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SECURITIES AND EXCHANGE COMMISSION  
WASHINGTON, D.C. 20549  
Form 19b-4

File No.\* SR - 2018 - \* 015

Filing by Financial Industry Regulatory Authority

Pursuant to Rule 19b-4 under the Securities Exchange Act of 1934

Initial *	Amendment *	Withdrawal	Section 19(b)(2) *	Section 19(b)(3)(A) *	Section 19(b)(3)(B) *
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Pilot	Extension of Time Period for Commission Action *
<input type="checkbox"/>	<input type="checkbox"/>



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) \*

Section 806(e)(2) \*

Section 3C(b)(2) \*

**Description**

Provide a brief description of the action (limit 250 characters, required when Initial is checked \*).

Proposed Rule Change to Amend FINRA Rule 6433 to Adopt the OTC Quotation Tier Pilot as Permanent

**Contact Information**

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 \* Racquel

Last Name \* Russell

Title \* Associate General Counsel

E-mail \* racquel.russell@finra.org

Telephone \* (202) 728-8363 Fax (202) 728-8264

**Signature**

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 04/20/2018

Senior Vice President and Director of Capital Markets  
Policy

By Stephanie M. Dumont

(Name \*)

Stephanie Dumont,

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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

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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

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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) Pursuant to the provisions of Section 19(b)(1) of the Securities Exchange Act of 1934 (“Act”),<sup>1</sup> Financial Industry Regulatory Authority, Inc. (“FINRA”) is filing with the Securities and Exchange Commission (“SEC” or “Commission”) a proposed rule change to amend FINRA Rule 6433 (Minimum Quotation Size Requirements for OTC Equity Securities) to adopt as permanent the minimum quotation sizes for OTC equity securities currently operating on a pilot basis, scheduled to expire on June 7, 2018.

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**

At its meeting on December 8, 2010, the FINRA Board of Governors authorized the filing of the proposed rule change with the SEC. No other action by FINRA is necessary for the filing of the proposed rule change.

FINRA is proposing to adopt as permanent minimum quotation sizes that have been in effect on a pilot basis since November 12, 2012. Thus, if the Commission approves the proposed rule change, the implementation date of the proposed rule change shall be the date of approval by the Commission to permit the pilot tiers to continue to operate without interruption.

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

(a) Purpose

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

FINRA proposes to amend Rule 6433 (Minimum Quotation Size Requirements for OTC Equity Securities) (the “Rule”) to adopt as permanent the minimum quotation sizes applicable to quotations in OTC equity securities<sup>2</sup> that were proposed pursuant to File No. SR-FINRA-2011-058 and implemented on a pilot basis on November 12, 2012 (“Tier Size Pilot” or “Pilot”).<sup>3</sup> The Pilot was initially approved for a one-year term, has been extended ten times, and currently is scheduled to expire on June 7, 2018.<sup>4</sup>

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<sup>2</sup> An OTC equity security is an equity security that is not an “NMS Stock” as defined in Rule 600(b)(47) of SEC Regulation NMS; provided, however, that the term “OTC equity security” shall not include any Restricted Equity Security. See FINRA Rule 6420(f).

<sup>3</sup> See Securities Exchange Act Release No. 65568 (October 14, 2011), 76 FR 65307 (October 20, 2011) (Notice of Filing of File No. SR-FINRA-2011-058) (“Original Proposal”).

<sup>4</sup> See Securities Exchange Act Release No. 67208 (June 15, 2012), 77 FR 37458 (June 21, 2012) (Notice of Filing of Amendment No. 2 and Order Granting Accelerated Approval of a Proposed Rule Change, as Modified by Amendment Nos. 1 and 2, To Amend FINRA Rule 6433 (Minimum Quotation Size Requirements for OTC Equity Securities)) (Order Approving File No. SR-FINRA-2011-058, as amended); see also Securities Exchange Act Release No. 70839 (November 8, 2013), 78 FR 68893 (November 15, 2013) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to November 14, 2014; File No. SR-FINRA-2013-049); Securities Exchange Act Release No. 73299 (October 3, 2014), 79 FR 61120 (October 9, 2014) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to February 13, 2015; File No. SR-FINRA-2014-041); Securities Exchange Act Release No. 74251 (February 11, 2015), 80 FR 8741 (February 18, 2015) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to May 15, 2015; File No. SR-FINRA-2015-002); Securities Exchange Act Release No. 74927 (May 12, 2015), 80 FR 28327 (May 18, 2015) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to August 14, 2015; File No. SR-FINRA-2015-010); Securities Exchange Act Release No. 75639 (August 7, 2015), 80 FR 48615 (August 13, 2015) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to December 11, 2015; File No. SR-FINRA-2015-028); Securities Exchange Act Release No. 76519 (November 24, 2015), 80 FR 75155 (December 1, 2015) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to



The Pilot tiers were designed to: (1) simplify the structure of the minimum quotation sizes; (2) facilitate the display of customer limit orders under Rule 6460 (Display of Customer Limit Orders) (“limit order display rule”); and (3) expand the scope of the Rule to provide for uniform treatment of the types and sources of quotations that would be subject to the Rule.<sup>5</sup> FINRA believes the Pilot has resulted in its intended objectives, and particularly notes that the Pilot has yielded a significant positive result with regard to increased display of customer limit orders. At the same time, market quality measures have been neutral (*i.e.*, unchanged) or slightly positive (*i.e.*, slightly improved) overall during the Pilot, as compared to the pre-Pilot period, as discussed more fully below. Accordingly, FINRA believes it is appropriate and consistent with the Act to adopt the Pilot tier sizes on a permanent basis.

#### Objectives of the Pilot

FINRA Rule 6433 sets forth the minimum quotation sizes applicable to the display of quotations in OTC equity securities on any inter-dealer quotation system that

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Extend the Tier Size Pilot to June 10, 2016; File No. SR-FINRA-2015-051); Securities Exchange Act Release No. 77923 (May 26, 2016), 81 FR 35432 (June 2, 2016) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to December 9, 2016; File No. SR-FINRA-2016-016); Securities Exchange Act Release No. 79401 (November 25, 2016), 81 FR 86762 (December 1, 2016) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to June 9, 2017; File No. SR-FINRA-2016-044); Securities Exchange Act Release No. 80727 (May 18, 2017), 82 FR 23953 (May 24, 2017) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to December 8, 2017; File No. SR-FINRA-2017-014); Securities Exchange Act Release No. 82153 (November 22, 2017), 82 FR 56300 (November 28, 2017) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to June 7, 2018; File No. SR-FINRA-2017-035).

<sup>5</sup> See Order Approving File No. SR-FINRA-2011-058, 77 FR at 37458.

permits quotation updates on a real-time basis. The Rule provides different minimum quotation sizes that apply depending upon the price level of the bid or offer in the security.

Prior to the Pilot, which has been in effect since November 12, 2012,<sup>6</sup> Rule 6433 provided for nine tier sizes that applied only to market makers' proprietary quotes. The pre-Pilot tiers ranged in price points from \$0.00 through \$2,500.01, and are shown below in Table 1.

TABLE 1

Price (Bid or Offer)	Minimum Quote Size (# of shares)
\$0 to \$0.50	5,000
\$0.51 to \$1.00	2,500
\$1.01 to \$10.00	500
\$10.01 to \$100.00	200
\$100.01 to \$200.00	100
\$200.01 to \$500.00	25
\$500.01 to \$1,000.00	10
\$1,000.01 to \$2,500.00	5
\$2,500.01 +	1

Under the Pilot, the number of tiers was reduced from nine to six, and the tiers apply to all quotations displayed by market makers, whether representing proprietary or customer interest, as well as quotations displayed by non-market makers (*i.e.*, alternative trading systems or any other member firm).<sup>7</sup> The Pilot tiers ultimately adopted are shown below in Table 2.

<sup>6</sup> Regulatory Notice 12-51 (November 2012); see also Regulatory Notice 12-37 (August 2012).

<sup>7</sup> FINRA initially proposed six tiers, some of which were different from those ultimately adopted. However, in response to comments received, FINRA amended the filing to increase the minimum quotation size for most price points between \$0.02 and \$1.00. FINRA stated that the amended tiers were intended to facilitate the display of additional liquidity by market makers. See Securities

**TABLE 2**

<b>Price (Bid or Offer)</b>	<b>Minimum Quote Size (# of shares)</b>
\$0.0001 to \$0.0999	10,000
\$0.10 to \$0.1999	5,000
\$0.20 to \$0.5099	2,500
\$0.51 to \$0.9999	1,000
\$1.00 to \$174.99	100
\$175.00 +	1

The Pilot tiers simplified the tier structure by reducing the number of tiers from nine to six. In addition, for price points between \$1.00 and \$174.99, the Pilot established a minimum quotation size of 100 shares, which is comparable to the minimums generally applicable to quotations in securities on equity exchanges. The Pilot also revised the smallest price point from \$0.00 to \$0.0001 to conform to the minimum quotation increments under Rule 6434 (Minimum Pricing Increment for OTC Equity Securities).<sup>8</sup>

Importantly, the Pilot was designed to facilitate the display of customer limit orders under FINRA's limit order display rule, which generally requires that OTC market makers fully display better-priced customer limit orders (or same-priced customer limit orders that are at the best bid or offer and that increase the OTC market maker's size by more than a de minimis amount). Pursuant to the limit order display rule, OTC market makers are not required to display a customer limit order on an inter-dealer quotation system unless doing so would comply with the minimum quotation size applicable to the price of the quotation under the Rule. Therefore, although a customer limit order may

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Exchange Act Release No. 66819 (April 17, 2012), 77 FR 23770 (April 20, 2012) (Amendment No. 1 to File No. SR-FINRA-2011-058); see also Original Proposal.

<sup>8</sup> Rule 6434, among other things, prohibits members from displaying a bid or offer in an OTC equity security in an increment smaller than \$0.01 if the bid or offer is priced \$1.00 or greater per share, or in an increment smaller than \$0.0001 if the bid or offer is priced below \$1.00.

otherwise have been required to be displayed under the limit order display rule – for example, because it improved price or the size (more than a de minimis amount) – if the order is less than the minimum quotation size prescribed by Rule 6433, the member is not required to display the order. Thus, FINRA believed that the revisions implemented by the Pilot would improve overall display of customer limit orders.

For example, because the Pilot would reduce the minimum quotation size from 2,500 to 100 shares for securities priced at or above \$1.00, FINRA believed that competitively priced customer limit orders, which tend to be smaller-sized orders, would more likely be displayed and potentially yield a variety of benefits, including improved price transparency, enhanced execution of customer limit orders, and narrower spreads. In addition, in a memorandum on potential effects of the Pilot, SEC staff economists noted that enhanced visibility of customer limit orders could reduce customers' execution costs.<sup>9</sup>

An additional objective of the Pilot was to expand the Rule's scope to apply to all member quotations on an inter-dealer quotation system. Prior to the Pilot, the Rule applied only to market makers' proprietary quotes in OTC equity securities on an inter-dealer quotation system. Under the Pilot, the minimum tier sizes apply to any member quotations entered on an inter-dealer quotation system (including quotes representing customer interest and quotations entered by non-market makers).

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<sup>9</sup> See Memorandum to File No. SR-FINRA-2011-058 re: FINRA Proposal to Reduce Minimum Quotation Size in OTC Market Tiers from Division of Risk, Strategy, and Financial Innovation, dated June 1, 2012, available at: <http://www.sec.gov/comments/sr-finra-2011-058/finra2011058-13.pdf>.

Concerns Raised During the Proposal Process and Data Commitment

The Commission received several comments in response to FINRA's Tier Size Pilot proposal. Commenters generally were supportive of the goal of increased customer limit order display;<sup>10</sup> however, commenters also raised concerns regarding the impact of revised tiers. Specifically, certain commenters questioned whether the Pilot might harm market quality by permitting market makers to post quotes representing minimum dollar value commitments that are not financially meaningful, or otherwise eroding market maker liquidity in OTC equity securities.<sup>11</sup> In addition, some commenters believed that there was not sufficient data analysis to support the proposed changes to the tier sizes.<sup>12</sup>

In response to commenters' concerns, FINRA filed Amendment No. 1 to the Original Proposal to increase the minimum quotation sizes for most price points between \$0.02 and \$1.00, and proposed that the revised tiers operate as a one-year pilot instead of as a permanent amendment. FINRA also submitted Amendment No. 2 to the Original Proposal to, among other things, specify the items of data that FINRA would collect and provide to the Commission during the duration of the Pilot; specifically:

1. The price of the first trade of each trading day executed at or after 9:30:00 a.m., based on execution time.
2. The price of the last trade of each trading day executed at or before 4:00:00 p.m., based on execution time.
3. Daily share volume.

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<sup>10</sup> See Order Approving File No. SR-FINRA-2011-058.

<sup>11</sup> See id.

<sup>12</sup> See id. at 37461-62.

4. Daily dollar volume.
5. Number of limit orders from customers and in total.
6. Percentage of the day that the size of the BBO equals the minimum quote size.
7. Number of market makers actively quoting.
8. Number of executions from a limit order and number of limit orders at the BBO or better by tier size from a customer and in total.
9. Liquidity/BBO metrics
  - a. Time-weighted quoted spread.
  - b. Effective spread.
  - c. Time-weighted quoted depth (number of shares) at the inside.
  - d. Time-weighted quoted depth (dollar value of shares) at the inside.

FINRA also committed to submitting an assessment, at least 60 days before the end of the Pilot, that addressed the impact of the Pilot, the concerns raised by commenters during the rule filing process, and whether the Pilot resulted in the desired effects.<sup>13</sup>

#### Pilot Assessment

FINRA submitted its assessment on the operation of the Tier Size Pilot on September 13, 2013, which utilized pilot data covering the period from November 12, 2012 through June 30, 2013.<sup>14</sup> The 2013 Assessment, discussed in greater detail below,

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<sup>13</sup> See Amendment No. 2 to File No. SR-FINRA-2011-058, available at <http://www.finra.org/file/amendment-no-2-propose-rule-change>.

<sup>14</sup> FINRA engaged a third-party, Cornerstone Research, to conduct an analysis of the impact of the Pilot on OTC market quality. The 2013 assessment is part of the SEC's comment file for SR-FINRA-2011-058 and also is available on FINRA's



included a recommendation, based on the extensive analysis conducted, that the Pilot tiers be adopted as permanent. Nonetheless, FINRA extended the Pilot duration to allow the effects of the Pilot to be more thoroughly reviewed.<sup>15</sup> During this extension, the Staff of the Division of Economic and Risk Analysis (“DERA”) of the SEC conducted a study, which assessed the impact of the Pilot on liquidity. The study was published as a memorandum to file (“DERA Memo to File”).<sup>16</sup> And while the two studies covered different time periods and employed different methods, the DERA Memo to File reported findings consistent with those of the FINRA 2013 Assessment. In light of the 2013 Assessment, FINRA’s further observations, and the DERA Memo to File, FINRA continues to believe that it is appropriate to permanently adopt the tier sizes that have been in operation since November 12, 2012, and is proposing to do so at this time.

FINRA believes the 2013 Assessment demonstrated that the Pilot accomplished its objectives, including increased customer limit order display, and that key market quality indicators have been unchanged or have slightly improved overall. FINRA continued to collect and provide Pilot data to the SEC since the 2013 Assessment. In addition, FINRA has continued to monitor the impact of the operation of the Pilot on market quality metrics for the over-the-counter marketplace, which FINRA generally believes indicate positive trends overall, providing continued support for permanent

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website at: <http://www.finra.org/industry/rule-filings/sr-finra-2011-058> (“2013 Assessment”).

<sup>15</sup> See supra note 4.

<sup>16</sup> See Memorandum to File No. SR-FINRA-2011-058 re: FINRA’s Pilot Program Amending Minimum Quotation Size Requirements for OTC Equity Securities from DERA, dated July 28, 2017, available at: [https://www.sec.gov/files/otc\\_tiersizepilot\\_memo.pdf](https://www.sec.gov/files/otc_tiersizepilot_memo.pdf).

adoption of the Pilot tiers.<sup>17</sup> Moreover, the DERA Memo to File provided further evidence, in a regression framework, that supports the conclusion that the Pilot had a neutral to positive impact on market quality.

Specifically, FINRA believes that the 2013 Assessment demonstrated that the Pilot has resulted in a meaningful increase in the display of customer limit orders. Moreover, FINRA believes the data collected during the Pilot also supports that market quality has not been harmed, as suggested by the analysis of market quality measures such as spreads and market depth.

(A) Enhanced Customer Limit Order Display

When the Commission approved the Pilot, it recognized the potential benefits of enhancing customer limit order display. Notably, the Commission found that “[i]n the Commission’s view, FINRA’s proposed revisions are designed to protect investors by revising the Rule’s tier thresholds such that a larger percentage of customer limit orders are reflected in quotations for OTC equity securities, thereby potentially improving the prices at which customer limit orders will be executed, consistent with the protection of investors and the public interest.”<sup>18</sup> FINRA believes the Pilot clearly has achieved the objective of increased customer limit order display.

As noted in FINRA’s September 2013 Assessment, between November 1, 2012 and June 30, 2013, for all tier sizes combined, there was a 13% increase in the number of

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<sup>17</sup> FINRA engaged in outreach with member firms that are active in the market for OTC Equity Securities regarding the operation of the Tier Size Pilot, and the majority of those firms did not oppose the permanent adoption of the Pilot.

<sup>18</sup> See Order Approving File No. SR-FINRA-2011-058, 77 FR at 37466. See also Memorandum to file from Division of Risk, Strategy, and Financial Innovation, dated June 1, 2012, supra note 9.

customer limit orders that met the minimum quotation sizes to be eligible for display under the Pilot tiers. FINRA also observed a significant increase in the number of customer limit orders in securities priced between \$0.20 and \$100.00 that became eligible for display. This trend continued through July 31, 2014. Specifically, between July 1, 2013 and July 31, 2014, FINRA observed, for all tier sizes combined, an 18.45% increase in the number of customer limit orders that met the minimum quotation sizes and, therefore, eligible for display – also with the most significant increase observed for securities priced between \$0.20 and \$100.00.

Tables 3 and 4 below show the percentage of customer limit orders that were equal to or greater than the minimum quotation size under both the Pilot and pre-Pilot tier sizes for the specified price ranges for the periods of November 1, 2012 through June 30, 2013, and from July 1, 2013 through July 31, 2014, respectively.

