and the two strike prices immediately above the forward price ( $K_3$  and  $K_4$ ) are used. This process is repeated for each term.

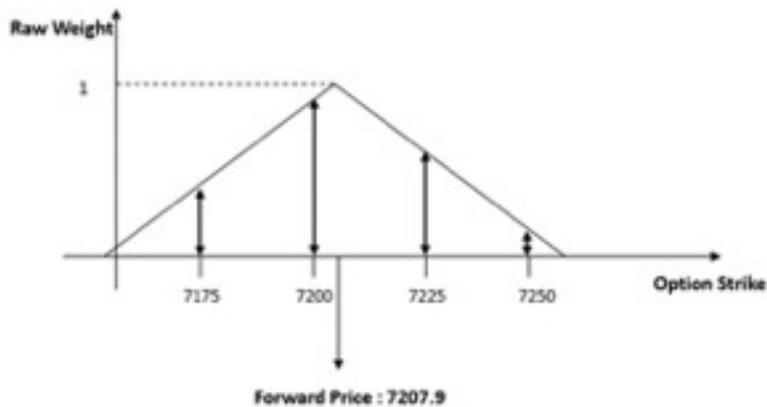
Given the forward price calculated above (7207.9076) and the options listed below for the August 17, 2018, expiration, four strike prices are selected.

**AUGUST 17 EXPIRATION**

STRIKE PRICE	CALL BID	CALL ASK	CALL MIDPOINT	PUT BID	PUT ASK	PUT MIDPOINT	DIFFERENCE
7150	151.30	155.70	153.50	94.30	97.40	95.85	57.65
7175	135.40	139.50	137.45	103.30	106.30	104.80	32.65
7200	120.40	124.10	122.25	112.60	116.10	114.35	7.90
7225	105.90	109.40	107.65	123.10	126.70	124.90	17.25
7250	92.40	95.70	94.05	134.20	138.20	136.20	42.15
7275	79.70	82.70	81.20	146.30	150.70	148.50	67.30

As such, the 7175, 7200, 7225, and 7250 call and put options are applied to this example. The precisely at-the-money option price is a weighted average of the option prices at these strikes. This means that each strike is multiplied by a factor reflecting its importance. Calculating this factor requires two steps: 1. Determine the raw weightings; and, 2. Normalize the weightings.

This diagram illustrates how the different strikes are weighted in terms of their importance when calculating the precisely at-the-money option price.



Calculate the raw weightings by following this progression:

If:

$$\left| \frac{K_n - F}{50} \right| \leq 1$$

Then:

$$W_n = 1 - \left| \frac{K_n - F}{50} \right|$$

Else:

$$W_n = 0$$

Where  $K_n$  is the strike price and  $n$  indicates which of the four strikes (7175, 7200, 7225, or 7250) is being weighted;  $F$  is the forward price for the given expiry;  $W$  is the raw weighting for strike price  $n$ .

The number 50 is used as a scaling factor for the strikes. Fifty was chosen because it is the maximum difference between any strike and the forward price (the numerator). The lowest strike price will be no more than 50 points below the forward price, and highest strike price will be no more than 50 points above the forward price.

Applying the 7200 strike for the first term to this formula gives:

$$\left| \frac{7200 - 7207.9076}{50} \right| \leq 1$$

Therefore:

$$W_1 = 1 - \left| \frac{7200 - 7207.9076}{50} \right| = 0.842$$

Where 7200 is the first out-of-the-money call price (or first in-the-money put price); 7207.9076 is the forward price for the first-term expiry; 50 is the smoothing bandwidth;  $W_1$  is the raw weighting for the 7200 strike.

After calculating the raw weightings for the four strike prices in each term, the weightings are normalized. This step is necessary because the raw weights do not sum to one, meaning they cannot be used to calculate the weighted average option price yet.

The normalized weighting for the 7200 strike in the first term is:

$$w_2 = \frac{W_2}{W_1 + W_2 + W_3 + W_4} = 0.421$$

Where  $w_1$  is the normalized weighting of the first out-of-the-money put price (or first in-the-money call price);  $W_1$  is the corresponding raw weighting;  $W_2$  is the raw weighting for the second out-of-the-money put price;  $W_3$  is the first in-the-money put price;  $W_4$  is the second in-the-money put price.

After each strike price is weighted and normalized, the precisely ATM call option and put option prices can be calculated. Referencing the table above, the prices of the constituent options are used in the formula:

$$ATM \text{ Call Option Price}_1 = (call(K_1) * w_1) + (call(K_2) * w_2) + (call(K_3) * w_3) + (call(K_4) * w_4)$$

$$ATM \text{ Put Option Price}_1 = (put(K_1) * w_1) + (put(K_2) * w_2) + (put(K_3) * w_3) + (put(K_4) * w_4)$$

Applying this equation to the example means the sum of each weighted price is used to create the at-the-money price. The price of each option is determined by the midpoint between the best bid and best ask found in the table above. As such, the weighted prices are:

$$(call(K_1) * w_1) = (\text{price of the call with 7175 strike} * \text{normalized weight of 7175 strike}) = 137.45 * 0.1709243$$

$$(call(K_2) * w_2) = (\text{price of the call with 7200 strike} * \text{normalized weight of 7200 strike}) = 122.25 * 0.4209243$$

$$(call(K_3) * w_3) = (\text{price of the call with 7225 strike} * \text{normalized weight of 7225 strike}) = 107.65 * 0.3290757$$

$$(call(K_4) * w_4) = (\text{price of the call with 7250 strike} * \text{normalized weight of 7250 strike}) = 94.05 * 0.0790757$$

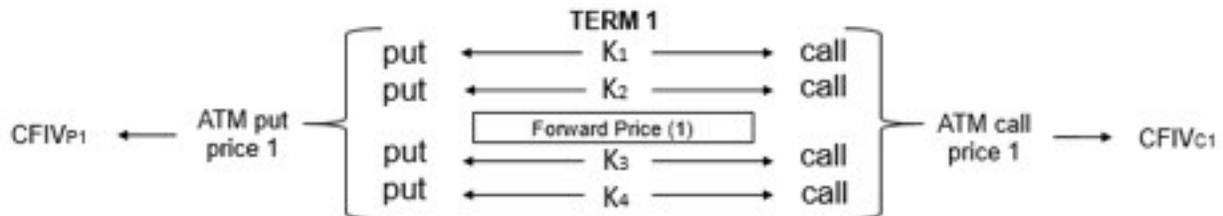
The sum of the weighted prices gives the at-the-money call option price for the first expiration:

$$ATM \text{ Call Option Price}_1 = (137.45 * 0.1709243) + (122.25 * 0.4209243) + (107.65 * 0.3290757) + (94.05 * 0.0790757) = 117.8136$$

**STEP 4: CALCULATE CLOSED-FORM IMPLIED VOLATILITY FOR EACH ATM OPTION.**

Using a closed-form equation to calculate implied volatility generates an exact result. This is a precise measurement that differs from traditional measures of implied volatility, which are calculated through iterative trial and error methods.

For example, the diagram below illustrates how eight options from each term are used to arrive at two values for closed-form implied volatility (CFIV)—one for put options and one for call options.



For a given option (call or put) and term, closed-form implied volatility is calculated by simply using the equation:

$$CFIV = \frac{\sqrt{2\pi}}{\left(\frac{F}{e^{R \cdot T}} \cdot \sqrt{T}\right)} \cdot \text{Precisely ATM Option Price}$$

The aforementioned formula is a minor variant of the Brenner Subrahmanyam formula to calculate implied volatility. <sup>[1]</sup>

Applying this equation will result in eight CFIV values.

For the first-term call option (assuming a risk-free rate of 1.950%), CFIV is:

$$CFIV_{C1} = \frac{\sqrt{2\pi}}{\left(\frac{7207.9076}{e^{0.0195 \cdot 0.0490906}} \cdot \sqrt{0.0490906}\right)} \cdot 117.8136 = 0.185094$$

**STEP 5: CALCULATE THE EXPIRATION TOTAL VARIANCE.**

Variance is a statistical measure of how much a set of observations differ from the mean. As such, the variance of the constituent call and put options measures the magnitude of price changes (how volatile it is) on a regular basis. The total variance in price for each option is calculated based on the time to expiration (step one) and the closed-form implied volatility (step four). The formula for total variance is:

$$TV = T \cdot CFIV^2$$

Eight different total variances are calculated; one for each precisely at-the-money call and precisely at-the-money put at each of the four expirations. The total variance for the first-term call option is:

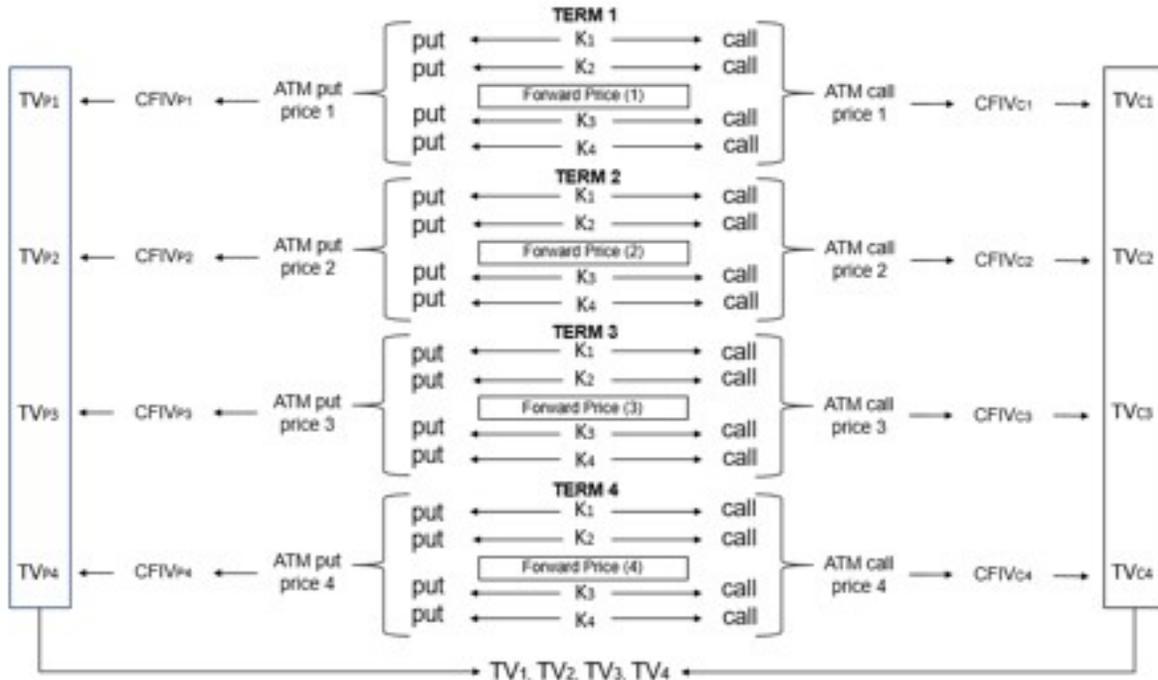
$$TV_{C1} = 0.0490906 \cdot 0.185094^2 = 0.00168184$$

Next, the expiration total variance is calculated using the simple average of the call total variance and the put total variance for that expiration. This will result in four values for total variance, one for each of the four expirations. For the first-term, total variance is:

$$TV_1 = \frac{TV_{C1} + TV_{P1}}{2}$$

$$TV_1 = \frac{0.00168184 + 0.00168480}{2} = 0.00168332$$

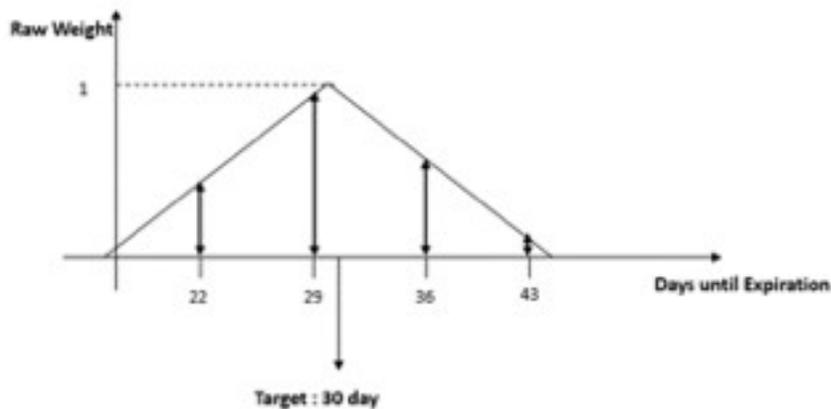
This is done for each expiration. The four total variance values, one for each expiration, are then interpolated to arrive at a 30-day total variance value. The diagram below depicts how the initial option prices lead to the calculation of four total variances.



**STEP 6: CALCULATE 30-DAY TOTAL VARIANCE.**

VOLQ is a 30-day implied volatility index; as such, 30-day total variance is an integral input. The next step is to use the expiration total variances to derive the 30-day total variance. Ultimately, this is a weighted average.

Similar to the calculation of strike price weights, each of the expirations is weighted. The weightings are illustrated in the diagram below:



There are 43,200 minutes in 30 days. The scaling factor for the expirations is 15 days (21,600 minutes), expressed as a fraction of a year (525,600 minutes). First, the raw weightings are calculated:

If:

$$\left| \frac{T_1 - \left( \frac{43,200}{525,600} \right)}{\left( \frac{21,600}{525,600} \right)} \right| \leq 1$$

Then:

$$W_1 = 1 - \left| \frac{T_1 - \left( \frac{43,200}{525,600} \right)}{\left( \frac{21,600}{525,600} \right)} \right|$$

Else:

$$W_1 = 0$$

Where  $T_1$  is the time to the first term expiration, expressed as a fraction of a year in minutes,  $W_1$  is the raw weighting for the first-term expiration.