**TABLE 3**  
November 1, 2012 through June 30, 2013

<b>Price Range</b>	<b>Pilot Tier Size</b>	<b>Customer Limit Orders ≥ Tier Size</b>	<b>Pre-Pilot Tier Size</b>	<b>Customer Limit Orders ≥ Tier Size</b>
0.0001-0.0999	10,000	78.29%	5,000	86.30%
0.10-0.1999	5,000	56.89%	5,000	56.89%
0.20-0.5099	2,500	57.35%	5,000	43.30%
0.51-0.9999	1,000	72.81%	2,500	46.05%
1.00-10.00	100	97.86%	500	74.73%
10.01-100.00	100	98.24%	200	87.93%
100.01-174.99	100	90.49%	100	90.49%
175.00-200.00	1	100%	100	96.71%
200.01-500.00	1	100%	25	90.74%
500.01-1,000.00	1	100%	10	64.62%
1,000.00-2,500.00	1	100%	5	61.38%
2,500.00+	1	100%	1	100.00%

**TABLE 4**  
July 1, 2013 through July 31, 2014

<b>Price Range</b>	<b>Pilot Tier Size</b>	<b>Customer Limit Orders <math>\geq</math> Tier Size</b>	<b>Pre-Pilot Tier Size</b>	<b>Customer Limit Orders <math>\geq</math> Tier Size</b>
0.0001-0.0999	10,000	78.29%	5,000	88.70%
0.10-0.1999	5,000	56.89%	5,000	57.78%
0.20-0.5099	2,500	57.35%	5,000	42.31%
0.51-0.9999	1,000	72.81%	2,500	42.10%
1.00-10.00	100	97.86%	500	68.36%
10.01-100.00	100	98.24%	200	78.03%
100.01-174.99	100	90.49%	100	90.60%
175.00-200.00	1	100%	100	91.94%
200.01-500.00	1	100%	25	89.41%
500.01-1,000.00	1	100%	10	66.65%
1,000.00-2,500.00	1	100%	5	65.58%
2,500.00+	1	100%	1	100.00%

As was noted in the 2013 Assessment, of the 301,628,686 customer limit orders in OTC equity securities reported to FINRA's Order Audit Trail System ("OATS") between November 1, 2012 and June 30, 2013, over 86.6% were priced between \$0.20 and \$100.00. Of particular note, 58.7 million customer limit orders, or almost 20% of all customer limit orders, were priced between \$1.00 and \$10.00. This price range experienced an increase of almost 24% in the number of customer limit orders that met the minimum quotation size to be eligible for display under the Pilot. Further, 181.6 million customer limit orders, or over 60% of all customer limit orders, were priced between \$10.01 and \$100.00. This price range experienced an increase of over 10% in the number of customer limit orders that met the tier sizes and were eligible for display under the Pilot tier sizes. Consequently, the 2013 Assessment found that an additional 32 million customer limit orders priced between \$1.00 and \$100.00 became eligible for display during the Pilot that otherwise would not have been eligible for display.

The trends during the period since the 2013 Assessment are similar. Specifically, of the 573,973,197 customer limit orders in OTC equity securities reported to OATS between July 1, 2013 and July 31, 2014, 81.4% were priced between \$0.20 and \$100.00. Of particular note, 114.5 million customer limit orders, or almost 20% of all customer limit orders, were priced between \$1.00 and \$10.00. From July 1, 2013 through July 31, 2014, this price range experienced an increase of over 29% in the number of customer limit orders that met the minimum quotation size to be eligible for display under the Pilot than would have been eligible in the absence of the Pilot. Further, 312.1 million customer limit orders, or over 54% of all customer limit orders, were priced between \$10.01 and \$100.00. This price range experienced an increase of over 19% in the number of customer limit orders that met the tier sizes and were eligible for display under the Pilot tier sizes. Consequently, an additional 94.9 million customer limit orders priced between \$1.00 and \$100.00 became eligible for display during the Pilot between June 30, 2013 and July 31, 2014 than otherwise would have been eligible for display.

Thus, with an aggregate overall increase in displayed customer limit orders in OTC equity securities over the period from November 12, 2012 through July 31, 2014 of 16.24%, representing approximately 142 million additional orders than otherwise would have been eligible for display, FINRA believes that the impact of the Pilot on limit order display has clearly been positive, with stronger than average results concentrated in the price points ranging from \$10.01 and \$100.00 (the range in which the majority of all customer limit orders fell (approximately 57%)).

(B) Impact on Market Quality

When the Commission approved the Pilot, it acknowledged that the Pilot may raise issues of “potentially competing forces” – enhanced customer limit order display on the one hand, and potential harm to OTC equity market quality (liquidity, efficiency, and volatility) on the other.<sup>19</sup> On balance, however, the Commission expressed the view that “as well as increasing the number of customer limit orders eligible for display and the potential for better executions, arguments can be made that FINRA’s proposal will benefit the OTC market by facilitating market making activity, narrowing spreads and increasing liquidity.”<sup>20</sup>

FINRA believes that analysis of the Pilot and pre-Pilot data generally shows that the market quality measures the Commission identified – i.e., market maker activity, spreads and liquidity<sup>21</sup> – were unchanged to slightly improved, and that, therefore, there has been an overall neutral to positive impact on OTC market quality for the majority of tiers as compared to the pre-Pilot data.<sup>22</sup>

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<sup>19</sup> See Order Approving File No. SR-FINRA-2011-058, 77 FR at 37467.

<sup>20</sup> See Order Approving File No. SR-FINRA-2011-058, 77 FR at 37467.

<sup>21</sup> To the extent the Commission expressed concern about volatility when it approved the Pilot, its concern was premised on the Pilot’s impact on liquidity. See, e.g., Order Approving File No. SR-FINRA-2011-058, 77 FR at 37470 (“[I]f the revised tier sizes result in less activity by market makers, overall liquidity in the marketplace could decline. Such a decline could result in increased volatility and less efficient pricing for OTC equity securities.”) (internal citation omitted).

<sup>22</sup> FINRA notes that, from an analytical perspective, changes in market quality measures may not be attributable solely due to the Pilot, since they may also be impacted by other contemporaneous market factors.



As noted in the 2013 Assessment, where minimum quotation size decreased under the Pilot, effective spreads generally remained the same or narrowed, quoted spreads narrowed, and price impact generally decreased. The 2013 Assessment also stated that some of the market quality metrics provided inconclusive results, specifically for Tier 1 securities, where the minimum quote size requirement increased. The 2013 Assessment documented that effective spreads had widened, but with no significant reduction in quoted depth.<sup>23</sup>

In the post-2013 Assessment period of July 1, 2013 through July 31, 2014, FINRA has observed that the number of stocks quoted in the OTC market has remained relatively constant<sup>24</sup> and market makers continued to provide liquidity.<sup>25</sup> The number of BBO quotes also significantly increased throughout 2014, the second year of the Pilot; as it generally hovered around 2 million per day during the Pre-Pilot period, but steadily increased, reaching a high of approximately 6 million per day in early 2014 and leveling off to an average of 5 million per day during the month of July 2014. The average

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<sup>23</sup> For Tier 1 securities, the DERA Memo to File finds that both quoted and effective spreads increase between the pre-Pilot period (November 14, 2011 through October 31, 2012) and the Pilot period (November 12, 2012 through November 28, 2014) covered by the analysis. However, the DERA Memo to File does not find sufficient evidence that these increases in spreads were caused by the Pilot, as spreads started to widen at least six months prior to the implementation of the Pilot.

<sup>24</sup> The number of stocks quoted on the OTC market remained stable at around 10,000 throughout the pre-Pilot period, and during the period covered in the 2013 Assessment and FINRA's subsequent observations (November 1, 2012 through July 31, 2014).

<sup>25</sup> There was an average of nine market-makers for each symbol with no significant change in the number between the pre-Pilot period, and during the period covered in the 2013 Assessment and FINRA's subsequent observations (November 1, 2012 through July 31, 2014).

number of trades per day was higher during the first two years of the Pilot compared to the pre-Pilot level, and more than tripled by March 2014.<sup>26</sup> However, trading activity appears to have leveled-off in mid-2014, albeit still at levels above the pre-Pilot trading.<sup>27</sup> Liquidity continued to be provided at levels greater than the minimum required depth, evidenced by executions at sizes greater than the required minimums, which enabled the execution of large trades in the OTC market. For example, for Tier 1 securities where the minimum quotation size increased, the number of trades executed above the minimum size increased by approximately 75%. While there was virtually no change in the frequency of trades above the minimum size for Tiers 2 and 3, all the other tiers experienced a positive change. Trading in sizes greater than the minimum quotation occurred infrequently in these tiers both prior to and during the pilot.

The analysis of data from the second year of the Pilot also confirms FINRA's position that the impact of the change in the minimum quotation size on the market quality metrics is generally positive. FINRA staff analyzed the change in five measures to evaluate the impact of the Pilot on market quality – time-weighted quoted spreads, volume-weighted spreads, time-weighted quoted depth at the BBO, time-weighted quoted depth around the BBO, and price impact. Time-weighted quoted spreads continued to narrow during the first two years of the Pilot and these positive changes in time-weighted quoted spreads between the pre-Pilot and the first two years of the Pilot were statistically

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<sup>26</sup> The daily number of trades executed during the year prior to the Pilot is estimated at approximately 75,000, and reached around 250,000 trades by the end of the first quarter in 2014.

<sup>27</sup> The daily average number of trades was approximately 100,000 by July 2014.

significant for all tiers.<sup>28</sup> Similarly, volume-weighted spreads were unchanged (or slightly narrowed) for all tiers between the pre-Pilot period and the first two years of the Pilot when accounting for the longer Pilot period.

The displayed depth decreased slightly for most tiers, but a consideration of depth beyond the BBO demonstrated that any declines were mostly statistically insignificant across tiers in the first two years of the Pilot. FINRA believes that consideration of depth beyond the BBO is a useful additional measure for assessing market depth.

In addition, based on a data review using the same methodology as was employed for the 2013 Assessment, subsequent to the completion of the 2013 Assessment, FINRA observed that the price impact of hypothetical market orders continued to remain lower during the second year of the Pilot period than during the pre-Pilot period.<sup>29</sup> For example, the following two tables present the price impact for hypothetical market buy and sell orders with sizes five times larger than the minimum size requirement for each tier. The price impact associated with the hypothetical orders is estimated to have declined for all tiers, which is an indication of improved market quality. The decline is

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<sup>28</sup> For stocks in price tiers where the minimum quotation size requirement decreased, the DERA Memo to File also finds that both quoted and effective spreads decrease between the pre-Pilot period (from November 14, 2011 to October 31, 2012) and the Pilot period (November 12, 2012 to November 28, 2014) covered by the analysis. Furthermore, the DERA Memo to File's analysis suggests that these decreases in spreads may reflect causal effects of the Pilot. In contrast, for stocks in price tiers where the minimum quotation size requirement increased or remained the same, the DERA Memo to File does not find sufficient evidence that the Pilot had a causal impact on spreads.

<sup>29</sup> As discussed in the 2013 Assessment, the price impact of hypothetical market orders is the effective half spread for a hypothetical market "sweep" order of a particular size. In other words, it is an estimate of what the volume-weighted average effective half spread would have been had a market order been broken up and routed to the market makers based on price priority.

significant for all levels except for Tiers 5b and 5c (for buy trades) and Tier 1 (for sell trades).<sup>30</sup>

**TABLE 5**  
Price Impact for Hypothetical Large Market Buy Orders

<b>Tier</b>	<b>Minimum Quotation Size Change</b>	<b>Number of Stocks</b>	<b>Pre-Pilot (10/2011 - 10/2012)</b>	<b>Pilot (11/2012 - 7/2014)</b>	<b>Difference</b>	<b>t-statistic</b>
1	Increased	3,586	0.0055	0.0050	-0.0005	(2.60)
2	Maintained	1,254	0.0235	0.0197	-0.0038	(5.03)
3	Decreased	1,752	0.0506	0.0420	-0.0086	(6.41)
4	Decreased	1,537	0.0969	0.0810	-0.0159	(5.00)
5a	Decreased	3,038	0.3295	0.2530	-0.0765	(7.79)
5b	Decreased	2,026	1.1630	1.0661	-0.0969	(1.55)
5c	Maintained	177	4.8322	4.7906	-0.0416	(0.06)

**TABLE 6**  
Price Impact for Hypothetical Large Market Sell Orders

<b>Tier</b>	<b>Minimum Quotation Size Change</b>	<b>Number of Stocks</b>	<b>Pre-Pilot (10/2011 - 10/2012)</b>	<b>Pilot (11/2012 - 7/2014)</b>	<b>Difference</b>	<b>t-statistic</b>
1	Increased	3,931	0.0062	0.0059	-0.0003	(1.60)
2	Maintained	1,483	0.0233	0.0169	-0.0064	(3.41)
3	Decreased	1,787	0.0540	0.0311	-0.0229	(4.87)
4	Decreased	1,676	0.1214	0.0656	-0.0558	(4.95)
5a	Decreased	3,059	0.4170	0.1500	-0.2670	(6.01)
5b	Decreased	2,145	2.3563	0.4214	-1.9349	(6.79)
5c	Maintained	288	14.8135	4.2683	-10.5452	(3.13)

<sup>30</sup> The t-statistic is designed to measure whether the price impact associated with a trade of a given (relative) size is different between the pre-Pilot and Pilot sample periods. The difference is tested for significance by calculating the two-sample un-pooled Student's t-statistic,  $t = \frac{\bar{x}_1 - \bar{x}_2}{s_{\bar{x}_1 - \bar{x}_2}}$ , where  $s_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$ .

The null hypothesis (i.e., that price impact is unchanged between the two sample periods) is rejected at the 90% and 95% confidence levels, if the t-statistics are greater than 1.65 and 1.96, respectively.

As noted above, the 2013 Assessment was not conclusive as to the impact of the Pilot on market quality for Tier 1 securities, the only tier where the minimum quotation size increased. For example, the 2013 Assessment indicated that the time-weighted quoted spread was unchanged for Tier 1 securities in the Pilot period. However, from June 30, 2013 to July 2014, there was a statistically significant narrowing of time-weighted quoted spreads in this tier. Evidence from the second year of the Pilot suggests that volume-weighted effective spreads and depth beyond the BBO were unchanged from pre-Pilot levels, but there was a statistically significant increase in depth at the BBO. Therefore, the updated analysis provides reliable evidence that market quality for Tier 1 securities has also improved during the Pilot.<sup>31</sup> The data for other tiers, however, continue to provide reliable evidence that market quality has been unchanged or slightly improved under the Pilot. Thus, because the Pilot had a demonstrable positive impact on customer limit order display, and appears to have had an overall neutral to positive impact on market quality, FINRA believes it is appropriate and in the best interest of investors to adopt the Pilot tiers as permanent.

As noted in Item 2 of this filing, because the filing would allow Rule 6433 to continue to operate without interruption, if the Commission approves the proposed rule change, the implementation date of the proposed rule change shall be the date of approval by the Commission.

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<sup>31</sup> As noted in note 23, supra, the DERA Memo to File finds that quoted and effective spreads for Tier 1 securities increase between the pre-Pilot period of November 14, 2011 to October 31, 2012 and the Pilot period of November 12, 2012 to November 28, 2014 covered by the analysis, but it does not find sufficient evidence that these increases in spreads were caused by the Pilot.

(C) Alternatives Considered

In developing the proposed rule change, FINRA considered several alternatives to the proposed rule change, to ensure that it (1) simplifies the structure of the minimum quotation sizes; and (2) facilitates the display of customer limit orders under Rule 6460 (Display of Customer Limit Orders) (“limit order display rule”) without having a negative impact on market quality and the number of customer limit orders that are eligible for display. Accordingly, FINRA considered alternative price points and minimum quotation sizes in forming the tiers and evaluated the number of customer limit orders that would be eligible for display. FINRA also assessed the potential impact associated with alternative price bands across multiple sample periods, and concluded that the tier structure that was adopted under the Pilot resulted in the maximum number of customer limit orders that would be eligible for display without harming competition in the OTC equity securities market. In addition, FINRA staff revised the smallest price point to conform to the minimum quotation increments under FINRA Rule 6434 and increased the minimum quotation sizes for most price points between \$0.02 and \$1.00. FINRA believes that the pilot tiers continue to be appropriate and should be adopted on a permanent basis.

(b) Statutory Basis

FINRA believes that the proposed rule change is consistent with the provisions of Section 15A(b)(6) of the Act,<sup>32</sup> which requires, among other things, that FINRA rules must be designed to prevent fraudulent and manipulative acts and practices, to promote just and equitable principles of trade, and, in general, to protect investors and the public

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<sup>32</sup> 15 U.S.C. 78o-3(b)(6).



interest. FINRA also believes that the proposed rule change is consistent with the provisions of Section 15A(b)(11) of the Act.<sup>33</sup> Section 15A(b)(11) requires that FINRA rules include provisions governing the form and content of quotations relating to securities sold otherwise than on a national securities exchange which may be distributed or published by any member or person associated with a member, and the persons to whom such quotations may be supplied.

FINRA believes that adopting the Pilot tiers as permanent would promote just and equitable principles of trade and protect investors and the public interest. The 2013 Assessment and subsequent observations clearly demonstrate that the Pilot has resulted in increased display of customer limit orders. The 2013 Assessment found a 13% increase in the number of customer limit orders that met the minimum quotation sizes to be eligible for display across all Pilot tiers, and the updated data through July 2014 shows an even greater increase of 18.45% than otherwise would have been eligible for display. Notably, the increase in customer limit orders eligible for display was significant in tiers that make up substantial percentages of the overall volume transacted in OTC equity securities.

FINRA further believes that any concerns about market quality raised by public commenters prior to the Commission's approval of Pilot have not materialized. In fact, FINRA believes that the Pilot has had a positive impact on OTC market quality for the majority of OTC equity securities and tiers. As more fully detailed above, FINRA believes the Pilot data shows overall a slight reduction in spreads for most OTC equity securities with no negative (and perhaps a positive) impact on liquidity.

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<sup>33</sup> 15 U.S.C. 78o-3(b)(11).

As noted previously, when the Commission approved the Pilot, it emphasized the potential benefits of increasing customer limit order display. For instance, the Commission noted that increased limit order display could potentially improve the prices at which customer limit orders will be executed, consistent with the protection of investors and the public interest.<sup>34</sup> The Commission also has stated its belief that greater customer limit order display could increase quote competition, narrow spreads, and increase the likelihood of price improvement for OTC equity securities.<sup>35</sup> The Commission had maintained a longstanding view that there are benefits to promoting customer limit order display.<sup>36</sup>

Accordingly, FINRA believes that the Pilot accomplished its intended objectives and realized benefits anticipated in its adoption, including greater customer limit order display. At the same time, market quality indicators during the Pilot suggest that the revised tiers and greater customer limit order display did not result in a harmful reduction in liquidity for OTC equity securities. As a result, FINRA believes it is consistent with the Act to adopt the Pilot tiers as permanent.

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

FINRA does not believe that the proposed rule change will result in any burden on competition that is not necessary or appropriate in furtherance of the purposes of the Act. Despite some initial concerns from commenters that the Pilot may have negative

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<sup>34</sup> See Order Approving File No. SR-FINRA-2011-058, 77 FR at 37466.

<sup>35</sup> See *id.* at 37469.