Therefore, the raw weighting for the first-term expiry is:

$$W_1 = 1 - |-0.8054630| = 0.1945370$$

The normalized weights are then calculated using the same formula used for the normalized weights of the strike prices. The first-term normalized weight is:

$$w_1 = \frac{0.1945370}{0.1945370 + 0.6792593 + 0.8540741 + 0.3874074} = 0.0919676$$

Where  $w_1$  is the normalized weight for the first term expiry; 0.1945370 is the raw weighting for the first-term expiry; 0.679 is the raw weighting for the second term expiry; 0.854 is the raw weighting for the third term expiry; 0.387 is the raw weighting for the fourth term expiry.

Now there are four total variances, one for each consecutive weekly expiry. The precise 30-day total variance is a weighted average of the total variance, calculated with the normalized weightings. Each expiration total variance is multiplied by its respective weighting and summed to get the 30-day total variance:

$$\begin{aligned} TV_{30\text{-day}} &= (TV_1 * w_1) + (TV_2 * w_2) + (TV_3 * w_3) + (TV_4 * w_4) \\ TV_{30\text{-day}} &= (0.00168332 * 0.0919676) + (0.00228178 * 0.3211206) + (0.00284554 * 0.4037645) + (0.00334221 \\ &\quad * 0.1831473) = 0.00264858 \end{aligned}$$

#### STEP 7: CALCULATE 30-DAY CLOSED-FORM IMPLIED VOLATILITY.

As depicted in step five, the 30-day closed-form implied volatility is based on the 30-day total variance. The formula is:

$$CFIV_{30\text{-day}} = \sqrt{\frac{TV_{30\text{-day}}}{\left( \frac{43200}{525600} \right)}}$$

Applying the example gives the value for 30-day closed-form implied volatility on Monday, July 30, 2018, at 11:28A.M. ET.

$$CFIV_{30\text{-Day}} = \sqrt{\frac{0.00264858}{\left(\frac{43,200}{525,600}\right)}} = 0.1795116$$

#### STEP 8: CALCULATE VOLQ.

The final step in the calculation of VOLQ is to convert 30-day closed-form implied volatility to an annualized percentage (multiply by 100). This index value represents the expected annualized price action in percentage terms (up or down) over the next 30-days.

$$VOLQ = 0.1795116 * 100 = 17.9512$$

### Final Settlement

The final settlement price (ticker symbol VOLS) is calculated once every trading day. The settlement value will be the Closing Volume Weighted Average Price ("Closing VWAP"), to be determined by reference to the prices and sizes of executed transactions or quotes in the thirty-two underlying NDX component options calculated at the opening of trading on the expiration date.

The Closing VWAP is calculated over a period of five minutes at the end of individual one-second time observations commencing at 9:32:00 A.M. and continuing each second for the next 300 seconds. The number of contracts traded on PHLX at each price during the observation period is multiplied by that price to yield a Reference Number. All Reference Numbers, for each second, are then summed and that sum is divided by the total number of contracts traded during the observation period to calculate a Volume Weighted Average Price (VWAP) for that observation period for that component.

Each one-second VWAP for each component option is then used to calculate the VOLQ, resulting in the calculation of 300 sequential VOLQ values. Finally, all 300 values will be arithmetically averaged (i.e., the sum of 300 Volatility Index calculations is divided by 300) and the resulting figure is rounded to the nearest 0.01 to arrive at the settlement value disseminated under the ticker symbol VOLS.

If no transaction takes place during any one-second period, the NBBO midpoint at the end of the one-second observation period will be considered the One-Second VWAP for that observation period.

## Conclusion

VOLQ is calculated throughout the trading day using published, real-time bid and ask quotes on the most liquid NDX options. Since options on NDX trade on three different exchanges, these NBBO bid/ask spreads are generally tighter than the spreads of options that trade on a single exchange. As a result, VOLQ creates a clearer measure of expectations for future volatility.

Calculating implied volatility for the next 30 days requires a precisely at-the-money option expiring in exactly 30 days. However, the method to calculate VOLQ rests upon the fact that this option is not listed in the market for all prices and times. Accordingly, VOLQ requires the transformation of a series of other options that are listed on the market. The prices of these options are what is used to calculate 30-day closed-form implied volatility.

VOLQ measures what traders look at most, at-the-money volatility. By using a fixed number of options (32) the accuracy of the measurement increases; using all options listed would limit understanding of index drivers.

## References

1. Brenner, M. & M.G. Subrahmanyam, 1988, "A Simple Formula to Compute the Implied Standard Deviation", *Financial Analysts Journal*, Sept/Oct, pp.80-83

## Appendix

### DERIVATION OF THE CFIV FORMULA

Starting with the standard Black Scholes formula:

$$C(S, t) = N(d_1) * S - N(d_2) * K * e^{-r(T-t)}$$

Where all variables stand for their usual meaning in the standard Black Scholes equation.

For at-the-money call options, we have:

$$S = K * e^{-r(T-t)}$$

Substituting the second equation into the first, we get:

$$C(S, t) = \left( N\left(\left(\frac{1}{2}\right) * \sigma * \sqrt{T-t}\right) - N\left(-\left(\frac{1}{2}\right) * \sigma * \sqrt{T-t}\right) \right) * S$$

Taylor's formula for small x implies:

$$N(x) = N(0) + N'(0) * x + N''(0) * \frac{x^2}{2} + O(x^3)$$

Using the Taylor series on the previous equation, we get:

$$C(S, t) = S * \left( N'(0) * \sigma * \sqrt{T-t} + O\left(\sigma^3 * \sqrt{(T-t)^3}\right) \right)$$

For soon-to-expire options, we can ignore the second term and we know that for a normal distribution:

$$N'(0) = \frac{1}{\sqrt{2 * \pi}}$$

This gives us the equation:

$$C(S, t) = \left( \frac{1}{\sqrt{2 * \pi}} \right) * S * \sigma * \sqrt{T-t}$$

On rearranging, we get the equation for implied volatility:

$$\sigma = C * \frac{\sqrt{2 * \pi}}{S * \sqrt{T-t}}$$

The above equation has variables with different meaning as compared what is described in the steps of the document but it is essentially the exact equation used in calculating VOLQ.

### To learn more about the VOLQ index:

Visit [nasdaq.com/VOLQ](http://nasdaq.com/VOLQ) Email [sales@nasdaq.com](mailto:sales@nasdaq.com)

**EXHIBIT 3-2****Nasdaq-100<sup>®</sup> Volatility Index Options****Trading Symbol: VOLQ****Underlying Description:**

The Nasdaq-100 Volatility Index (“Volatility Index” or “VOLQ”) measures changes in 30 day implied volatility as expressed by options on the Nasdaq-100 Index (NDX), a modified market capitalization-weighted index composed of securities issued by 100 of the largest non-financial companies listed on The Nasdaq Stock Market LLC. VOLQ uses the prices of listed Nasdaq-100 Index options (NDX) to obtain the prices of synthetic precisely at-the-money (ATM) options. The ultimate index component options used directly in the computation include a total of eight options from each of four expirations for a total of thirty-two component options derived from observation of thirty-two NDX option bids and offers (a total of sixty-four input observations). The synthetic ATM option prices are then used to calculate 30-day closed-form implied volatility. The result is a closed-form measure of implied volatility for the Nasdaq-100 Index that focuses on the options practitioners, hedgers, and traders use most, at-the-money options.

VOLQ is quoted in percentage points per annum. For example, a VOLQ Index level of 17.90 represents an annualized implied volatility of 17.90.

**Settlement Value Symbol: VOLS****Settlement Value:**

Cash settlement - equal to the difference between the final settlement value and the strike price of the contract, multiplied by \$100. Exercise will result in delivery of cash on the business day following expiration.

The Volatility Index final settlement value, VOLS, is calculated at the open of trading on the expiration date (usually a Wednesday) based on the following process used to calculate the Closing Volume Weighted Average Price (“Closing VWAP”). At the end of individual one-second time observations during a 300 second period of time (the “Closing Settlement Period”) commencing at 9:32:00.000 on the expiration day (or 2.00.001 minutes after the open of trading in the event trading does not commence at 9:30:00 a.m. ET), and continuing each second for the next 300 seconds, the number of contracts traded at each price during the observation period is multiplied by that price to yield a Reference Number. All Reference Numbers are then summed, and that sum is then divided by the total number of contracts traded during the observation period [Sum of (contracts traded at a price x price) ÷ total contracts traded] to calculate a Volume Weighted Average Price for that observation period (a “One Second VWAP”) for that component option. If no transactions occur during any one-second observation period, the BBO midpoint at the end of the one second observation period will be considered the One Second VWAP for that observation period for purposes of this settlement methodology. Each One Second VWAP for each component option is then used to calculate the Volatility Index, resulting in the calculation of 300 sequential Volatility Index values. Finally, all 300 Volatility Index values will be arithmetically averaged (i.e., the sum of three hundred Volatility Index

calculations is divided by three hundred) and the resulting figure is rounded to the nearest .01 to arrive at the settlement value disseminated under the ticker symbol VOLS.