<sup>36</sup> See *id.* at 37469 n.168 (citing, among other things, the Commission's 1996 Order Handling Rules Release).

effects on market makers who quote OTC equity securities, as the Pilot has progressed, FINRA observed an overall increase in the number of market makers quoting OTC equity securities across the duration of the Pilot. Accordingly, given the increase in the number of market makers quoting OTC equity securities, as demonstrated by the analysis using the first two years of data from the Pilot, and the increased display of customer limit orders, FINRA believes the Pilot has generated evidence that support the Commission's preliminary view "that the [Pilot] could enhance competition."<sup>37</sup>

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

Written comments were neither solicited nor received.

6. **Extension of Time Period for Commission Action**

FINRA does not consent at this time to an extension of the time period for Commission action specified in Section 19(b)(2) of the Act.<sup>38</sup>

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

Not applicable.

8. **Proposed Rule Change Based on Rule 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.

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<sup>37</sup> See Order Approving File No. SR-FINRA-2011-058, 77 FR at 37469.

<sup>38</sup> 15 U.S.C. 78s(b)(2).

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

Not applicable.

**11. Exhibits**

Exhibit 1. Completed notice of proposed rule change for publication in the Federal Register.

Exhibit 3a. 2013 Assessment.

Exhibit 3b. DERA Memorandum to File dated July 28, 2017.

Exhibit 3c. Division of Risk, Strategy and Financial Innovation Memorandum to File dated June 1, 2012.

Exhibit 5. Text of the proposed rule change.

EXHIBIT 1

SECURITIES AND EXCHANGE COMMISSION  
(Release No. 34- ; File No. SR-FINRA-2018-015)

Self-Regulatory Organizations; Financial Industry Regulatory Authority, Inc.; Notice of Filing of a Proposed Rule Change to Amend FINRA Rule 6433 to Adopt the OTC Quotation Tier Pilot as Permanent

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 , Financial Industry Regulatory Authority, Inc. (“FINRA”) 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 FINRA. 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

FINRA is proposing to amend FINRA Rule 6433 (Minimum Quotation Size Requirements for OTC Equity Securities) to adopt as permanent the minimum quotation sizes for OTC equity securities currently operating on a pilot basis, scheduled to expire on June 7, 2018.

The text of the proposed rule change is available on FINRA’s website at <http://www.finra.org>, at the principal office of FINRA 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, FINRA 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. FINRA 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

FINRA proposes to amend Rule 6433 (Minimum Quotation Size Requirements for OTC Equity Securities) (the "Rule") to adopt as permanent the minimum quotation sizes applicable to quotations in OTC equity securities<sup>3</sup> that were proposed pursuant to File No. SR-FINRA-2011-058 and implemented on a pilot basis on November 12, 2012 ("Tier Size Pilot" or "Pilot").<sup>4</sup> The Pilot was initially approved for a one-year term, has been extended ten times, and currently is scheduled to expire on June 7, 2018.<sup>5</sup>

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<sup>3</sup> An OTC equity security is an equity security that is not an "NMS Stock" as defined in Rule 600(b)(47) of SEC Regulation NMS; provided, however, that the term "OTC equity security" shall not include any Restricted Equity Security. See FINRA Rule 6420(f).

<sup>4</sup> See Securities Exchange Act Release No. 65568 (October 14, 2011), 76 FR 65307 (October 20, 2011) (Notice of Filing of File No. SR-FINRA-2011-058) ("Original Proposal").

<sup>5</sup> See Securities Exchange Act Release No. 67208 (June 15, 2012), 77 FR 37458 (June 21, 2012) (Notice of Filing of Amendment No. 2 and Order Granting Accelerated Approval of a Proposed Rule Change, as Modified by Amendment Nos. 1 and 2, To Amend FINRA Rule 6433 (Minimum Quotation Size Requirements for OTC Equity Securities)) (Order Approving File No. SR-FINRA-2011-058, as amended); see also Securities Exchange Act Release No. 70839 (November 8, 2013), 78 FR 68893 (November 15, 2013) (Notice of Filing



The Pilot tiers were designed to: (1) simplify the structure of the minimum quotation sizes; (2) facilitate the display of customer limit orders under Rule 6460 (Display of Customer Limit Orders) (“limit order display rule”); and (3) expand the scope of the Rule to provide for uniform treatment of the types and sources of quotations that would be subject to the Rule.<sup>6</sup> FINRA believes the Pilot has resulted in its intended objectives, and particularly notes that the Pilot has yielded a significant positive result

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and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to November 14, 2014; File No. SR-FINRA-2013-049); Securities Exchange Act Release No. 73299 (October 3, 2014), 79 FR 61120 (October 9, 2014) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to February 13, 2015; File No. SR-FINRA-2014-041); Securities Exchange Act Release No. 74251 (February 11, 2015), 80 FR 8741 (February 18, 2015) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to May 15, 2015; File No. SR-FINRA-2015-002); Securities Exchange Act Release No. 74927 (May 12, 2015), 80 FR 28327 (May 18, 2015) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to August 14, 2015; File No. SR-FINRA-2015-010); Securities Exchange Act Release No. 75639 (August 7, 2015), 80 FR 48615 (August 13, 2015) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to December 11, 2015; File No. SR-FINRA-2015-028); Securities Exchange Act Release No. 76519 (November 24, 2015), 80 FR 75155 (December 1, 2015) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to June 10, 2016; File No. SR-FINRA-2015-051); Securities Exchange Act Release No. 77923 (May 26, 2016), 81 FR 35432 (June 2, 2016) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to December 9, 2016; File No. SR-FINRA-2016-016); Securities Exchange Act Release No. 79401 (November 25, 2016), 81 FR 86762 (December 1, 2016) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to June 9, 2017; File No. SR-FINRA-2016-044); Securities Exchange Act Release No. 80727 (May 18, 2017), 82 FR 23953 (May 24, 2017) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to December 8, 2017; File No. SR-FINRA-2017-014); Securities Exchange Act Release No. 82153 (November 22, 2017), 82 FR 56300 (November 28, 2017) (Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot to June 7, 2018; File No. SR-FINRA-2017-035).

<sup>6</sup> See Order Approving File No. SR-FINRA-2011-058, 77 FR at 37458.

with regard to increased display of customer limit orders. At the same time, market quality measures have been neutral (i.e., unchanged) or slightly positive (i.e., slightly improved) overall during the Pilot, as compared to the pre-Pilot period, as discussed more fully below. Accordingly, FINRA believes it is appropriate and consistent with the Act to adopt the Pilot tier sizes on a permanent basis.

#### Objectives of the Pilot

FINRA Rule 6433 sets forth the minimum quotation sizes applicable to the display of quotations in OTC equity securities on any inter-dealer quotation system that permits quotation updates on a real-time basis. The Rule provides different minimum quotation sizes that apply depending upon the price level of the bid or offer in the security.

Prior to the Pilot, which has been in effect since November 12, 2012,<sup>7</sup> Rule 6433 provided for nine tier sizes that applied only to market makers' proprietary quotes. The pre-Pilot tiers ranged in price points from \$0.00 through \$2,500.01, and are shown below in Table 1.

**TABLE 1**

<b>Price (Bid or Offer)</b>	<b>Minimum Quote Size (# of shares)</b>
\$0 to \$0.50	5,000
\$0.51 to \$1.00	2,500
\$1.01 to \$10.00	500
\$10.01 to \$100.00	200
\$100.01 to \$200.00	100
\$200.01 to \$500.00	25
\$500.01 to \$1,000.00	10
\$1,000.01 to \$2,500.00	5
\$2,500.01 +	1

<sup>7</sup> Regulatory Notice 12-51 (November 2012); see also Regulatory Notice 12-37 (August 2012).

Under the Pilot, the number of tiers was reduced from nine to six, and the tiers apply to all quotations displayed by market makers, whether representing proprietary or customer interest, as well as quotations displayed by non-market makers (*i.e.*, alternative trading systems or any other member firm).<sup>8</sup> The Pilot tiers ultimately adopted are shown below in Table 2.

**TABLE 2**

<b>Price (Bid or Offer)</b>	<b>Minimum Quote Size (# of shares)</b>
\$0.0001 to \$0.0999	10,000
\$0.10 to \$0.1999	5,000
\$0.20 to \$0.5099	2,500
\$0.51 to \$0.9999	1,000
\$1.00 to \$174.99	100
\$175.00 +	1

The Pilot tiers simplified the tier structure by reducing the number of tiers from nine to six. In addition, for price points between \$1.00 and \$174.99, the Pilot established a minimum quotation size of 100 shares, which is comparable to the minimums generally applicable to quotations in securities on equity exchanges. The Pilot also revised the smallest price point from \$0.00 to \$0.0001 to conform to the minimum quotation increments under Rule 6434 (Minimum Pricing Increment for OTC Equity Securities).<sup>9</sup>

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<sup>8</sup> FINRA initially proposed six tiers, some of which were different from those ultimately adopted. However, in response to comments received, FINRA amended the filing to increase the minimum quotation size for most price points between \$0.02 and \$1.00. FINRA stated that the amended tiers were intended to facilitate the display of additional liquidity by market makers. See Securities Exchange Act Release No. 66819 (April 17, 2012), 77 FR 23770 (April 20, 2012) (Amendment No. 1 to File No. SR-FINRA-2011-058); see also Original Proposal.

<sup>9</sup> Rule 6434, among other things, prohibits members from displaying a bid or offer in an OTC equity security in an increment smaller than \$0.01 if the bid or offer is priced \$1.00 or greater per share, or in an increment smaller than \$0.0001 if the bid or offer is priced below \$1.00.

Importantly, the Pilot was designed to facilitate the display of customer limit orders under FINRA's limit order display rule, which generally requires that OTC market makers fully display better-priced customer limit orders (or same-priced customer limit orders that are at the best bid or offer and that increase the OTC market maker's size by more than a de minimis amount). Pursuant to the limit order display rule, OTC market makers are not required to display a customer limit order on an inter-dealer quotation system unless doing so would comply with the minimum quotation size applicable to the price of the quotation under the Rule. Therefore, although a customer limit order may otherwise have been required to be displayed under the limit order display rule – for example, because it improved price or the size (more than a de minimis amount) – if the order is less than the minimum quotation size prescribed by Rule 6433, the member is not required to display the order. Thus, FINRA believed that the revisions implemented by the Pilot would improve overall display of customer limit orders.

For example, because the Pilot would reduce the minimum quotation size from 2,500 to 100 shares for securities priced at or above \$1.00, FINRA believed that competitively priced customer limit orders, which tend to be smaller-sized orders, would more likely be displayed and potentially yield a variety of benefits, including improved price transparency, enhanced execution of customer limit orders, and narrower spreads. In addition, in a memorandum on potential effects of the Pilot, SEC staff economists

noted that enhanced visibility of customer limit orders could reduce customers' execution costs.<sup>10</sup>

An additional objective of the Pilot was to expand the Rule's scope to apply to all member quotations on an inter-dealer quotation system. Prior to the Pilot, the Rule applied only to market makers' proprietary quotes in OTC equity securities on an inter-dealer quotation system. Under the Pilot, the minimum tier sizes apply to any member quotations entered on an inter-dealer quotation system (including quotes representing customer interest and quotations entered by non-market makers).

#### Concerns Raised During the Proposal Process and Data Commitment

The Commission received several comments in response to FINRA's Tier Size Pilot proposal. Commenters generally were supportive of the goal of increased customer limit order display;<sup>11</sup> however, commenters also raised concerns regarding the impact of revised tiers. Specifically, certain commenters questioned whether the Pilot might harm market quality by permitting market makers to post quotes representing minimum dollar value commitments that are not financially meaningful, or otherwise eroding market maker liquidity in OTC equity securities.<sup>12</sup> In addition, some commenters believed that there was not sufficient data analysis to support the proposed changes to the tier sizes.<sup>13</sup>

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<sup>10</sup> See Memorandum to File No. SR-FINRA-2011-058 re: FINRA Proposal to Reduce Minimum Quotation Size in OTC Market Tiers from Division of Risk, Strategy, and Financial Innovation, dated June 1, 2012, available at: <http://www.sec.gov/comments/sr-finra-2011-058/finra2011058-13.pdf>.

<sup>11</sup> See Order Approving File No. SR-FINRA-2011-058.

<sup>12</sup> See *id.*

<sup>13</sup> See *id.* at 37461-62.

In response to commenters' concerns, FINRA filed Amendment No. 1 to the Original Proposal to increase the minimum quotation sizes for most price points between \$0.02 and \$1.00, and proposed that the revised tiers operate as a one-year pilot instead of as a permanent amendment. FINRA also submitted Amendment No. 2 to the Original Proposal to, among other things, specify the items of data that FINRA would collect and provide to the Commission during the duration of the Pilot; specifically:

1. The price of the first trade of each trading day executed at or after 9:30:00 a.m., based on execution time.
2. The price of the last trade of each trading day executed at or before 4:00:00 p.m., based on execution time.
3. Daily share volume.
4. Daily dollar volume.
5. Number of limit orders from customers and in total.
6. Percentage of the day that the size of the BBO equals the minimum quote size.
7. Number of market makers actively quoting.
8. Number of executions from a limit order and number of limit orders at the BBO or better by tier size from a customer and in total.
9. Liquidity/BBO metrics
  - a. Time-weighted quoted spread.
  - b. Effective spread.
  - c. Time-weighted quoted depth (number of shares) at the inside.
  - d. Time-weighted quoted depth (dollar value of shares) at the inside.

FINRA also committed to submitting an assessment, at least 60 days before the end of the Pilot, that addressed the impact of the Pilot, the concerns raised by commenters during the rule filing process, and whether the Pilot resulted in the desired effects.<sup>14</sup>

#### Pilot Assessment

FINRA submitted its assessment on the operation of the Tier Size Pilot on September 13, 2013, which utilized pilot data covering the period from November 12, 2012 through June 30, 2013.<sup>15</sup> The 2013 Assessment, discussed in greater detail below, included a recommendation, based on the extensive analysis conducted, that the Pilot tiers be adopted as permanent. Nonetheless, FINRA extended the Pilot duration to allow the effects of the Pilot to be more thoroughly reviewed.<sup>16</sup> During this extension, the Staff of the Division of Economic and Risk Analysis (“DERA”) of the SEC conducted a study, which assessed the impact of the Pilot on liquidity. The study was published as a memorandum to file (“DERA Memo to File”).<sup>17</sup> And while the two studies covered different time periods and employed different methods, the DERA Memo to File reported findings consistent with those of the FINRA 2013 Assessment. In light of the 2013

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<sup>14</sup> See Amendment No. 2 to File No. SR-FINRA-2011-058, available at <http://www.finra.org/file/amendment-no-2-propose-rule-change>.

<sup>15</sup> FINRA engaged a third-party, Cornerstone Research, to conduct an analysis of the impact of the Pilot on OTC market quality. The 2013 assessment is part of the SEC’s comment file for SR-FINRA-2011-058 and also is available on FINRA’s website at: <http://www.finra.org/industry/rule-filings/sr-finra-2011-058> (“2013 Assessment”).

<sup>16</sup> See *supra* note 5.

<sup>17</sup> See Memorandum to File No. SR-FINRA-2011-058 re: FINRA’s Pilot Program Amending Minimum Quotation Size Requirements for OTC Equity Securities from DERA, dated July 28, 2017, available at: [https://www.sec.gov/files/otc\\_tiersizepilot\\_memo.pdf](https://www.sec.gov/files/otc_tiersizepilot_memo.pdf).

Assessment, FINRA's further observations, and the DERA Memo to File, FINRA continues to believe that it is appropriate to permanently adopt the tier sizes that have been in operation since November 12, 2012, and is proposing to do so at this time.

FINRA believes the 2013 Assessment demonstrated that the Pilot accomplished its objectives, including increased customer limit order display, and that key market quality indicators have been unchanged or have slightly improved overall. FINRA continued to collect and provide Pilot data to the SEC since the 2013 Assessment. In addition, FINRA has continued to monitor the impact of the operation of the Pilot on market quality metrics for the over-the-counter marketplace, which FINRA generally believes indicate positive trends overall, providing continued support for permanent adoption of the Pilot tiers.<sup>18</sup> Moreover, the DERA Memo to File provided further evidence, in a regression framework, that supports the conclusion that the Pilot had a neutral to positive impact on market quality.

Specifically, FINRA believes that the 2013 Assessment demonstrated that the Pilot has resulted in a meaningful increase in the display of customer limit orders. Moreover, FINRA believes the data collected during the Pilot also supports that market quality has not been harmed, as suggested by the analysis of market quality measures such as spreads and market depth.

(A) Enhanced Customer Limit Order Display

When the Commission approved the Pilot, it recognized the potential benefits of enhancing customer limit order display. Notably, the Commission found that "[i]n the

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<sup>18</sup> FINRA engaged in outreach with member firms that are active in the market for OTC Equity Securities regarding the operation of the Tier Size Pilot, and the majority of those firms did not oppose the permanent adoption of the Pilot.



Commission's view, FINRA's proposed revisions are designed to protect investors by revising the Rule's tier thresholds such that a larger percentage of customer limit orders are reflected in quotations for OTC equity securities, thereby potentially improving the prices at which customer limit orders will be executed, consistent with the protection of investors and the public interest."<sup>19</sup> FINRA believes the Pilot clearly has achieved the objective of increased customer limit order display.

As noted in FINRA's September 2013 Assessment, between November 1, 2012 and June 30, 2013, for all tier sizes combined, there was a 13% increase in the number of customer limit orders that met the minimum quotation sizes to be eligible for display under the Pilot tiers. FINRA also observed a significant increase in the number of customer limit orders in securities priced between \$0.20 and \$100.00 that became eligible for display. This trend continued through July 31, 2014. Specifically, between July 1, 2013 and July 31, 2014, FINRA observed, for all tier sizes combined, an 18.45% increase in the number of customer limit orders that met the minimum quotation sizes and, therefore, eligible for display – also with the most significant increase observed for securities priced between \$0.20 and \$100.00.

Tables 3 and 4 below show the percentage of customer limit orders that were equal to or greater than the minimum quotation size under both the Pilot and pre-Pilot tier sizes for the specified price ranges for the periods of November 1, 2012 through June 30, 2013, and from July 1, 2013 through July 31, 2014, respectively.

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<sup>19</sup> See Order Approving File No. SR-FINRA-2011-058, 77 FR at 37466. See also Memorandum to file from Division of Risk, Strategy, and Financial Innovation, dated June 1, 2012, supra note 10.