If the Exchange is unable to publish a settlement value by 12:00 p.m. (New York time) due to a trading halt, the Exchange will commence the calculation of the settlement window beginning 2.00.001 minutes after the re-opening of trading and publish that value on its website.

The Exchange shall be the reporting authority for VOLQ Index Options as defined within Phlx Options 4A, Section 2(a)(16).

**Multiplier:**

\$100

**Strike Price Intervals:**

\$0.50 or greater where the strike price is less than \$75, \$1 or greater where the strike price is \$200 or less.

**Strike Prices:**

In-, at- and out-of-the-money strike prices are initially listed. New series generally will be added when the VOLQ trades through the highest or lowest strike price available.

**Premium Quote:**

Stated in decimals. One point equals \$100. Minimum increment for options trading below 3.00 is 0.05 (\$5.00) and for all other series, 0.10 (\$10.00).

**Expiration Date:**

Ordinarily on the business day (usually a Wednesday) that is thirty days prior to the third Friday of the calendar month immediately following the expiring month.

**Expiration Months:**

The Exchange shall open for trading six consecutive near term expiration weeks (Short Term Option Series) plus up to nine successive expiration months. In addition, long term option series having up to sixty months to expiration may be traded.

**Exercise Style:**

European - VOLQ Index Options generally may be exercised only on the expiration date.

**Last Trading Day:**

Trading in VOLQ Options will ordinarily cease on the business day (usually a Tuesday) preceding the day on which the exercise-settlement value is calculated.

**Position Limit and Reporting Requirements:**

No position and exercise limits are in effect. Each member or member organization that maintains a position on the same side of the market in excess of 100,000 contracts for its own account or for the account of a customer in the Nasdaq-100 Volatility Index Options (VOLQ) must file a report with the Exchange that includes, but is not limited to, data related to the option

position, whether such position is hedged and if applicable, a description of the hedge and information concerning collateral used to carry the position. Market Makers are exempt from this reporting requirement.

**Margin:**

Purchases of puts or calls with 9 months or less until expiration must be paid for in full. Writers of uncovered puts or calls must deposit / maintain 100% of the option proceeds\* plus 15% of the aggregate contract value (current index level x \$100) minus the amount by which the option is out-of-the-money, if any, subject to a minimum for calls of option proceeds\* plus 10% of the aggregate contract value and a minimum for puts of option proceeds\* plus 10% of the aggregate exercise price amount. (\*For calculating maintenance margin, use option current market value instead of option proceeds.)

**Cusip Number:**

[            ]

**Trading Hours:**

9:30 a.m. - 4:15 p.m. ET

**Contact Information:**

For more information on the Nasdaq-100 Volatility Index Options (VOLQ), contact: [sales@nasdaq.com](mailto:sales@nasdaq.com) or visit [www.nasdaq.com/VOLQ](http://www.nasdaq.com/VOLQ)

**Disclaimer**

Nasdaq may, from time to time, exercise reasonable discretion as it deems appropriate in order to ensure Index integrity including but not limited to quantitative inclusion criteria. Nasdaq may also, due to special circumstances, if deemed essential, apply discretionary adjustments to ensure and maintain the high quality of the index construction and calculation. Nasdaq does not guarantee that any Index accurately reflects future market performance.

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**EXHIBIT 5**

Deleted text is [bracketed]. New text is underlined.

**NASDAQ PHLX LLC Rules**

\* \* \* \* \*

**Options Rules**

\* \* \* \* \*

**Options 3 Options Trading Rules**

\* \* \* \* \*

**Section 3. Minimum Increments**

(a) No change.

***Supplementary Material to Options 3, Section 3***

.01 - .03 No change.

.04 All Nasdaq-100<sup>®</sup> Volatility Index Options shall have a minimum increment of \$.01.

\* \* \* \* \*

**Options 4A Options Index Rules**

\* \* \* \* \*

**Section 6. Position Limits**

(a) The position limit for a broad-based (market) index option shall be 25,000 contracts on the same side of the market except as provided below. Certain positions must be aggregated in accordance with paragraph (d) or (e) below.

(i) – (iii) No change.

(iv) Respecting Nasdaq-100<sup>®</sup> Volatility Index Options, there shall be no position limits.

(b) No change.