**TABLE 3**  
November 1, 2012 through June 30, 2013

<b>Price Range</b>	<b>Pilot Tier Size</b>	<b>Customer Limit Orders <math>\geq</math> Tier Size</b>	<b>Pre-Pilot Tier Size</b>	<b>Customer Limit Orders <math>\geq</math> Tier Size</b>
0.0001-0.0999	10,000	78.29%	5,000	86.30%
0.10-0.1999	5,000	56.89%	5,000	56.89%
0.20-0.5099	2,500	57.35%	5,000	43.30%
0.51-0.9999	1,000	72.81%	2,500	46.05%
1.00-10.00	100	97.86%	500	74.73%
10.01-100.00	100	98.24%	200	87.93%
100.01-174.99	100	90.49%	100	90.49%
175.00-200.00	1	100%	100	96.71%
200.01-500.00	1	100%	25	90.74%
500.01-1,000.00	1	100%	10	64.62%
1,000.00-2,500.00	1	100%	5	61.38%
2,500.00+	1	100%	1	100.00%

**TABLE 4**  
July 1, 2013 through July 31, 2014

<b>Price Range</b>	<b>Pilot Tier Size</b>	<b>Customer Limit Orders <math>\geq</math> Tier Size</b>	<b>Pre-Pilot Tier Size</b>	<b>Customer Limit Orders <math>\geq</math> Tier Size</b>
0.0001-0.0999	10,000	78.29%	5,000	88.70%
0.10-0.1999	5,000	56.89%	5,000	57.78%
0.20-0.5099	2,500	57.35%	5,000	42.31%
0.51-0.9999	1,000	72.81%	2,500	42.10%
1.00-10.00	100	97.86%	500	68.36%
10.01-100.00	100	98.24%	200	78.03%
100.01-174.99	100	90.49%	100	90.60%
175.00-200.00	1	100%	100	91.94%
200.01-500.00	1	100%	25	89.41%
500.01-1,000.00	1	100%	10	66.65%
1,000.00-2,500.00	1	100%	5	65.58%
2,500.00+	1	100%	1	100.00%

As was noted in the 2013 Assessment, of the 301,628,686 customer limit orders in OTC equity securities reported to FINRA's Order Audit Trail System ("OATS") between November 1, 2012 and June 30, 2013, over 86.6% were priced between \$0.20 and \$100.00. Of particular note, 58.7 million customer limit orders, or almost 20% of all

customer limit orders, were priced between \$1.00 and \$10.00. This price range experienced an increase of almost 24% in the number of customer limit orders that met the minimum quotation size to be eligible for display under the Pilot. Further, 181.6 million customer limit orders, or over 60% of all customer limit orders, were priced between \$10.01 and \$100.00. This price range experienced an increase of over 10% in the number of customer limit orders that met the tier sizes and were eligible for display under the Pilot tier sizes. Consequently, the 2013 Assessment found that an additional 32 million customer limit orders priced between \$1.00 and \$100.00 became eligible for display during the Pilot that otherwise would not have been eligible for display.

The trends during the period since the 2013 Assessment are similar. Specifically, of the 573,973,197 customer limit orders in OTC equity securities reported to OATS between July 1, 2013 and July 31, 2014, 81.4% were priced between \$0.20 and \$100.00. Of particular note, 114.5 million customer limit orders, or almost 20% of all customer limit orders, were priced between \$1.00 and \$10.00. From July 1, 2013 through July 31, 2014, this price range experienced an increase of over 29% in the number of customer limit orders that met the minimum quotation size to be eligible for display under the Pilot than would have been eligible in the absence of the Pilot. Further, 312.1 million customer limit orders, or over 54% of all customer limit orders, were priced between \$10.01 and \$100.00. This price range experienced an increase of over 19% in the number of customer limit orders that met the tier sizes and were eligible for display under the Pilot tier sizes. Consequently, an additional 94.9 million customer limit orders priced between \$1.00 and \$100.00 became eligible for display during the Pilot between June 30, 2013 and July 31, 2014 than otherwise would have been eligible for display.

Thus, with an aggregate overall increase in displayed customer limit orders in OTC equity securities over the period from November 12, 2012 through July 31, 2014 of 16.24%, representing approximately 142 million additional orders than otherwise would have been eligible for display, FINRA believes that the impact of the Pilot on limit order display has clearly been positive, with stronger than average results concentrated in the price points ranging from \$10.01 and \$100.00 (the range in which the majority of all customer limit orders fell (approximately 57%)).

(B) Impact on Market Quality

When the Commission approved the Pilot, it acknowledged that the Pilot may raise issues of “potentially competing forces” – enhanced customer limit order display on the one hand, and potential harm to OTC equity market quality (liquidity, efficiency, and volatility) on the other.<sup>20</sup> On balance, however, the Commission expressed the view that “as well as increasing the number of customer limit orders eligible for display and the potential for better executions, arguments can be made that FINRA’s proposal will benefit the OTC market by facilitating market making activity, narrowing spreads and increasing liquidity.”<sup>21</sup>

FINRA believes that analysis of the Pilot and pre-Pilot data generally shows that the market quality measures the Commission identified – i.e., market maker activity,

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<sup>20</sup> See Order Approving File No. SR-FINRA-2011-058, 77 FR at 37467.

<sup>21</sup> See Order Approving File No. SR-FINRA-2011-058, 77 FR at 37467.

spreads and liquidity<sup>22</sup> – were unchanged to slightly improved, and that, therefore, there has been an overall neutral to positive impact on OTC market quality for the majority of tiers as compared to the pre-Pilot data.<sup>23</sup>

As noted in the 2013 Assessment, where minimum quotation size decreased under the Pilot, effective spreads generally remained the same or narrowed, quoted spreads narrowed, and price impact generally decreased. The 2013 Assessment also stated that some of the market quality metrics provided inconclusive results, specifically for Tier 1 securities, where the minimum quote size requirement increased. The 2013 Assessment documented that effective spreads had widened, but with no significant reduction in quoted depth.<sup>24</sup>

In the post-2013 Assessment period of July 1, 2013 through July 31, 2014, FINRA has observed that the number of stocks quoted in the OTC market has remained

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<sup>22</sup> To the extent the Commission expressed concern about volatility when it approved the Pilot, its concern was premised on the Pilot's impact on liquidity. See, e.g., Order Approving File No. SR-FINRA-2011-058, 77 FR at 37470 (“[I]f the revised tier sizes result in less activity by market makers, overall liquidity in the marketplace could decline. Such a decline could result in increased volatility and less efficient pricing for OTC equity securities.”) (internal citation omitted).

<sup>23</sup> FINRA notes that, from an analytical perspective, changes in market quality measures may not be attributable solely due to the Pilot, since they may also be impacted by other contemporaneous market factors.

<sup>24</sup> For Tier 1 securities, the DERA Memo to File finds that both quoted and effective spreads increase between the pre-Pilot period (November 14, 2011 through October 31, 2012) and the Pilot period (November 12, 2012 through November 28, 2014) covered by the analysis. However, the DERA Memo to File does not find sufficient evidence that these increases in spreads were caused by the Pilot, as spreads started to widen at least six months prior to the implementation of the Pilot.

relatively constant<sup>25</sup> and market makers continued to provide liquidity.<sup>26</sup> The number of BBO quotes also significantly increased throughout 2014, the second year of the Pilot; as it generally hovered around 2 million per day during the Pre-Pilot period, but steadily increased, reaching a high of approximately 6 million per day in early 2014 and leveling off to an average of 5 million per day during the month of July 2014. The average number of trades per day was higher during the first two years of the Pilot compared to the pre-Pilot level, and more than tripled by March 2014.<sup>27</sup> However, trading activity appears to have leveled-off in mid-2014, albeit still at levels above the pre-Pilot trading.<sup>28</sup> Liquidity continued to be provided at levels greater than the minimum required depth, evidenced by executions at sizes greater than the required minimums, which enabled the execution of large trades in the OTC market. For example, for Tier 1 securities where the minimum quotation size increased, the number of trades executed above the minimum size increased by approximately 75%. While there was virtually no change in the frequency of trades above the minimum size for Tiers 2 and 3, all the other tiers

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<sup>25</sup> The number of stocks quoted on the OTC market remained stable at around 10,000 throughout the pre-Pilot period, and during the period covered in the 2013 Assessment and FINRA's subsequent observations (November 1, 2012 through July 31, 2014).

<sup>26</sup> There was an average of nine market-makers for each symbol with no significant change in the number between the pre-Pilot period, and during the period covered in the 2013 Assessment and FINRA's subsequent observations (November 1, 2012 through July 31, 2014).

<sup>27</sup> The daily number of trades executed during the year prior to the Pilot is estimated at approximately 75,000, and reached around 250,000 trades by the end of the first quarter in 2014.

<sup>28</sup> The daily average number of trades was approximately 100,000 by July 2014.

experienced a positive change. Trading in sizes greater than the minimum quotation occurred infrequently in these tiers both prior to and during the pilot.

The analysis of data from the second year of the Pilot also confirms FINRA's position that the impact of the change in the minimum quotation size on the market quality metrics is generally positive. FINRA staff analyzed the change in five measures to evaluate the impact of the Pilot on market quality – time-weighted quoted spreads, volume-weighted spreads, time-weighted quoted depth at the BBO, time-weighted quoted depth around the BBO, and price impact. Time-weighted quoted spreads continued to narrow during the first two years of the Pilot and these positive changes in time-weighted quoted spreads between the pre-Pilot and the first two years of the Pilot were statistically significant for all tiers.<sup>29</sup> Similarly, volume-weighted spreads were unchanged (or slightly narrowed) for all tiers between the pre-Pilot period and the first two years of the Pilot when accounting for the longer Pilot period.

The displayed depth decreased slightly for most tiers, but a consideration of depth beyond the BBO demonstrated that any declines were mostly statistically insignificant across tiers in the first two years of the Pilot. FINRA believes that consideration of depth beyond the BBO is a useful additional measure for assessing market depth.

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<sup>29</sup> For stocks in price tiers where the minimum quotation size requirement decreased, the DERA Memo to File also finds that both quoted and effective spreads decrease between the pre-Pilot period (from November 14, 2011 to October 31, 2012) and the Pilot period (November 12, 2012 to November 28, 2014) covered by the analysis. Furthermore, the DERA Memo to File's analysis suggests that these decreases in spreads may reflect causal effects of the Pilot. In contrast, for stocks in price tiers where the minimum quotation size requirement increased or remained the same, the DERA Memo to File does not find sufficient evidence that the Pilot had a causal impact on spreads.

In addition, based on a data review using the same methodology as was employed for the 2013 Assessment, subsequent to the completion of the 2013 Assessment, FINRA observed that the price impact of hypothetical market orders continued to remain lower during the second year of the Pilot period than during the pre-Pilot period.<sup>30</sup> For example, the following two tables present the price impact for hypothetical market buy and sell orders with sizes five times larger than the minimum size requirement for each tier. The price impact associated with the hypothetical orders is estimated to have declined for all tiers, which is an indication of improved market quality. The decline is significant for all levels except for Tiers 5b and 5c (for buy trades) and Tier 1 (for sell trades).<sup>31</sup>

**TABLE 5**  
Price Impact for Hypothetical Large Market Buy Orders

<b>Tier</b>	<b>Minimum Quotation Size Change</b>	<b>Number of Stocks</b>	<b>Pre-Pilot (10/2011 - 10/2012)</b>	<b>Pilot (11/2012 - 7/2014)</b>	<b>Difference</b>	<b>t-statistic</b>
1	Increased	3,586	0.0055	0.0050	-0.0005	(2.60)
2	Maintained	1,254	0.0235	0.0197	-0.0038	(5.03)
3	Decreased	1,752	0.0506	0.0420	-0.0086	(6.41)
4	Decreased	1,537	0.0969	0.0810	-0.0159	(5.00)

<sup>30</sup> As discussed in the 2013 Assessment, the price impact of hypothetical market orders is the effective half spread for a hypothetical market “sweep” order of a particular size. In other words, it is an estimate of what the volume-weighted average effective half spread would have been had a market order been broken up and routed to the market makers based on price priority.

<sup>31</sup> The t-statistic is designed to measure whether the price impact associated with a trade of a given (relative) size is different between the pre-Pilot and Pilot sample periods. The difference is tested for significance by calculating the two-sample un-pooled Student’s t-statistic,  $t = \frac{\bar{x}_1 - \bar{x}_2}{s_{\bar{x}_1 - \bar{x}_2}}$ , where  $s_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$ .

The null hypothesis (i.e., that price impact is unchanged between the two sample periods) is rejected at the 90% and 95% confidence levels, if the t-statistics are greater than 1.65 and 1.96, respectively.



5a	Decreased	3,038	0.3295	0.2530	-0.0765	(7.79)
5b	Decreased	2,026	1.1630	1.0661	-0.0969	(1.55)
5c	Maintained	177	4.8322	4.7906	-0.0416	(0.06)

**TABLE 6**  
Price Impact for Hypothetical Large Market Sell Orders

<b>Tier</b>	<b>Minimum Quotation Size Change</b>	<b>Number of Stocks</b>	<b>Pre-Pilot (10/2011 - 10/2012)</b>	<b>Pilot (11/2012 - 7/2014)</b>	<b>Difference</b>	<b>t-statistic</b>
1	Increased	3,931	0.0062	0.0059	-0.0003	(1.60)
2	Maintained	1,483	0.0233	0.0169	-0.0064	(3.41)
3	Decreased	1,787	0.0540	0.0311	-0.0229	(4.87)
4	Decreased	1,676	0.1214	0.0656	-0.0558	(4.95)
5a	Decreased	3,059	0.4170	0.1500	-0.2670	(6.01)
5b	Decreased	2,145	2.3563	0.4214	-1.9349	(6.79)
5c	Maintained	288	14.8135	4.2683	-10.5452	(3.13)

As noted above, the 2013 Assessment was not conclusive as to the impact of the Pilot on market quality for Tier 1 securities, the only tier where the minimum quotation size increased. For example, the 2013 Assessment indicated that the time-weighted quoted spread was unchanged for Tier 1 securities in the Pilot period. However, from June 30, 2013 to July 2014, there was a statistically significant narrowing of time-weighted quoted spreads in this tier. Evidence from the second year of the Pilot suggests that volume-weighted effective spreads and depth beyond the BBO were unchanged from pre-Pilot levels, but there was a statistically significant increase in depth at the BBO. Therefore, the updated analysis provides reliable evidence that market quality for Tier 1 securities has also improved during the Pilot.<sup>32</sup> The data for other tiers, however,

<sup>32</sup> As noted in note 24, *supra*, the DERA Memo to File finds that quoted and effective spreads for Tier 1 securities increase between the pre-Pilot period of November 14, 2011 to October 31, 2012 and the Pilot period of November 12, 2012 to November 28, 2014 covered by the analysis, but it does not find sufficient evidence that these increases in spreads were caused by the Pilot.

continue to provide reliable evidence that market quality has been unchanged or slightly improved under the Pilot. Thus, because the Pilot had a demonstrable positive impact on customer limit order display, and appears to have had an overall neutral to positive impact on market quality, FINRA believes it is appropriate and in the best interest of investors to adopt the Pilot tiers as permanent.

As noted in Item 2 of this filing, because the filing would allow Rule 6433 to continue to operate without interruption, if the Commission approves the proposed rule change, the implementation date of the proposed rule change shall be the date of approval by the Commission.

(C) Alternatives Considered

In developing the proposed rule change, FINRA considered several alternatives to the proposed rule change, to ensure that it (1) simplifies the structure of the minimum quotation sizes; and (2) facilitates the display of customer limit orders under Rule 6460 (Display of Customer Limit Orders) (“limit order display rule”) without having a negative impact on market quality and the number of customer limit orders that are eligible for display. Accordingly, FINRA considered alternative price points and minimum quotation sizes in forming the tiers and evaluated the number of customer limit orders that would be eligible for display. FINRA also assessed the potential impact associated with alternative price bands across multiple sample periods, and concluded that the tier structure that was adopted under the Pilot resulted in the maximum number of customer limit orders that would be eligible for display without harming competition in the OTC equity securities market. In addition, FINRA staff revised the smallest price point to conform to the minimum quotation increments under FINRA Rule 6434 and

increased the minimum quotation sizes for most price points between \$0.02 and \$1.00.

FINRA believes that the pilot tiers continue to be appropriate and should be adopted on a permanent basis.

## 2. Statutory Basis

FINRA believes that the proposed rule change is consistent with the provisions of Section 15A(b)(6) of the Act,<sup>33</sup> which requires, among other things, that FINRA rules must be designed to prevent fraudulent and manipulative acts and practices, to promote just and equitable principles of trade, and, in general, to protect investors and the public interest. FINRA also believes that the proposed rule change is consistent with the provisions of Section 15A(b)(11) of the Act.<sup>34</sup> Section 15A(b)(11) requires that FINRA rules include provisions governing the form and content of quotations relating to securities sold otherwise than on a national securities exchange which may be distributed or published by any member or person associated with a member, and the persons to whom such quotations may be supplied.

FINRA believes that adopting the Pilot tiers as permanent would promote just and equitable principles of trade and protect investors and the public interest. The 2013 Assessment and subsequent observations clearly demonstrate that the Pilot has resulted in increased display of customer limit orders. The 2013 Assessment found a 13% increase in the number of customer limit orders that met the minimum quotation sizes to be eligible for display across all Pilot tiers, and the updated data through July 2014 shows an even greater increase of 18.45% than otherwise would have been eligible for display.

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<sup>33</sup> 15 U.S.C. 78o-3(b)(6).

<sup>34</sup> 15 U.S.C. 78o-3(b)(11).

Notably, the increase in customer limit orders eligible for display was significant in tiers that make up substantial percentages of the overall volume transacted in OTC equity securities.

FINRA further believes that any concerns about market quality raised by public commenters prior to the Commission's approval of Pilot have not materialized. In fact, FINRA believes that the Pilot has had a positive impact on OTC market quality for the majority of OTC equity securities and tiers. As more fully detailed above, FINRA believes the Pilot data shows overall a slight reduction in spreads for most OTC equity securities with no negative (and perhaps a positive) impact on liquidity.

As noted previously, when the Commission approved the Pilot, it emphasized the potential benefits of increasing customer limit order display. For instance, the Commission noted that increased limit order display could potentially improve the prices at which customer limit orders will be executed, consistent with the protection of investors and the public interest.<sup>35</sup> The Commission also has stated its belief that greater customer limit order display could increase quote competition, narrow spreads, and increase the likelihood of price improvement for OTC equity securities.<sup>36</sup> The Commission had maintained a longstanding view that there are benefits to promoting customer limit order display.<sup>37</sup>

Accordingly, FINRA believes that the Pilot accomplished its intended objectives and realized benefits anticipated in its adoption, including greater customer limit order

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<sup>35</sup> See Order Approving File No. SR-FINRA-2011-058, 77 FR at 37466.

<sup>36</sup> See *id.* at 37469.

<sup>37</sup> See *id.* at 37469 n.168 (citing, among other things, the Commission's 1996 Order Handling Rules Release).

display. At the same time, market quality indicators during the Pilot suggest that the revised tiers and greater customer limit order display did not result in a harmful reduction in liquidity for OTC equity securities. As a result, FINRA believes it is consistent with the Act to adopt the Pilot tiers as permanent.

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

FINRA does not believe that the proposed rule change will result in any burden on competition that is not necessary or appropriate in furtherance of the purposes of the Act. Despite some initial concerns from commenters that the Pilot may have negative effects on market makers who quote OTC equity securities, as the Pilot has progressed, FINRA observed an overall increase in the number of market makers quoting OTC equity securities across the duration of the Pilot. Accordingly, given the increase in the number of market makers quoting OTC equity securities, as demonstrated by the analysis using the first two years of data from the Pilot, and the increased display of customer limit orders, FINRA believes the Pilot has generated evidence that support the Commission's preliminary view "that the [Pilot] could enhance competition."<sup>38</sup>

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

Written comments were neither solicited nor 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

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<sup>38</sup> See Order Approving File No. SR-FINRA-2011-058, 77 FR at 37469.

if it finds such longer period to be appropriate and publishes its reasons for so finding or  
(ii) as to which the self-regulatory organization consents, the Commission will:

(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-FINRA-2018-015 on the subject line.

##### Paper Comments:

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

All submissions should refer to File Number SR-FINRA-2018-015. 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 website (<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 a.m. and 3 p.m. Copies of such filing also will be available for inspection and copying at the principal office of FINRA. All comments received will be posted without change. Persons submitting comments are cautioned that we do not redact or edit personal identifying information from comment submissions. You should submit only information that you wish to make available publicly. All submissions should refer to File Number SR-FINRA-2018-015 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>39</sup>

Robert W. Errett  
Deputy Secretary

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<sup>39</sup> 17 CFR 200.30-3(a)(12).

## **I. EXECUTIVE SUMMARY**

On October 6, 2011, FINRA filed with the SEC a proposed rule change to amend the minimum quotation sizes (or “tier sizes”) for OTC equity securities<sup>1</sup> to, among other things, simplify the tier structure, facilitate the display of customer limit orders and expand the scope of the Rule to apply to additional quoting participants. During the proposal process, the SEC received a number of comments and, in response, FINRA proposed that the new tier sizes operate on a pilot basis for one year to allow FINRA and the SEC to better analyze the impact of the revised tier sizes. During the comment process, commenters raised a variety of concerns regarding the potential impact of the revised tiers. The primary concerns raised by commenters related to: (1) market-maker behavior, (2) market quality (including on liquidity and spreads), and (3) customer limit order display. On November 12, 2012, FINRA implemented the revised tiers on a pilot basis.

As discussed more fully below and in the accompanying Cornerstone Study,<sup>2</sup> FINRA believes that the Pilot accomplished its intended objectives without adversely impacting market-maker behavior, market quality (including on liquidity and spreads), or customer limit order display. FINRA believes that the impact of the revised tier sizes on the number of customer limit orders eligible for display was positive and that the overall impact of the revised tier sizes on market maker behavior and market quality was generally neutral with some metrics reflecting positive changes. Accordingly, FINRA is recommending that the SEC approve the adoption of the revised tier sizes on a permanent basis.

## **II. OVERVIEW**

FINRA Rule 6433 (Minimum Quotation Size Requirements For OTC Equity Securities) (the “Rule”) sets forth the minimum quotation sizes that may be displayed on any inter-dealer quotation system that permits quotation updates on a real-time basis in OTC equity securities. Under the Rule, different minimum quotation sizes apply depending upon the price level of the bid or offer and, therefore, a different minimum quotation size can apply to each side of the market being quoted by a member in a given security.

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<sup>1</sup> An OTC equity security is an equity security that is not an “NMS Stock” as defined in Rule 600(b)(47) of SEC Regulation NMS. *See* FINRA Rule 6420(f).

<sup>2</sup> FINRA engaged Cornerstone Research (“Cornerstone”) to conduct an analysis of the impact of the Pilot on OTC market quality. A summary of the Pilot Assessment is provided in Section IV below and Cornerstone’s study is attached as Appendix A and Supplemental Exhibits 10 and 11 (“Cornerstone Study”).



On October 6, 2011, FINRA filed with the SEC SR-FINRA-2011-058, a proposed rule change to amend the minimum quotation sizes for OTC equity securities to, among other things, simplify the tier structure, facilitate the display of customer limit orders under FINRA Rule 6460 (Display of Customer Limit Orders) and expand the scope of the Rule.<sup>3</sup> The SEC received a number of comments on the Original Proposal and, in response to those concerns, FINRA ultimately proposed revised tier sizes<sup>4</sup> and further proposed that the new tier sizes operate on a pilot basis for one year (“Minimum Quotation Size Pilot” or “Pilot”)<sup>5</sup> to allow FINRA and the SEC the opportunity to better analyze the impact of the Pilot.<sup>6</sup>

The minimum quotation sizes in effect prior to the Pilot, which was implemented on November 12, 2012, consisted of nine tiers that applied only to market makers displaying quotations in OTC equity securities, and ranged in price categories from \$0.00 through \$2,500.01 (*See* TABLE 1). The Pilot provided for six revised tier sizes for quotations in OTC equity securities, whether displayed by market makers (both representing proprietary and customer interest), alternative trading systems or any other member firm. (*See* TABLE 2).

TABLE 1

Price (Bid or Offer)	Minimum Quote Size (# of shares)
\$0 to \$0.50	5,000
\$0.51 to \$1.00	2,500
\$1.01 to \$10.00	500
\$10.01 to \$100.00	200
\$100.01 to \$200.00	100
\$200.01 to \$500.00	25
\$500.01 to \$1,000.00	10
\$1,000.01 to \$2,500.00	5
\$2,500.01 +	1

<sup>3</sup> See Securities Exchange Act Release No. 65568 (October 14, 2011), 76 FR 65307 (October 20, 2011) (File No. SR-FINRA-2011-058; Notice of Filing of Proposed Rule Change To Amend FINRA Rule 6433 (Minimum Quotation Size Requirements for OTC Equity Securities)) (“Original Proposal”).

<sup>4</sup> See Amendment No. 1 to File No. SR-FINRA-2011-058 (“Amendment No. 1”).

<sup>5</sup> See Amendment No. 2 to File No. SR-FINRA-2011-058 (“Amendment No. 2”).

<sup>6</sup> See Securities Exchange Act Release No. 67208 (June 15, 2012), 77 FR 37458 (June 28, 2012) (File No. SR-FINRA-2011-058; Notice of Filing of Amendment No. 2 and Order Granting Accelerated Approval of a Proposed Rule Change, as Modified by Amendment Nos. 1 and 2, To Amend FINRA Rule 6433 (Minimum Quotation Size Requirements for OTC Equity Securities)) (“Minimum Quotation Size Approval Order”).

TABLE 2

Price (Bid or Offer)	Minimum Quote Size (# of shares)
\$0.0001 to \$0.0999	10,000
\$0.10 to \$0.1999	5,000
\$0.20 to \$0.5099	2,500
\$0.51 to \$0.9999	1,000
\$1.00 to \$174.99	100
\$175.00 +	1

### III. PILOT OBJECTIVES AND DATA COLLECTION

The objectives of the Minimum Quotation Size Pilot included: (1) simplifying the structure of the tiers; (2) modernizing the minimum sizes, including in light of regulatory changes; (3) providing for uniform treatment of the types and sources of quotations that would be subject to the Minimum Quotation Size Rule; and (4) facilitating greater display of customer limit orders.

The Pilot simplified the tier structure in a variety of ways. Reducing the number of tiers and conforming the minimum quotation size applicable to OTC equity securities priced between \$1.00 and \$174.99 to the one hundred share-minimum generally applicable on exchanges accomplished the structural simplification sought to be achieved. In addition, the Pilot revised the smallest price point from \$0.00 to \$0.0001 to conform to the minimum quotation increments under FINRA Rule 6434 (Minimum Pricing Increments for OTC Equity Securities), which, among other things, prohibits members from displaying a bid or offer in an OTC equity security in an increment smaller than \$0.01 if the bid or offer is priced \$1.00 or greater per share, or in an increment smaller than \$0.0001 if the bid or offer is priced below \$1.00.

FINRA also expected that the Pilot's revised tier sizes would result in benefits to investors by facilitating the display of customer limit orders under FINRA's limit order display rule,<sup>7</sup> which generally requires that OTC market makers fully display better-priced customer limit orders (or same-priced customer limit orders that are at the best bid or offer and that increase the OTC market maker's size by more than a *de minimis* amount). OTC market makers are not required to display a customer limit order on an inter-dealer quotation system unless doing so would comply with the minimum quotation size applicable to the price of the quotation. Therefore, although a customer limit order may otherwise have been required to be displayed under the limit order display rule because it improved the price or size more than a *de minimis* amount, if the order is less than the minimum quotation size, the member would not be required to display the order. FINRA believed that the revised tiers set forth in the Pilot would improve overall display of customer limit orders.

<sup>7</sup>

See FINRA Rule 6460.

For example, because the Pilot would reduce the tier size from 2,500 to 100 shares for securities priced at or above \$1.00, FINRA believed that competitively priced customer limit orders, which tend to be smaller sized orders, would be more likely to be displayed and potentially yield a variety of benefits, including improved price transparency, enhanced execution of customer limit orders and narrower spreads. As further discussed below in Section IV, FINRA believes that the Pilot generally resulted in the anticipated effect in this regard.

To effectively assess the impact of the Pilot on quoted OTC equity securities, FINRA collected and provided to the Commission certain pre and post-pilot data. Specifically, FINRA provided the following data to the SEC aggregated daily by symbol for those securities subject to the Pilot:<sup>8</sup>

- The price of the first trade of each trading day executed at or after 9:30:00 a.m., based on execution time.
- The price of the last trade of each trading day executed at or before 4:00:00 p.m., based on execution time.
- Daily share volume.
- Daily dollar volume.
- Number of limit orders from customers and in total.
- Percentage of the day that the size of the BBO (i.e., best bid and offer on FINRA's OTCBB facility and OTC Link) equals the minimum quote size.
- Number of market makers actively quoting.
- Number of executions from a limit order and number of limit orders at the BBO or better by tier size from a customer and in total.
- Liquidity/BBO metrics
  - Time-weighted quoted spread.
  - Effective spread.
  - Time-weighted quoted depth (number of shares) at the inside.
  - Time-weighted quoted depth (dollar value of shares) at the inside.<sup>9</sup>

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<sup>8</sup> If an OTC equity security was not quoted on an inter-dealer quotation system during the Pilot period, it was not subject to the Pilot.

<sup>9</sup> FINRA also provided the listed data to the SEC for five random days from each month for a one-year period prior to the effective date of the Pilot. Three months after the Pilot commenced, FINRA started to provide SEC staff with monthly reports that contained the listed data for each day during the month. The data for

FINRA also committed to providing an assessment to the SEC addressing the impact of the pilot, the validity of concerns raised by commenters during the rule filing process, whether the pilot resulted in the desired effects, conclusions regarding the impact of the pilot on liquidity (and potentially other measures of market quality) of the stocks in each tier, and whether the tier cutoffs or sizes should be revised in light of the impact of the Pilot on the over-the-counter market.

#### **IV. PILOT ASSESSMENT RESULTS**

##### **A. Overview of Market Impact**

FINRA believes that the Pilot accomplished its intended objectives without adversely impacting market-maker behavior, market quality (including on liquidity and spreads), or customer limit order display. This belief is supported by the results of the Cornerstone Study, as well as other data analyzed by FINRA. The results of the study are discussed further in Section IV.B. In addition, analysis conducted by FINRA indicates that the impact of the revised tier sizes on the number of customer limit orders eligible for display was positive. This is discussed further in Section IV.C. Importantly, the increase in the number of customer limit orders eligible for display is the most likely explanation for the decrease in quoted spreads that was observed for securities priced greater than \$0.20 and the decrease in effective spreads for retail trades in securities priced between \$1.00 and \$100.00. There also is mixed evidence with respect to market quality for securities priced less than \$0.10 (Tier 1).

##### **B. Impact on Market Quality**

FINRA believes that the Cornerstone Study generally shows that the Pilot had a neutral to positive impact on OTC market quality for the majority of OTC equity securities and tiers. While the evidence produced by the study generally supports the conclusion that the Pilot is associated with increased limit order display and narrower spreads, evidence for Tier 1 securities is mixed. Evidence suggested that effective spreads have widened, but also no significant reduction in quoted depth at the BBO was observed. As a result, the results are not conclusive. The study found evidence that some large market makers initially responded to the Pilot by reducing the number of OTC equity securities for which they displayed a priced quotation, and instead quoted on a name-only basis in the vast majority of these cases. While some large market makers reduced the number of securities actively quoted on a priced basis, Cornerstone's analysis suggests that many of these same market makers were continuing to provide liquidity throughout the Pilot. Moreover, notwithstanding the initial decline in the number of quoting market maker positions, the number of market makers providing quotes increased over the duration of the Pilot.

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each month was provided to the SEC within 20 business days of the beginning of the following month.

The study investigated whether the Pilot had a statistically significant impact on market quality by comparing a number of important quality measures during the Pilot to those measures during the pre-Pilot period.<sup>10</sup> Since the minimum quotation size increased for one price level, remained the same for some price levels, and decreased for most price levels during the Pilot, the study controlled for this variation in treatment by comparing market quality measures within tier size categories pre- and post-Pilot. Also, since the tier size categories and price ranges during the pre-Pilot did not directly match up with the Pilot tier size categories and price ranges, the study matched pre-Pilot and Pilot data by price level to maintain consistency across every variation in Pilot treatment. Among other things, this resulted in the Pilot's Tier 5 (\$1.00 to \$175.00) being decomposed into three subcategories for analysis.<sup>11</sup>

The results of the study suggest that the Pilot had a neutral to positive impact on market quality for OTC equity securities where the minimum quotation size decreased (Tiers 3, 4, 5a, and 5b).<sup>12</sup> The study found that effective spreads generally remained the same or decreased, quoted spreads decreased, and price impact generally decreased for these tiers.

However, the study also found that displayed depth at the BBO declined, while an alternative displayed depth measure, one that assesses depth beyond the BBO and provides a fairer comparison of depth when quoted spreads narrow, remained the same or declined. The study also indicated that the ability to execute trades larger than the displayed depth remained essentially unchanged during the Pilot.

The effective spread and price impact results are particularly important because these measures are more comprehensive, better represent the experience of investors in the market and implicitly take into account the contemporaneous decline in quoted spreads (positive toward market quality) and the decline in displayed depth (negative toward market quality). The results generally show declines in effective spreads and price impact for Tiers 5a and 5b, suggesting an overall positive impact on market quality.

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<sup>10</sup> Due to the small number of securities within the Pilot's Tier 6 (which previously was comprised of higher priced issues in Tiers 5 through 9 in the pre-Pilot tier structure), Tier 6 was omitted from the study. Please see footnote 14 of the Cornerstone Study for further information.

<sup>11</sup> The Pilot's Tier 5, which included securities priced between \$1.00 and \$175.00, was divided into three subcategories – 5a, 5b and 5c – for analysis in the Cornerstone Study. The resulting categories are Tier 5a, which ranged from \$1.00 to \$10.00; Tier 5b, which ranged from \$10.00 to \$100.00; and Tier 5c, which ranged from \$100.00 to \$175.00. See Table 1 of Appendix A for further information.

<sup>12</sup> See Table 3 of Appendix A for a comprehensive overview of the results.

The results generally show no change in effective spreads and a decline in price impact for Tiers 3 and 4, suggesting a more neutral or slightly positive impact on market quality.

The results of the study also suggest that the Pilot had a neutral or negative impact on market quality for OTC equity securities where the minimum quote size requirement increased (Tier 1). The study found that quoted spreads remained the same, displayed depth at the BBO remained the same, and price impact generally remained the same or decreased. However, the study also found that effective spreads remained the same or increased and the alternative displayed depth measure remained the same or decreased. Since the two more comprehensive measures (effective spreads and price impact) offer somewhat contradictory results, the overall evidence is not conclusive with regard to market quality with respect to Tier 1.

The results of the study also suggest that the Pilot had a neutral impact on market quality for securities where the minimum quote size requirement remained the same (Tiers 2 and 5c). The study found that effective spreads remained the same, quoted spreads remained the same or decreased, displayed depth at the BBO remained the same, the alternative displayed depth measure generally remained the same, and price impact remained the same or decreased for these tiers. As expected, the Pilot appears to have had very little effect on these tiers.

There was also some evidence that some large market makers reduced the number of securities they actively quoted upon the initiation of the Pilot.<sup>13</sup> The observed behavior occurred in securities in all tiers, regardless of whether the minimum quotation size increased, decreased or remained the same. FINRA concludes that the large reduction in the number of securities actively quoted by certain market makers appears to have been temporary and gradually reversed over time. The market making data is consistent with the explanation that the Pilot initially gave some market makers a reason to re-evaluate their market making risk and drop active quoting in securities to reduce risk. But when the Pilot did not have dire consequences on market making, these same market makers expanded their breadth of active quoting during the Pilot. The market quality metrics analyzed and discussed previously would have encompassed any impacts on market quality due to changes in market maker quoting.

### **C. Impact on Customer Limit Order Display**

FINRA analyzed the number of customer limit orders that would be eligible for display under both the Pilot and pre-Pilot tier sizes and observed that for all tier sizes combined, there was a 13% increase in the number of customer limit orders that met the minimum quotation sizes to be eligible for display under the Pilot tiers. While the 13%

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<sup>13</sup> See page 5, #16 and Exhibit 1 of the Cornerstone Study. Many market makers continued to quote in name only; this behavior is not reflected in the actively quoted numbers.

overall increase is meaningful, FINRA observed a significant increase in the number of customer limit orders in securities priced between \$0.20 and \$100.00 that became eligible for display. TABLE 3 below reflects the percentage of customer limit orders that were equal to or greater than the minimum quotation size under both the Pilot and pre-Pilot tier sizes for each defined price range included in either the Pilot or pre-Pilot tier size levels.

**TABLE 3**

<b>Price Range</b>	<b>Pilot Tier Size</b>	<b>Customer Limit Orders <math>\geq</math> Tier Size</b>	<b>Pre-Pilot Tier Size</b>	<b>Customer Limit Orders <math>\geq</math> Tier Size</b>
0.0001-0.0999	10,000	78.29%	5,000	86.30%
0.10-0.1999	5,000	56.89%	5,000	56.89%
0.20-0.5099	2,500	57.35%	5,000	43.30%
0.51-0.9999	1,000	72.81%	2,500	46.05%
1.00-10.00	100	97.86%	500	74.73%
10.01-100.00	100	98.24%	200	87.93%
100.01-174.99	100	90.49%	100	90.49%
175.00-200.00	1	100%	100	96.71%
200.01-500.00	1	100%	25	90.74%
500.01-1,000.00	1	100%	10	64.62%
1,000.00-2,500.00	1	100%	5	61.38%
2,500.00+	1	100%	1	100.00%

FINRA notes that, of the 301,628,686 customer limit orders reported to FINRA's Order Audit Trail System ("OATS") between November 1, 2012 and June 30, 2013, over 86.6% were priced between 0.20 and 100.00. Of particular note, 58.7 million customer limit orders, or almost 20% of all customer limit orders, were priced between \$1.00 and \$10.00.<sup>14</sup> This price range experienced an increase of almost 24% in the number of customer limit orders that met the minimum quotation size to be eligible for display under the Pilot. Further, 181.6 million customer limit orders, or over 60% of all customer limit orders, were priced between \$10.01 and \$100.00. This price range experienced an increase of over 10% in the number of customer limit orders that met the tier sizes and were eligible for display under the Pilot tier sizes. Consequently, an additional 32 million customer limit orders priced between \$1.00 and \$100.00 became eligible for display during the Pilot that otherwise would not have been displayable.