(c) *Reporting Requirements for Options on Market Indexes.*—Each member or member organization that maintains a position on the same side of the market in excess of 100,000 contracts for its own account or for the account of a customer in the Full Value Russell 2000<sup>®</sup> Options, RUT; or in excess of 100,000 contracts for its own account or for the account of a customer in Full Value Nasdaq-100<sup>®</sup> Options, NDX[,]; or in excess of 100,000 contracts for its own account for the account of a customer in Nasdaq-100<sup>®</sup> Volatility Index options, must file a report with the Exchange that includes, but is not limited to, data related to the option positions, whether such positions are hedged and if applicable, a description of the hedge and information concerning collateral used to carry

the positions. Market Makers are exempt from this reporting requirement. For positions exceeding the position limit in paragraph (a), Supplementary Material .01 contains the requirements for qualifying for the Index Hedge Exemption under this Rule.

(d) – (f) No change.

*Supplementary Material to Options 4A, Section 6*

**.01 - .04** No change.

\* \* \* \* \*

## **Section 12. Terms of Index Options Contracts**

(a) No change.

(b) After a particular class of stock index options has been approved for listing and trading on the Exchange, the Exchange shall from time to time open for trading series of options therein. Within each approved class of stock index options, the Exchange shall open for trading a minimum of one expiration month and series for each class of approved stock index options and may also open for trading series of options having not less than twelve and up to 60 months to expiration (long-term options series) as provided in subparagraph (b)(2). Prior to the opening of trading in any series of stock index options, the Exchange shall fix the expiration month and exercise price of option contracts included in each such series.

(1) No change.

### **(2) Long-Term Option Series**

The Exchange may list, with respect to any class of stock index options or Nasdaq-100<sup>®</sup> Volatility Index options, series of options having not less than twelve and up to 60 months to expiration, adding up to ten expiration months. Such series of options may be opened for trading simultaneously with series of options trading pursuant to this rule. Strike price interval, bid/ask differential and continuity rules shall not apply to such options series until the time to expiration is less than twelve months.

(3) – (5) No change.

### **(6) Nasdaq-100<sup>®</sup> Volatility Index Options (“VOLQ options”).**

(A) Listing Schedule. The Exchange may list up to six weekly expirations and up to 12 standard (monthly) expirations in VOLQ options. The six weekly expirations shall be for the nearest weekly expirations from the actual listing date and weekly expirations may not expire in the same week in which standard (monthly) VOLQ options expire. Standard (monthly) expirations in VOLQ

options are not counted as part of the maximum six weekly expirations permitted for VOLQ options.

(B) *Exercise Settlement Value Date.* The exercise settlement value of a VOLQ option for all purposes under these Rules and the Rules of the Clearing Corporation shall be calculated on the specific date (usually a Wednesday) identified in the option symbol for the series. If that Wednesday or the Friday that is 30 days following that Wednesday is an Exchange holiday, the exercise settlement value shall be calculated on the business day immediately preceding that Wednesday.

(C) *Expiration Date and Last Day of Trading.* The expiration date of a VOLQ option shall be the same day that the exercise settlement value of the VOLQ option is calculated. The last trading day for a VOLQ option shall be the business day immediately preceding the expiration date of the VOLQ option. When the last trading day is moved because of an Exchange holiday, the last trading day for an expiring VOLQ option contract will be the day immediately preceding the last regularly scheduled trading day.

(D) *Final Settlement Price Calculation.*

(I) The final settlement price for VOLQ options will be the Closing Volume Weighted Average Price (“Closing VWAP”) calculated on the morning of the VOLQ options expiration.

(II) The Closing VWAP shall be determined by reference to the prices and sizes of executed transactions or quotes in the thirty-two underlying Nasdaq-100<sup>®</sup> index (“NDX”) component options on the Exchange. The following process is used to calculate the Closing VWAP of the VOLQ options. At the end of individual one-second time observations during a 300 second period of time (the “Closing Settlement Period”) commencing at 9:32:010 on the expiration day (or 2.01 minutes after the open of trading in the event trading does not commence at 9:30:00 a.m. ET), and continuing each second for the next 300 seconds, the number of contracts traded at each price during the observation period is multiplied by that price to yield a Reference Number. All Reference Numbers are then summed, and that sum is then divided by the total number of contracts traded during the observation period [Sum of (contracts traded at a price x price) ÷ total contracts traded] to calculate a Volume Weighted Average Price for that observation period (a “One Second VWAP”) for that component option. If no transactions occur on Phlx during any one-second observation period, the NBBO midpoint at the end of the one second observation period will be considered the One Second VWAP for that observation period for purposes of this settlement methodology. VOLS would utilize the

best bid and best offer, which may consist of a quote or an order, from among the listing markets, Phlx, Nasdaq ISE, LLC and Nasdaq GEMX, LLC markets. Each One Second VWAP for each component option is then used to calculate the Volatility Index, resulting in the calculation of 300 sequential Volatility Index values. Finally, all 300 Volatility Index values will be arithmetically averaged (i.e., the sum of 300 Nasdaq-100<sup>®</sup> Volatility Index calculations is divided by 300) and the resulting figure is rounded to the nearest .01 to arrive at the settlement value disseminated under the ticker symbol VOLS.