<sup>14</sup> In performing these calculations and arriving at the described results, as noted in Amendment No. 2, FINRA calculated the percentage of customer limit orders at or above the minimum tier size by using all limit orders reported to OATS as being received by a FINRA member, including those received from other FINRA members. FINRA excluded all proprietary orders originated by a member from its calculations.



FINRA believes the material increase in the number of customer limit orders eligible for display directly contributed to the decrease in quoted spreads that were observed for OTC equity securities priced greater than \$0.20 and the decrease in effective spreads for retail trades in securities priced between \$1.00 and \$100.00.

#### **D. Discussion of Comments**

During the notice and comment process for the proposed changes to Rule 6433, commenters raised a variety of concerns regarding the potential impact of the Pilot. The SEC received eight comment letters on the Original Proposal and two comment letters on Amendment No. 1.<sup>15</sup> The primary concerns raised by commenters related to: (1) market-maker behavior, (2) market quality (including on liquidity and spreads), and (3) customer limit order display.<sup>16</sup> As discussed more fully above (*See* Section IV) and in the Cornerstone Study, FINRA believes that the overall impact of the Pilot on market maker behavior and market quality was neutral to positive, and that the Pilot's impact on customer limit order display was positive.

##### Market Maker Behavior

Commenters raised concerns that the Pilot would result in a reduction in market makers quoting OTC equity securities, which, in turn, could erode liquidity in the marketplace.<sup>17</sup>

<sup>15</sup> See Letters to Elizabeth M. Murphy, Secretary, Commission, from Suzanne H. Shatto, Seattle, Washington, dated October 20, 2011; Naphtali M. Hamlet, Seattle, Washington, dated October 21, 2011; Daniel Zinn, General Counsel, OTC Markets Group, Inc., dated November 10, 2011; Michael T. Corrao, Managing Director, Knight Capital Group, Inc., dated November 16, 2011; R. Cromwell Coulson, President and CEO, OTC Markets, dated November 18, 2011; Daniel Zinn, General Counsel, OTC Markets Group, Inc., dated December 29, 2011; Michael T. Corrao, Managing Director, Knight Capital Group, Inc., dated January 13, 2012 and Daniel Zinn, General Counsel, OTC Markets Group, Inc., dated February 14, 2012 on the Original Proposal. See Letter from Daniel Zinn, General Counsel, OTC Markets Group, Inc., dated May 7, 2012 and Michael T. Corrao, Managing Director, Knight Capital Group, Inc., dated May 7, 2012 on Amendment No. 1. (All of the letters from Knight Capital Group, Inc. are collectively referred to as "Knight letters." All of the letters from OTC Markets Group, Inc. are collectively referred to as "OTC Markets letters.").

<sup>16</sup> FINRA notes that the majority of the comments received related to FINRA's Original Proposal. FINRA revised the originally proposed tiers in Amendment No. 1 and proposed to adopt those tiers on a pilot basis in Amendment No. 2. FINRA's summary and responses to comments are available at <http://www.finra.org/Industry/Regulation/RuleFilings/2011/P124615>.

<sup>17</sup> See Knight letters.



As noted above, there was an initial move to name-only quotations by some market makers, but as the Pilot progressed FINRA saw an overall increase in the number of market makers quoting OTC equity securities over the duration of the Pilot. Accordingly, because the concern about the departure of quoting market makers did not materialize, FINRA does not believe there is evidence to support the position that market liquidity was harmed by fewer market makers.

#### Impact on Market Quality

Certain commenters also believed that reduced minimum tier sizes would lead to reduced displayed liquidity and less efficient, more-costly trading.<sup>18</sup> FINRA notes that the evidence collected during the Pilot indicates that, as was previously the case, market makers largely tended to quote at the required minimum size. In addition, the data shows that displayed depth at the inside market decreased for those securities whose minimum quote size decreased. While displayed liquidity at the inside market declined for these issues due to narrower spreads, Cornerstone found that there was not a significant reduction in total depth displayed within consistent price bands at 1%, 2%, 5% and 10% surrounding the midpoint. Moreover, based on the number of trades executed in amounts exceeding the minimum quote sizes, Cornerstone also concluded that “liquidity continued to be provided at levels greater than the minimum required depth and the change in the minimum quote size requirements did not significantly alter the ability to execute larger trades in the OTC market.” Therefore, FINRA does not believe there is sufficient evidence to suggest that trading was either less efficient or more costly as a result of the revised minimum quotation sizes.

Concerns also were raised that the revised tier sizes could increase realized spreads.<sup>19</sup> As discussed in Section IV.A. and in the Cornerstone Study, FINRA believes the Pilot had a neutral to positive impact on market quality, including on liquidity and effective spreads, for the large majority of OTC issues.<sup>20</sup>

#### Limit Order Display

Comments also were raised regarding whether the Pilot would positively impact limit order display as FINRA anticipated. In particular, one commenter stated that the proposal would have a negligible effect on the display of customer limit orders in OTC equity securities, and questioned whether such change in display would offset the negative consequences on other aspects of market quality.<sup>21</sup>

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<sup>18</sup> See Knight letters and OTC Markets letters.

<sup>19</sup> See OTC Markets letters.

<sup>20</sup> See Section IV and the Cornerstone Study.

<sup>21</sup> See OTC Markets letters.

As discussed above in Section IV, the decrease in the minimum quotation size substantially increased the number of customer limit orders eligible for display. Specifically, under the Pilot, FINRA calculated that there was a 13% increase in the number of limit orders eligible for display, with the most significant increases in securities priced between \$0.20 and \$100.00.

## **V. FINRA RECOMMENDATION**

Based upon FINRA's experience to date with the tier sizes operational during the Pilot and the information reflected above and in Appendix A, FINRA believes that the Pilot has accomplished its original objectives of: (1) simplifying the structure of the tiers; (2) modernizing the minimum sizes; (3) providing for uniform treatment of types and sources of quotations that would be subject to the Minimum Quotation Size Rule; and (4) improving display eligibility for customer limit orders.

In addition, as discussed above, while FINRA believes that the Cornerstone Study generally shows that the Pilot had a neutral to positive impact on OTC market quality for the majority of OTC equity securities and tiers, evidence for Tier 1 securities was mixed though not conclusive. Thus, recommends that the Pilot tiers be adopted for all OTC equity securities on a permanent basis.

***OTC Tier Size Analysis***  
***(FINRA Rule 6433)***

**Cornerstone Research**

September 13, 2013

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## **I. Executive Summary**

1. This report is submitted by Cornerstone Research (“Cornerstone”) to the staff of the Financial Industry Regulatory Authority (“FINRA”). The report summarizes the results of research conducted by Cornerstone pursuant to a contract with FINRA. Cornerstone was selected to perform this research based on Cornerstone’s response to a Request for Proposal (RFP) entitled “OTC Tier Size – SEC Analysis,” issued by FINRA in October 2012.
2. This report was prepared by the staff of Cornerstone under the direction of Dr. Stewart Mayhew of Cornerstone, Dr. D. Timothy McCormick, and Dr. Jeffrey H. Harris of Syracuse University.
3. The research summarized in this report relates to FINRA Rule 6433, which designates a minimum quote size for firm quotes entered by members acting as OTC Market Makers. The minimum quote size in Rule 6433 also determines the minimum size at which price-improving customer limit orders must be reflected in the quote.<sup>1</sup> This minimum quote size varies as a function of the price level, according to a schedule specified in the rule, with higher minimum quote sizes corresponding to lower prices.
4. In particular, the research in this report evaluates the impact of recent amendments to Rule 6433 that modified the minimum quote size schedule.<sup>2</sup> The proposed rule change was first published for comment in the Federal Register on October 20, 2011,<sup>3</sup> and amended proposals were published on April 20, 2012 (“Amendment No. 1”)<sup>4</sup> and June 5, 2012 (“Amendment No. 2”).<sup>5</sup> On June 15, 2012, the Securities and Exchange Commission (“SEC” or “Commission”) approved the proposed rule change, as modified by Amendment No. 1 and No. 2, for a pilot period of one year.<sup>6</sup> The new rule became effective on a pilot basis on November 12, 2012.

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<sup>1</sup> Rule 6460 generally requires that OTC Market Makers fully display better-priced customer limit orders or same-priced customer limit orders that are at the best bid or offer and that increase the OTC Market Maker’s size by more than a *de minimus* amount.

<sup>2</sup> The new amendments also expanded the scope of Rule 6433 to apply to all quotations or orders displayed by alternative trading systems or by non-market makers representing customer trading interest.

<sup>3</sup> See Securities Act Release No. 65568 (October 14, 2011), 76 FR 65307.

<sup>4</sup> See Securities Act Release No. 66819 (April 17, 2012), 77 FR 23770. This amendment No. 1 revised the minimum quote size requirements and proposed the amended Rule operate as a pilot.

<sup>5</sup> See public file SR-FINRA-2011-058.

<sup>6</sup> See SEC Release No. 34-67208; File No. SR-FINRA-2011-058.

5. Prior to the amendment, Rule 6433 specified nine price tiers, with minimum quote sizes ranging from 1 share for the highest price tier to 5,000 shares for the lowest price tier. As amended, the rule specifies six price tiers, with minimum quote sizes ranging from 1 share for the highest price tier to 10,000 shares for the lowest price tier.

6. Table 1 summarizes the definition of the price tiers under the old rule and the amended rule, and how the minimum quote size requirement changed for each price range. The minimum quote size increased for prices below \$0.10, remained unchanged for prices between \$0.10 and \$0.20, decreased for prices between \$0.20 and \$100.00, remained unchanged for prices between \$100.00 and \$175.00, decreased for prices between \$175.00 and \$2,500.00, and remained unchanged for prices higher than \$2,500.00.

7. During the two comment periods, certain market participants expressed a view that the rule would harm market quality in the OTC markets.<sup>7</sup> Among the views expressed by these commenters were the following:

- a. Commenters suggested that FINRA had not shown sufficient economic evidence to support the minimum quotation size requirements and had not demonstrated that the proposed revisions would improve liquidity or lower transaction costs to investors;
- b. Commenters stated that the proposed rule could lead to a reduction in liquidity if it caused market makers to display less depth or stop quoting altogether;
- c. Commenters argued that the immediate effect of the proposal would be less displayed liquidity overall, because the additional liquidity from additional customer orders being displayed would be more than offset by reduced displayed liquidity from market makers—the commenters argued this reduced displayed liquidity would potentially lead to more volatility and increased trading costs.

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<sup>7</sup> See Letter from Daniel Zinn, General Counsel, OTC Markets Group Inc. (OTC Markets) to Elizabeth M. Murphy, Secretary, Commission, dated November 10, 2011 (OTC Markets Letter I); Letter from Michael T. Corrao, Managing Director, Knight Capital Group, Inc. (Knight) to Elizabeth M. Murphy, Secretary, Commission, dated November 16, 2011 (Knight Letter I); Letter from R. Cromwell Coulson, President & CEO, OTC Markets to Craig Lewis and Kathleen Hanley, Commission, dated November 18, 2011 (OTC Markets Letter II); Letter from Daniel Zinn, General Counsel, OTC Markets Group Inc. to Elizabeth M. Murphy, Secretary, Commission, dated December 29, 2011 (OTC Markets Letter III); Letter from Michael T. Corrao, Managing Director, Knight Capital Group, Inc. to Elizabeth M. Murphy, Secretary, Commission, dated January 13, 2012 (Knight Letter II); Letter from Daniel Zinn, General Counsel, OTC Markets Group Inc. to Elizabeth M. Murphy, Secretary, Commission, dated February 14, 2012 (OTC Markets Letter IV); Letter from Daniel Zinn, General Counsel, OTC Markets Group Inc. to Elizabeth M. Murphy, Secretary, Commission, dated May 7, 2012 (OTC Markets Letter V); Letter from Michael T. Corrao, Managing Director, Knight Capital Group, Inc. to Elizabeth M. Murphy, Secretary, Commission, dated May 7, 2012 (Knight Letter III).

8. In Amendment No. 2, FINRA proposed to provide the Commission with data necessary to assess the impact of the revised tier sizes on the OTC equity market, and to provide the Commission with its own assessment of the impact of the pilot.<sup>8</sup> In the approval order, the Commission summarized its expectations<sup>9</sup> regarding FINRA's responsibility to assess the impact of the rule change as follows:

Because of the uncertainty of the actual impact of FINRA's proposal on market maker behavior, however, the Commission believes that it is necessary to conduct a meaningful review of data collected during the pilot period to credibly assess this aspect of the proposed rule change.<sup>10</sup> The Commission notes that, in Amendment No. 2, FINRA committed to provide the Commission with specified data to assist the Commission in its assessment of the impact of the pilot on the OTC market.<sup>11</sup> Further, FINRA committed to provide, at least 60 days before the conclusion of the pilot, its own assessment of the impact of the pilot, addressing the concerns raised by commenters regarding the efficacy of the pilot in achieving its intended effects. Moreover, FINRA committed to revisit the pilot program during its pendency should an analysis of the data show degradation in liquidity and other factors indicating that the revisions to the Rule are having an adverse effect on OTC equity securities. *(Footnotes from original)*

9. This report summarizes the findings of research assessing the impact of Amended Rule 6433 on liquidity in the OTC markets. In particular, this research investigated whether Amended Rule 6433 had a statistically significant impact on various measures of liquidity in OTC traded equities.

<sup>8</sup> See Federal Register, Vol. 77, No. 120, June 21, 2012, p. 37459.

<sup>9</sup> See Federal Register, Vol. 77, No. 120, June 21, 2012, p. 37468.

<sup>10</sup> With respect to the comment from Knight that the proposed rule change would have an adverse impact on both dealers and investors, the Commission preliminarily believes that the revised proposal, as described in Amendment No. 1, would facilitate the display of additional customer orders while still requiring a reasonable commitment of liquidity from market makers. See Knight Letter I at pp. 1–2.

<sup>11</sup> In Amendment No. 2, FINRA committed to provide the following data to the Commission, on a monthly basis, to allow its staff to evaluate the impact of the pilot: the price of the first trade of each trading day executed at or after 9:30:00 a.m., based on execution time; the price of the last trade of each trading day executed at or before 4:00:00 p.m., based on execution time; daily share volume; daily dollar volume; number of limit orders from customers and in total; percentage of day the size of the BBO (i.e., best bid and offer on FINRA's OTCBB facility and OTC Link) equals minimum quote size; number of market makers actively quoting; number of executions from a limit order and number of limit orders at the BBO or better by tier size from a customer and in total; time-weighted quoted spread; effective spread; time-weighted quoted depth (number of shares) at the inside; and time-weighted quoted depth (dollar value of shares) at the inside.

## A. Methodology

10. The question of whether Amended Rule 6433 had an impact on liquidity in the OTC markets was addressed by computing various liquidity metrics for OTC stocks before and after the effective date of the amendments, and examining whether these metrics exhibited a statistically significant change after the rule change went into effect. Further details regarding the data used to conduct this analysis are provided in Section II, below.

11. The liquidity metrics examined included quoted spreads, effective spreads, quoted depth at the best bid and offer (“BBO”), quoted depth within a range of prices surrounding the BBO midpoint, estimates of the price impact for hypothetical market orders of various sizes (assuming execution only against displayed depth), and the percentage of time hypothetical market orders of various sizes could be fully executed. Further details regarding the construction of these metrics are provided in Section III, below.

12. These metrics were computed for the universe of all OTC Link stocks each day, for samples of days before and after the effective date of the amendments.<sup>12</sup> The “Pre-Rule Sample period” included five randomly-selected<sup>13</sup> days each month from November 2011 to October 2012 and the “Post-Rule period” included all trading days from November 12, 2012 to June 30, 2013.

13. Price tiers as defined in the amended rule are referred to in this report as “Tier 1” through “Tier 6,” with Tier 1 corresponding to the lowest price range. For purposes of this study, Tier 5 was subdivided into three categories, designated 5a, 5b, and 5c, corresponding to three different tiers under the old rule. Tier 6, corresponding to prices greater than \$175.00, was not included in this study, due to concern that the number of securities quoted in that tier may not be sufficient to provide reliable statistical evidence.<sup>14</sup>

14. Metrics were averaged over time for each security, separately for the Pre-Rule Sample period and Post-Rule period. Statistical tests were then performed to evaluate whether there was a significant change in the metric between the two samples. These tests were performed separately for each price tier.

<sup>12</sup> There were only a small number of securities that traded on the OTC Bulletin Board but not on OTC Link. These were excluded from the analysis.

<sup>13</sup> The days to be included in the Pre-Rule Sample period were randomly selected by FINRA.

<sup>14</sup> In particular, Tier 6 was subdivided into five categories, corresponding to the different tiers under the old rule. The number of securities with quote data in the various Tier 6 categories during either period ranged from nine to 52.



15. The metrics described above are based on data relating to displayed liquidity and executed trades. As such, these metrics might not fully capture the extent to which market makers are willing to provide liquidity beyond what is displayed, and might not adequately account for possible changes in order submission strategies under the pilot. To address this, the study examines whether the pilot changed the extent to which the market provides liquidity for larger trades. Data are presented summarizing the average number of trades executed at sizes larger than the minimum depth requirement<sup>15</sup>, separately for the Pre-Rule Sample period and Post-Rule period.

## **B. Results**

16. A decline in the average number of market makers providing quotes on OTC securities was observed on the day Amended Rule 6433 became effective. This appears to have been largely driven by a substantial decrease in the number of OTC securities quoted by certain large market makers. For example, Knight Securities reduced the number of securities covered from approximately 9,400 on November 9, 2012 to approximately 8,400 on November 12, 2012 (the day the rule became effective). Similarly, the number of stocks quoted by vFinance Investments, Inc. decreased from over 4,400 to roughly 1,700 when the rule became effective. As shown in Exhibit 1, these are two of several examples. This initial reduction in the number of market makers was not confined to securities in price ranges where the rule reduced the minimum quote size—there was a substantial reduction in the number of stocks quoted in Tier 1 (under \$0.10), where the rule increased the minimum quote size. The reduction in the number of stocks quoted at the time of the rule change appears to have been only a temporary response to the transition, as the initial reduction was reversed in the following months.

17. Results of the analysis of how the changes to Rule 6433 impacted market quality and liquidity are presented in Section IV, below. These results may be summarized as follows.

18. For stocks priced under \$0.10 where the rule change increased the minimum quote size requirement (Tier 1), some statistically significant changes were observed. In particular,

- a. Effective spreads increased, particularly for trades valued under \$10,000;

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<sup>15</sup> The minimum depth requirement is calculated as the larger of the Pre-Rule Sample period and the Post-Rule period minimum required depth.

- b. No significant reduction in quoted depth at the BBO was observed; however, there was a significant reduction in quoted depth within one percent of the quote midpoint and within two percent of the quote midpoint;
- c. The price impact of hypothetical market orders declined for buy orders and sell orders of 5,000 and 10,000 shares, but increased for sell orders of 50,000 shares.

19. For stocks in those tiers where the minimum quote size requirement declined (Tiers 3, 4, 5a, 5b), the rule change consistently appears to be associated with narrower quoted spreads, and less displayed depth at the BBO. In particular:

- a. Quoted spreads narrowed significantly for all price tiers from \$0.20 to \$100.00 (Tiers 3, 4, 5a, and 5b);
- b. Effective spreads for all trades and those trades valued under \$10,000 and trades valued between \$10,000 and \$200,000 decreased for the two price tiers from \$1.00 to \$100.00 (Tiers 5a and 5b);
- c. Effective spreads for trades valued over \$200,000 increased for securities priced from \$0.20 to \$0.51 and from \$10.00 to \$100.00 (Tiers 3 and 5b);
- d. Quoted depth at the BBO decreased for all price tiers from \$0.20 to \$100.00 (Tiers 3, 4, 5a, and 5b);
- e. The reduction of depth at the BBO overstates the reduction of displayed liquidity because quoted spreads narrowed; for stocks priced between \$1.00 and \$100.00 (Tiers 5a and 5b), no significant change was observed in the total depth displayed within constant price bands of one percent, two percent, five percent, and ten percent surrounding the midpoint;
- f. Liquidity as measured by the price impact of hypothetical market orders increased for all price tiers from \$0.20 to \$100.00 (Tiers 3, 4, 5a, and 5b).

20. For prices between \$0.10 and \$0.20 (Tier 2) and prices between \$100.00 and \$175.00 (Tier 5c), the minimum quote size requirement was not changed. While most of the market quality metrics exhibited no significant changes, some statistically significant changes were observed for these price tiers. In particular:

- a. Quoted spreads narrowed for Tier 2;

- b. Liquidity as measured by the price impact of hypothetical market orders increased for both buy and sell orders in Tier 2, and for sell orders in Tier 5c.

21. Since OTC market makers may be willing to provide liquidity beyond the amount displayed in their quotes (“hidden liquidity”), it is possible that the impact of the rule change on total liquidity may not be fully captured in the measures of displayed depth. Moreover, this study does not address whether order submission strategies might have changed from the Pre-Rule Sample period to the Post-Rule period, and the metrics described above do not account for the possibility that market participants may be submitting fewer large orders under the pilot rule.

22. For these two reasons, as an alternative way to measure the impact of the rule change on liquidity, this study examined whether there were substantive changes in the number of trades executed at sizes larger than the minimum quote requirement after the pilot went into effect. Exhibit 2 provides histograms summarizing the number of trades per stock per day for various ranges of dollar values, with one page for each tier. The exhibit shows that the number of trades executed at sizes exceeding the depth requirement<sup>16</sup> was noticeably larger for Tiers 1, 4, 5a, and 5c, stayed relatively constant for Tiers 2 and 5b, and declined for Tier 3. The preponderance of evidence for this measure suggests that liquidity continues to be provided at levels greater than the minimum required depth and the change in the minimum quote size requirements did not significantly alter the ability to execute larger trades in the OTC market.

23. In summary, the results of this study indicate that the Rule 6433 amendments were associated with declines in displayed depth at the BBO for those tiers where the minimum quote size requirement was reduced, but this decline in displayed liquidity was offset by a narrowing of the BBO spread across all tiers. For stocks priced between \$1.00 and \$100.00 (Tiers 5a and 5b), no evidence was found of a decrease in total displayed depth after controlling for the spread, but evidence was found of an improvement in execution quality (lower effective spreads) for trades valued up to \$200,000. Across tiers, the evidence indicates a decrease in the price impact of hypothetical large market orders executed against displayed depth, but also a decrease in the percentage of the time such orders could be fully executed. On balance, the evidence suggests that the changes in Rule 6433 were beneficial to market quality and liquidity in the OTC equity market, at least with respect to trades sized under \$200,000. This study was not designed to

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<sup>16</sup> Dollar value of depth requirement is calculated as the highest price in a given tier multiplied by the larger of the Pre-Rule Sample period and the Post-Rule period minimum required depth.

measure important aspects of larger trades, such as hidden liquidity or large orders broken up and executed over time. As a result, there are important limitations to the conclusions that can be drawn from the evidence on trades above \$200,000 and more generally on the execution quality for institutional investors.

24. This study was based on quote and trade data; although FINRA does receive order-level data through its Order Audit Trail System (OATS), because not all orders are captured by OATS, such as market making orders and orders received or originated by smaller firms that are exempt from the OATS Rules, it was determined that order level data would not be used in the study. Accordingly, it was not within the scope of this study to assess how the rule might have affected execution quality for institutional-sized orders that were broken up or executed over the course of the day or several days.

## **II. Data Sources**

### **A. OTC Link Quotes and BBO data**

25. OTC Equity Securities may be quoted on the OTC Pink Link and the OTC Bulletin Board. OTC Markets Group Inc., formerly known as Pink OTC Markets Inc., operates OTC Link, an electronic quotation system that displays quotes from broker dealers for many OTC securities. FINRA operates the OTC Bulletin Board, an electronic quotation system that displays real-time quotes, last-sale prices, and volume information for a number of OTC securities. For the analysis in this study, FINRA provided on a monthly basis all published OTC Link quotes and the best bid and best offer (BBO) as calculated by OTC Link.<sup>17</sup> Data were received for five randomly chosen days, as selected by FINRA, for each month November 2011 through October 2012 (prior to the pilot), as reported in Table 2, and for all trading days from November 2012 through June 2013 (during the pilot study).

### **B. ORF Trade Reports**

26. The OTC Reporting Facility (“ORF”) is a service provided by FINRA for the reporting of trades in OTC Equity Securities executed other than on or through an exchange and for

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<sup>17</sup> In order for an OTC equity trading on the Bulletin Board to have a BBO value it must have two market makers quoting the stock. There only needs to be a single market maker for an equity quoted on OTC Pink Link.

dissemination of last sale information. Data were provided for the same set of dates as were provided in the OTC Link quotes and BBO data.

### **C. FINRA Calculated Data**

27. FINRA staff calculated data items #3-8 as outlined in Amendment No. 2. In particular, FINRA provided the following for each stock/date:

- a. Daily share volume;
- b. Daily dollar volume;
- c. Number of limit orders from customers and in total;
- d. Percentage of day the depth at the BBO equals the minimum quote size;
- e. Number of market makers actively quoting; and
- f. Number of executions from a limit order and number of limit orders at the BBO or better by tier size from a customer and in total.

## **III. Study Design and Methodology**

28. This section provides an overview of the empirical design of the study, including the market quality metrics and the empirical specifications used to assess the impact of Amended Rule 6433. Section A describes the metrics used for measuring market quality in the OTC markets, and Section B describes the statistical test methodology.

### **A. Market Quality Metrics**

29. Measures of market quality were calculated using intraday quote data from OTC Link, which contained time series of BBO prices by stock and also individual market maker quotes, and using intraday trade executions reported to the ORF. Metrics were computed for each stock/day.

30. In computing metrics that rely on quotes, quotes were removed prior to the calculation if the market was crossed, if the quoted bid or offer was zero, or if the quoted spread was greater than 90 percent of the offer price.<sup>18</sup>

31. In addition, stock/days were removed from the sample in cases where the bid and/or offer prices used to compute the metric of interest crossed the border between multiple tiers within the day. For example, if bid prices of \$0.19 (Tier 2) and \$0.21 (Tier 3) were observed on the same stock on the same day, any metric relying on the bid price would not be computed for that stock/day.<sup>19</sup>

32. For metrics relying on execution prices, trades were removed if they were executed at a price greater than 150 percent of the prevailing best offer or less than 50 percent of the prevailing best bid.<sup>20</sup> Trades were included if they were within market hours, disseminated to the public, and classified within the ORF database as having a trade status code of (A)-Accepted; locked in; (F)-forced match; (L)-Automatic; (M)-Matched; (R)-Received via an execution system interface; (S)-Automatic locked-in split trade; (T)-Trade reporting only/not for clearing submission; or (G)-One-sided submissions. Cancelled trades, trades without a non-zero price, reversal trades, and “as-of” trades were excluded.

## 1. Time-Weighted Quoted Spread

33. The time-weighted quoted spread refers to the intraday average difference between the best bid and offer prices for a security, as reported by OTC Link. Specifically, each stock’s daily time-weighted quoted spread ( $S$ ) was calculated according to the following formula:

$$S = \frac{1}{\sum_{j \in BBO} T_j} \sum_{j \in BBO} T_j (Offer_j - Bid_j)$$

where  $j$  traces the set of BBO quotes observed during trading hours,  $T_j$  is the amount of time  $BBO_j$  is active, and  $Offer_j$  and  $Bid_j$  are the best offer and bid prices from  $BBO_j$ .

<sup>18</sup> This requirement was intended to eliminate situations where the best bid or offer was a stub quote. Overall less than 0.05 percent of BBOs were removed.

<sup>19</sup> This allows for cleaner interpretation of the within tier results since any transitions of stocks across tiers are eliminated.

<sup>20</sup> For example, in the exceptional case where the prevailing meaningful quote offer price is less than or equal to \$0.20, the trade is removed from calculation if the trade price is more than 10 cents over the offer or more than 10 cents below the bid.

34. The stock's daily time-weighted quoted spreads were then averaged by stock and price tier over the Pre-Rule Sample and the Post-Rule periods.

## 2. Volume-Weighted Effective Spread

35. The volume-weighted effective spread is a measure of the actual spreads at which transactions occur throughout the trading day for a stock. A stock's daily volume-weighted effective spread (Eff) was calculated according to the following formula:

$$Eff = \frac{1}{TV} \sum_{i \in Tr} V_i |P_i - Mid_t|$$

where TV is the total share volume,  $TV = \sum_{i \in Tr} V_i$ ,  $i$  traces Tr which is the set of trades throughout the day,  $V_i$  is the trade volume of trade  $i$ ,  $P_i$  is the price of trade  $i$ , and  $Mid_t$  is the midpoint of the BBO, as provided by OTC Link, at time  $t$ :

$$Mid_t = \frac{Offer_t + Bid_t}{2}$$

where  $Offer_t$  is the prevailing best offer at time  $t$ , and  $Bid_t$  is the prevailing best bid at time  $t$ , based on the most recent valid BBO at the time of the trade  $i$ .<sup>21</sup>

36. The stock's daily volume-weighted effective spreads were then averaged by stock and price tier over the Pre-Rule Sample and the Post-Rule periods.

## 3. Volume-Weighted Effective Spread by Dollar Trade Size

37. The effective spread measure described above is a value-weighted average of effective spreads across all trades regardless of size. Value-weighted effective spreads were also calculated separately for "Small" trades (defined as trades having a market value less than \$10,000), "Medium" trades (between \$10,000 and \$200,000), and "Large" trades (over \$200,000).<sup>22</sup>

<sup>21</sup> Quotes are shown to the millisecond, whereas trades are not. For purposes of the calculation it is assumed that all trades took place at the beginning of the second reported as the execution time.

<sup>22</sup> These size categories follow Bessembinder H., and H. Kaufman, "A Comparison of Trade Execution Costs for NYSE and NASDAQ-Listed Stocks," *Journal of Financial and Quantitative Analysis*, 32 (1997), 287-310.

#### 4. Time-Weighted Quoted Depth

38. The time-weighted quoted depth measures the average number of shares available for market purchase or sale at the quoted BBO for a given stock/day. For each quote throughout the trading day, the quoted depth at the bid and offer were obtained from the OTC Link data. For each stock/day, the sum of the bid plus offer quoted depth was then weighted by the period of time the corresponding quote was active, to compute the time weighted quoted depth metric. The stock/day metrics were then averaged by stock and price tier.

39. Specifically, a stock's daily time-weighted quoted depth sum (D) was calculated as follows:

$$D = \frac{1}{\sum_{j \in BBO} T_j} \sum_{j \in BBO} T_j (OD_j + BD_j)$$

where  $BD_j$  is the quoted depth of the best bid,  $OD_j$  is the quoted depth of the best offer, and all other variables are as defined previously.

40. The stock's daily time-weighted quoted depth sums were then averaged by stock and price tier over the Pre-Rule Sample and the Post-Rule periods.

#### 5. Time-Weighted Quoted Depth around the Midpoint

41. The time-weighted quoted depth around the midpoint measures the number of shares displayed for market purchase or sale within a set range of prices around the BBO midpoint, aggregated across quotes posted by individual market makers. This metric differs from the depth at the BBO, in that it includes depth across all market makers quoting within a certain distance of the midpoint, not only those quoting at the BBO.

42. Because BBO spreads changed when the rule changed, comparing depth at the BBO before and after the rule change is confounded by the simultaneous change in spreads. The time-weighted quoted depth around the midpoint allows for a more proper comparison by defining a constant range of prices around the midpoint for the Pre-Rule and Post-Rule periods. This metric was calculated for four different ranges, including all quotes within one percent, two percent, five percent, and ten percent of the BBO midpoint.



43. In instances where different market makers were quoting within the specified range, this metric will include more depth than is displayed at the BBO. In cases where the BBO quotes are the only prices quoted within the specified range, this measure will be the same as the depth at the BBO. In cases where no market makers are quoting within the specified range, this measure will be zero.

44. These metrics were computed as follows. Each time a new quote was posted by any market maker, total bid depth within one percent of the midpoint was computed by summing the quote size across bids from all market makers that were bidding at most one percent below the BBO midpoint. Similarly, total offer depth within one percent of the midpoint was computed by summing across all offers at most one percent above the BBO midpoint. Bid depth and offer depth were then added together to compute total depth within one percent of the midpoint. A similar process was used to compute aggregate depth within two percent, five percent, and ten percent of the midpoint.

45. Each of the bid, offer, and aggregate quoted depth measures was then weighted by the period of time the current set of quotes was active—that is, by the amount of time between the quote update that triggered the calculation and the subsequent quote update.

46. Specifically, a stock's daily time-weighted quoted depth below the midpoint (WBM), time-weighted quoted depth above the midpoint (WAM), and time-weighted quoted depth around the midpoint (DM) were calculated using the following formulas:

$$WBM = \frac{1}{\sum_{j \in MMquote} T_j} \sum_{j \in MMquote} T_j (BD_j)$$

where  $BD_j$  is the sum of all market makers' quoted bid depths within a given level below the midpoint and  $MMquote$  is defined as each time a new quote was posted by any market maker;

$$WAM = \frac{1}{\sum_{j \in MMquote} T_j} \sum_{j \in MMquote} T_j (OD_j)$$

where  $OD_j$  is the sum of all market makers' quoted offer depths within a given level above the midpoint; and

$$DM = \frac{1}{\sum_{j \in MMquote} T_j} \sum_{j \in MMquote} T_j (OD_j + BD_j)$$

where all other variables are as defined previously.

47. The stock's daily WBM, WAM, and DM were then each averaged by stock and price tier. Holding all else constant, a smaller total quote depth around the midpoint is consistent with a lower level of liquidity or higher transaction costs.

## 6. Price Impact of Hypothetical Large Market Orders

48. The price impact of hypothetical market orders is the effective half spread for a hypothetical market "sweep" order of a particular size. In other words, it is an estimate of what the volume-weighted average effective half spread would have been had a market order been broken up and routed to the market makers based on price priority. The price impact of the hypothetical trade was calculated using all market makers' displayed bids and offers.

49. For example, if the midpoint of the BBO is \$15.00, the best quoted offer price is 300 shares at \$15.10, and the next best quoted offer is 500 shares at \$15.20, a hypothetical buy order for 400 shares would be assumed to be executed 300 shares at \$15.10 and 100 shares at \$15.20. Three quarters of the order would have been filled \$0.10 above the midpoint, and one quarter of the order would have been filled \$0.20 above the midpoint. The weighted average price impact would have been \$0.125.<sup>23</sup>

50. This price impact metric was calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. Specifically, the metric was calculated for order sizes equal to one times, two times, five times, and ten times the minimum quote size under the pilot rule, for the corresponding tier.<sup>24</sup> If there was not enough depth in the market at that particular time to execute the entire order, the observation was classified as unexecutable.

51. To avoid the possibility that the hypothetical orders might be executed against quotes that were clearly stub quotes, hypothetical orders were assumed to be executed only against market maker quotes priced within 45 percent of the calculated BBO midpoint. Each of the bid (sell) and offer (buy) price impact measures was then weighted by the period of time the

<sup>23</sup> When calculating the weighted average price impact for the bid side, the absolute value is taken.

<sup>24</sup> For example, the minimum quote size for Tier 1 under the old rule was 5,000 shares. For this tier, therefore, the price impact measure was computed for hypothetical market orders of 5,000 shares, 10,000 shares, 25,000 shares, and 50,000 shares.

corresponding market maker quotes were active to compute the time-weighted price impact metrics.

52. Specifically, a stock's daily time-weighted price impact at the bid (TWPIB) and time-weighted price impact at the offer (TWPIO) were calculated according to the following formula:

$$PIB = \sum_{j \in MMquote} \sum_{i \in MT} \frac{[Tr_i(PB_i - Mid_t)]}{MT}$$

where  $PB_i$  is the bid price of the shares executed,  $Tr_i$  is the quantity executed, and  $MT$  is the trade size.

$$TWPIB = \frac{1}{\sum_{j \in MMquote} T_j} \sum_{j \in MMquote} T_j(PIB_j)$$

where all variables are as defined previously.

$$PIO = \sum_{j \in MMquote} \sum_{i \in MT} \frac{[Tr_i(PO_i - Mid_t)]}{MT}$$

where  $PO_i$  is the offer price of the shares executed,  $Tr_i$  is the quantity executed, and  $MT$  is the trade size.

$$TWPIO = \frac{1}{\sum_{j \in MMquote} T_j} \sum_{j \in MMquote} T_j(PIO_j)$$

where all variables are as defined previously.

53. The stock's daily TWPIB and TWPIO were then each averaged by stock and price tier. Holding all else constant, a smaller hypothetical trade price impact is consistent with a higher level of liquidity or lower transaction costs.

## 7. Executability of Hypothetical Large Market Orders

54. The executability of hypothetical large market buy and sell orders is an estimate of what portion of the day a hypothetical market order of a given size could have been fully executed against displayed quotes.

55. Similar to the price impact metric described above in A.6, this hypothetical depth metric was calculated for various set sizes of hypothetical buy and sell orders, constituting fixed

multiples of the minimum required depth size for the corresponding tier. If there was not enough depth in the market at that particular time to execute the entire order, the observation was classified as unexecutable.