If the Exchange is unable to publish a settlement value by 12:00 p.m. (New York time) due to a trading halt, the Exchange will commence the calculation of the settlement window beginning 2.00.001 minutes after the re-opening of trading and publish that value on its website.

(E) *Strike Price Intervals.* Notwithstanding subsection (a) to this Options 4A, Section 12, the interval between strike prices for VOLQ options will be \$0.50 or greater where the strike price is less than \$75, \$1 or greater where the strike price is \$200 or less and \$5 or greater where the strike price is more than \$200.

(c) and (d) No change.

(e) A.M.-Settled Index Options. The last day of trading for A.M.-settled index options shall be the business day preceding the business day of expiration, or, in the case of an option contract expiring on a day that is not a business day, the business day preceding the last day of trading in the underlying securities prior to the expiration date. The current index value at the expiration of an A.M.-settled index option shall be determined, for all purposes under these Rules and the Rules of The Options Clearing Corporation, on the last day of trading in the underlying securities prior to expiration, by reference to the reported level of such index as derived from first reported sale (opening) prices of the underlying securities on such day, except that:

(I) In the event that the primary market for an underlying security does not open for trading on that day, the price of that security shall be determined, for the purposes of calculating the current index value at expiration, as set forth in Options 4A, Section 12(g), unless the current index value at expiration is fixed in accordance with the Rules and By-Laws of The Options Clearing Corporation; and

(II) in the event that the primary market for an underlying security is open for trading on that day, but that particular security does not open for trading on that day, the price of that security, for the purposes of calculating the current index value at expiration, shall be the last reported sale price of the security. The following A.M.-settled index options are approved for trading on the Exchange:

- (i) PHLX Semiconductor Sector
- (ii) PHLX Housing Sector
- (iii) PHLX Oil Service Sector
- (iv) KBW Bank Index
- (v) Full Value Nasdaq-100<sup>®</sup> Options
- (vi) Reduced Value Nasdaq-100<sup>®</sup> Options
- (vii) Nasdaq-100<sup>®</sup> Volatility Index Options

(f) and (g) No change.

*Supplementary Material to Options 4A, Section 12*

**.01** Transactions in broad-based (market) index options traded on the Exchange, including Full Value Russell 2000<sup>®</sup> Options and Reduced Value Russell 2000<sup>®</sup> Options, Full and Reduced Value Russell 3000<sup>®</sup> Index, Full and Reduced Value Russell 3000<sup>®</sup> Value Index, Full and Reduced Value Russell 3000<sup>®</sup> Growth Index, Full and Reduced Value Russell 2500<sup>™</sup> Index, Full and Reduced Value Russell 2500<sup>™</sup> Value Index, Full and Reduced Value Russell 2500<sup>™</sup> Growth Index, Full and Reduced Value Russell 2000<sup>®</sup> Value Index, Full and Reduced Value Russell 2000<sup>®</sup> Growth Index, Full and Reduced Value Russell 1000<sup>®</sup> Index, Full and Reduced Value Russell 1000<sup>®</sup> Value Index, Full and Reduced Value Russell 1000<sup>®</sup> Growth Index, Full and Reduced Value Russell Top 200<sup>®</sup> Index, Full and Reduced Value Russell Top 200<sup>®</sup> Value Index, Full and Reduced Value Russell Top 200<sup>®</sup> Growth Index, Full and Reduced Value Russell MidCap<sup>®</sup> Index, Full and Reduced Value Russell MidCap<sup>®</sup> Value Index, Full and Reduced Value Russell MidCap<sup>®</sup> Growth Index, Full and Reduced Value Russell Small Cap Completeness<sup>®</sup> Index, Full and Reduced Value Russell Small Cap Completeness<sup>®</sup> Value Index, and Full and Reduced Value Russell Small Cap Completeness<sup>®</sup> Growth Index and Full Value Nasdaq-100<sup>®</sup> Options, [and ]Reduced Value Nasdaq-100<sup>®</sup> Options and Nasdaq-100<sup>®</sup> Volatility Index Options may be effected on the Exchange until 4:15 P.M. each business day, through the expiration date. Transactions in Alpha Index options may also be effected on the Exchange until 4:15 P.M. each business day, through the expiration date.

**.02 - .05** No change.

\* \* \* \* \*