56. A stock's daily percentage of time executed for buy orders (PEB) and percentage of time executed for buy orders (PEO) were calculated according to the following formula:

$$PEB = \frac{1}{\sum_{j \in MMquote} T_j} \sum_{j \in MMquote} T_j(MDO_j)$$

where  $MDO_j$  sum of all market makers' quoted offer depths. If  $MDO_j$  is greater than or equal to order size then  $MDO_j = 1$ ; otherwise  $MDO_j = 0$ . All variables are as defined previously.

$$PEO = \frac{1}{\sum_{j \in MMquote} T_j} \sum_{j \in MMquote} T_j(MDB_j)$$

where  $MDB_j$  sum of all market makers' quoted offer depths. If  $MDB_j$  is greater than or equal to order size then  $MDB_j = 1$ ; otherwise  $MDB_j = 0$ . All variables are as defined previously.

57. The stock's daily PEB and PEO were then each averaged by stock and price tier. Holding all else constant, a smaller percentage of time executable is consistent with a lower level of liquidity.

## B. Statistical Test Methodology

58. This study utilized t-tests to address whether there were significant changes in the market quality metrics when the rule went into effect. The t-test is a commonly used methodology for determining whether there was a statistically significant difference in the average level of a variable between two samples. In this report, a t-test was used to test whether any observed changes in the average market quality metrics described in the previous section changed significantly after the rule was changed.

59. A t-statistic takes into account the variance in the sample that occurs within each period and is calculated separately for each metric as follows:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Where,

$\bar{x}_1$  = the average metric across securities for the Post-Rule period;

$\bar{x}_2$  = the average metric across securities for the Pre-Rule Sample period;

$s_1^2$  = the variance of the average metrics across securities for the Post-Rule period;

$s_2^2$  = the variance of the average metrics across securities for the Pre-Rule Sample period;

$n_1$  = the number of securities in the Post-Rule period; and

$n_2$  = the number of securities in the Pre-Rule Sample period.

60. The tables in this report provide the “p-values” corresponding to the t-tests. The p-value represents the likelihood of observing a difference at least as large as that observed in the test, under the null hypothesis that the true difference is zero and the standard assumptions of the t-test hold. For example, if a particular difference has a p-value of 0.07, this indicates that there would be only a seven percent chance of observing such a difference if the true difference were zero.

61. Under the commonly applied 95 percent confidence level for statistical significance, a p-value lower than 0.05 is grounds for rejecting the null hypothesis that the true difference is zero. Under the more stringent 99 percent confidence level, a p-value lower than 0.01 is grounds for rejecting the null hypothesis. In this study, both the 95 percent and 99 percent confidence levels are applied for testing statistical significance.

## **IV. Analysis and Results**

### **A. Characteristics of Sample Period**

62. The research described in this study is based on data from November 2011 through June 2013. For the most part, this has been a relatively calm period for equity markets, during which

prices have generally increased and volatility decreased for U.S. equities in general and for small stocks specifically.

63. Exhibit 3 shows the evolution of the Wilshire 5000, Russell 2000, Russell Microcap, MSCI US Microcap, and Dow Jones Select Microcap indices over this period. Exhibit 4 shows the evolution of the CBOE SPX Volatility Index (VIX) and the Russell Small Cap Volatility Index (RVX) over the period.

## **B. Summary Statistics**

64. During the study period, approximately 10,000 OTC stocks were quoted on the OTC Pink Link. As shown in Exhibit 5, the number of stocks on OTC Pink Link remained relatively constant from November 2011 through June 2013. The number of securities quoted on the OTC Bulletin Board represented only a small percentage of all OTC stocks, and this percentage declined significantly during the Pre-Rule Sample period. As shown in Exhibit 6, the number of stocks quoted on OTC Pink Link within each price tier was relatively constant over time.

65. The number of trades per day during the study period typically ranged from about 60,000 to 100,000. As shown in Exhibit 7, the number of trades in the Pre-Rule Sample period was roughly 80,000 per day over the first half of the Pre-Rule Sample period and roughly 60,000 per day over the second half; however, during the Post-Rule period the number of trades per day trended back toward the levels of the first half of the Pre-Rule Sample period.

66. The number of BBOs per day during the Pre-Rule Sample period and Post-Rule period differed. As shown in Exhibit 8, the BBO quotes entered generally ranged between 2 and 3 million per day during the Pre-Rule Sample period, and steadily increased to 6 million per day towards the end of the Post-Rule period.<sup>25</sup>

67. Exhibits 9A through 9E show graphs summarizing the time series of some of the data items requested by the Commission in connection with the pilot. Exhibit 9A shows the percentage of the day that the total size at the best offer is equal to the minimum quote size, averaged across all securities with prices under \$175.00 (Tiers 1-5c). Exhibit 9B shows the same

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<sup>25</sup> This chart includes potential stub and flickering quotes. Flickering quotes occur when a given market maker places several differing BBO values or depths within seconds. Stub quotes occur when a market maker enters a quote a price that is far away from the market and designed to not be executed, such as a bid quote of one penny on a stock that otherwise trades near ten dollars.

metric for the best bid. Charts breaking down these metrics by price tier are provided in the supplemental appendix (Exhibit 10).

68. Exhibit 9C shows the time series of the total number of limit orders at the BBO or better. Exhibit 9D shows the time series of the total number of limit orders, and Exhibit 9E shows the total number of limit orders executed. Charts breaking down these metrics by price tier are provided in the supplemental appendix (Exhibit 10).

## **C. Main Results**

### **1. Overview**

69. Table 3 summarizes the main results of the market quality analysis. In this table, each column corresponds to a different price tier in Rule 6433, and each row corresponds to a different market quality metric. The entries in the table indicate the outcome of the t-test. A single “up” arrow indicates that the Rule 6433 pilot was associated with an increase in the metric that was statistically significant at the 95 percent confidence level. Two “up” arrows indicates a statistically significant increase at the 99 percent confidence level. Likewise, one or two “down” arrows indicates statistically significant declines at the 95 percent and 99 percent level, respectively. A blank indicates that the test showed no statistically significant change.

70. For example, in the row labeled “time-weighted quoted spread,” the second column, corresponding to Tier 2, contains one “down” arrow. This means that the t-test indicated a decrease in quoted spreads for Tier 2 stocks after the pilot rule became effective, and this result is significant at the 95 percent confidence level. For each metric summarized in Table 3, further details of the underlying statistical test are provided in separate tables, described below.

### **2. Time-Weighted Quoted Spreads**

71. Table 4 provides summary statistics for an analysis of time-weighted quoted spreads before and after the implementation of the Rule 6433 pilot. Each row in Table 4 corresponds to a different range of prices, corresponding to the different tiers as defined by the rule. The first

two columns in this table indicate the tier and whether Amended Rule 6433 increased, maintained, or decreased the minimum quote size requirement.

72. Columns three through five of Table 4 report the number of unique stocks included in the Pre-Rule Sample period, and the mean and median time-weighted quoted spread across stocks in the Pre-Rule Sample period. Columns six through eight report the same statistics for the Post-Rule period.

73. Columns nine and ten report the results of the statistical test evaluating whether the amended rule impacted the time-weighted quoted spread. The table reports the t-statistic and the corresponding p-value for the t-test of whether there was a change in the average spread when the rule went into effect. Negative t-statistics (in parentheses) correspond to decreases in the spread.

74. To illustrate, the fourth row of Table 4 corresponds to Tier 4 for which Rule 6433 decreased the minimum quote size from 2,500 shares to 1,000 shares. As the table indicates, there were 953 unique stocks during the Pre-Rule Sample period. The mean time-weighted quoted spread across these stock dates in the Pre-Rule Sample period was 0.0961, and the median was 0.0659. Over the Post-Rule period, there were 918 unique stocks, the mean time-weighted quoted spread was 0.0847 and the median was 0.0540. The t-test indicated a statistically significant decrease in quoted spreads for Tier 4 stocks when the rule went into effect, at the 99 percent confidence level.

75. As indicated by the other rows in Table 4, the t-test results showed statistically significant decreases in time-weighted quoted spreads for Tier 2 through Tier 5b (that is, for all price levels from \$0.10 to \$100.00). This result was statistically significant at the 99 percent confidence level for all tiers except Tier 2, which was significant at only the 95 percent confidence level. These results are summarized by the first row of “up” and “down” arrows in Table 3.

76. While the tables described above provide information about the *statistical* significance of the changes in quoted spreads when the rule went into effect, they do not contain provide much intuition about the *economic* significance of these changes, or the precise timing of when the changes occurred. A more complete picture of the evolution of time-weighted quoted spread measures is provided in a series of graphs in the supplemental appendix (see Exhibit 11). Each of these graphs corresponds to a particular tier, and shows how the average quoted spread



evolved from November 2011 through June 2013. On each graph, the horizontal axis represents time and the vertical axis represents the average time-weighted quoted spread across all stocks that were in that tier on that day. The time series represented by lines on the bottom of the graph indicate the number of stock observations per day.

### **3. Volume-Weighted Effective Spreads**

77. Table 5, page 1 summarizes the results of tests based on volume-weighted effective spreads. The format of the table is identical to that of Table 4. As the table indicates, the t-test provides evidence that the rule was associated with statistically significant declines in effective spreads for Tier 5a and Tier 5b (that is, prices from \$1.00 to \$100.00) and a statistically significant increase in effective spreads for Tier 1.

78. Table 5, pages 2 – 4 report the results of tests of how the rule impacted effective spreads on small trades (under \$10,000), medium trades (\$10,000 to \$200,000) and large trades (over \$200,000). The evidence in these tables indicates the same statistically significant reduction in effective spreads for small trades as were in all trades (namely Tier 5a and Tier 5b). For medium trades the t-test provides evidence that the rule was associated with statistically significant declines in effective spreads for Tier 5a and Tier 5b (prices from \$1.00 to \$100.00). For large trades there is evidence that the effective spreads significantly increased for Tiers 3 and 5b. In summary, the evidence suggests that the rule change was associated with either no change or a decrease in effective spreads for trades valued up to \$200,000 for those categories of stocks where the minimum required depth declined.

79. Exhibit 11 in the supplemental appendix provides additional detail on the time series of effective spreads for each tier, in general and separately for small, medium, and large trades.

### **4. Time-Weighted Quoted Depth at the BBO**

80. Table 6 reports the results of t-tests for changes in quoted depth. As the table indicates quoted depth at the BBO declined significantly for every price range from Tier 3 through Tier 5b (all prices from \$0.20 to \$100.00).

81. Exhibit 11 in the supplemental appendix provides additional detail on the time series of quoted depth, showing how quoted depth evolved for each tier over time. As expected (given the

fact that quoted spreads narrowed significantly), these graphs demonstrate that many of the tiers experienced immediate, dramatic decreases in quoted depth at the BBO when the rule went into effect.

## **5. Time-Weighted Depth around the Midpoint**

82. Table 7 reports the results of t-tests examining changes in aggregate quoted depth within set ranges of prices surrounding the BBO midpoint. The first panel shows the impact of the rule on total quoted depth within one percent on either side of the midpoint, and the second, third, and fourth panels shows the impact on quoted depth within two percent, five percent, and ten percent of the midpoint, respectively.

83. The results in Table 7 indicate that the evidence of a decline in depth associated with the rule change is weaker than suggested by Table 6. Where the tests based on quoted depth at the BBO reported in Table 6 indicated economically large and statistically significant declines in depth for all price ranges from Tier 3 through Tier 5b, Table 7 shows that after controlling for the spread, the declines in displayed depth were smaller and generally not statistically significant for Tiers 5a or 5b.

84. For Tiers 3 and 4 (prices between \$0.20 and \$1.00), the tests reported in Table 7 indicate a statistically significant decrease in quoted depth within the majority of the bands around the quote midpoint. While the declines are not as large in percentage terms as indicated in Table 6, the evidence is consistent with significant reductions in total displayed depth for stocks in this price range.

85. Exhibit 11 in the supplemental appendix provides additional detail on the time series of quoted depth within set ranges of prices surrounding the BBO midpoint.

## **6. Price Impact for Hypothetical Large Market Orders**

86. Table 8 reports the results of t-tests based on price impact measures. As described above, these price impact measures are alternative metrics of total liquidity that measure what the effective spread would have been for hypothetical market orders of various sizes. Unlike the depth around the midpoint metrics, which give equal importance to all quotes that fall within the

stated price range, the price impact metrics produce a more favorable number in instances where more of the quoted depth is at a better price.

87. The first four panels of the table report estimates of the price impact for sell orders with sizes of one times, two times, five times, and ten times the minimum quote size. These tests indicate that there was a statistically significant reduction in price impact (improvement in liquidity) at the bid for most trade sizes across all tiers. The only exceptions were for the largest (10X) trades in Tier 1, where there was a statistically significant increase in the price impact measure, and for 5X trades in Tier 1 and 10X trades in Tier 2, where there no statistically significant change at the 95 percent confidence level.

88. The second four panels in Table 8 report the corresponding statistics for the price impact of buy orders, a measure of liquidity on the offer side. Similar to the evidence on the bid side, these tests consistently indicate decreases in price impact (increases in liquidity) at the offer for those tiers where the minimum quote size declined. Estimates of price impact declined for all trade sizes in Tiers 2 through 5a (prices between \$0.10 and \$10.00), and for the smaller trade sizes in Tier 5b (prices between \$10.00 and \$100.00). No significant change in price impact was observed for the larger trades sizes (5X or 10X trades) in Tier 5b. In addition, statistically significant declines were observed for smaller trades in Tier 1 (prices below \$0.10).

89. Exhibit 11 in the supplemental appendix provides additional detail on the time series of price impact for hypothetical large market orders at both the bid and the offer.

## **7. Executability of Hypothetical Large Market Orders**

90. Table 9 reports the results of t-tests based on the executability of hypothetical large market orders. As described above, these percentages measure the percentage of time when the total displayed depth was sufficient to execute hypothetical market “sweep” orders of various sizes.

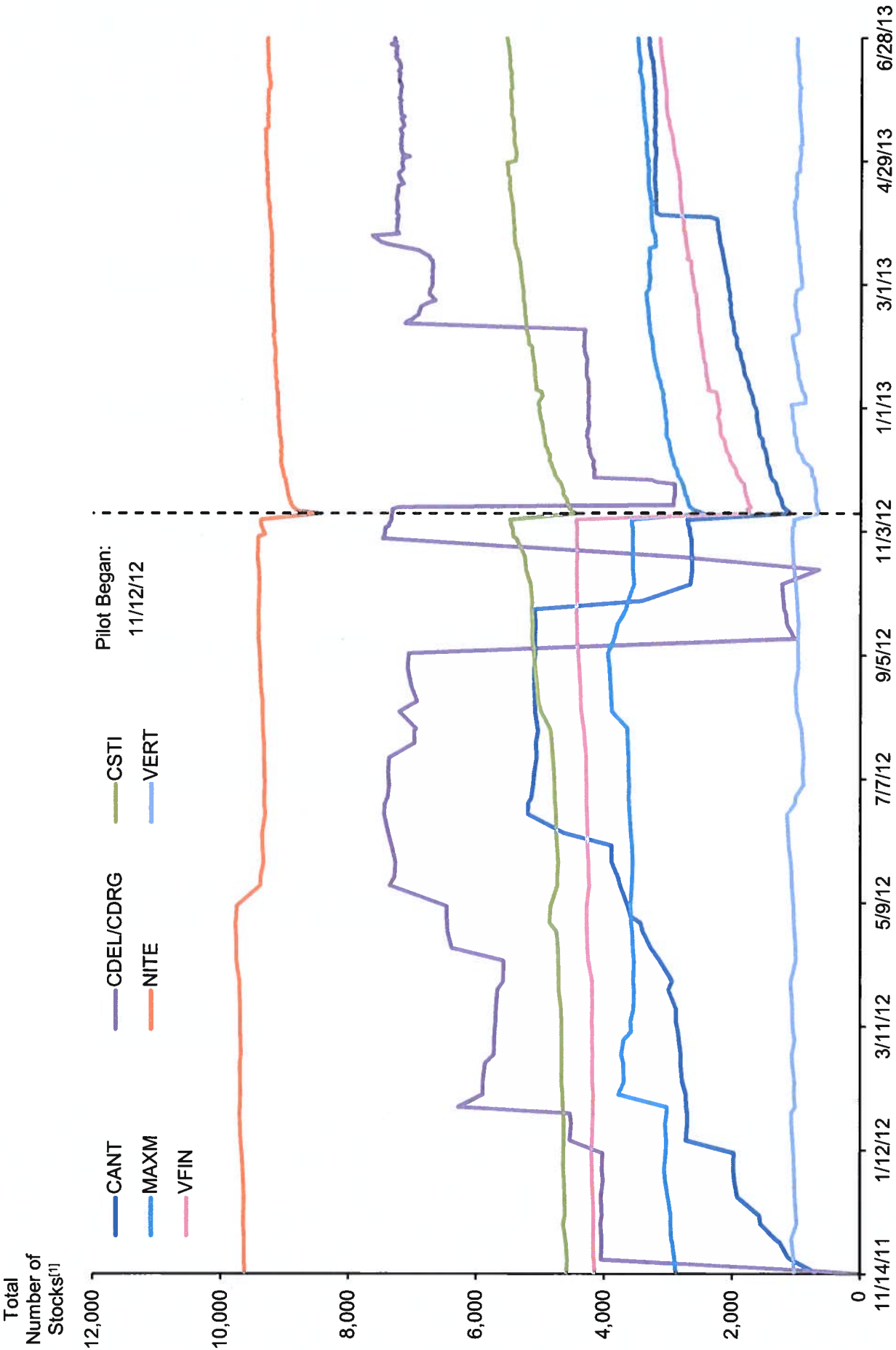
91. The first four panels of the table report estimates of the percentage of time hypothetical market sell orders of various sizes would have been fully executable against displayed depth. These tests indicate that there was a statistically significant reduction in the executability of hypothetical large market orders on the bid side for most trade sizes in Tiers 4 through 5b (prices between \$0.51 and \$100.00). The only exceptions were for the smallest trades in Tiers 4 and 5a,

where there was a statistically significant increase the executability of hypothetical large market orders on the bid side. For these tiers there was also a statistically significant decrease in the price impact measure described above. For Tiers 1 and 2, there were statistically significant increases in the executability of hypothetical large market sell orders in all but the smallest trade size.

92. The second four panels in Table 9 report the corresponding statistics for the percentages of time hypothetical buy orders would be able to be executed using displayed depth, a measure of liquidity on the offer side. These tests indicate a statistically significant reduction in the executability of hypothetical large market orders at the offer for Tiers 3 through 5b (prices between \$0.20 and \$100.00). The only exceptions were for the smallest trades in Tiers 3, 4, and 5a, where there was a statistically significant increase the executability of hypothetical large market orders on the offer side. For these tiers there was also a statistically significant decrease in the price impact measure described above. For Tiers 1 and 2, there were statistically significant increases in the executability of hypothetical large market buy orders in at least half of the trade sizes.

93. Exhibit 11 in the supplemental appendix provides additional detail on the time series of the executability of hypothetical large market orders at both the bid and the offer.

# Selected OTC Market Makers Quoting More than 1000 Stocks 11/14/11 – 6/28/13

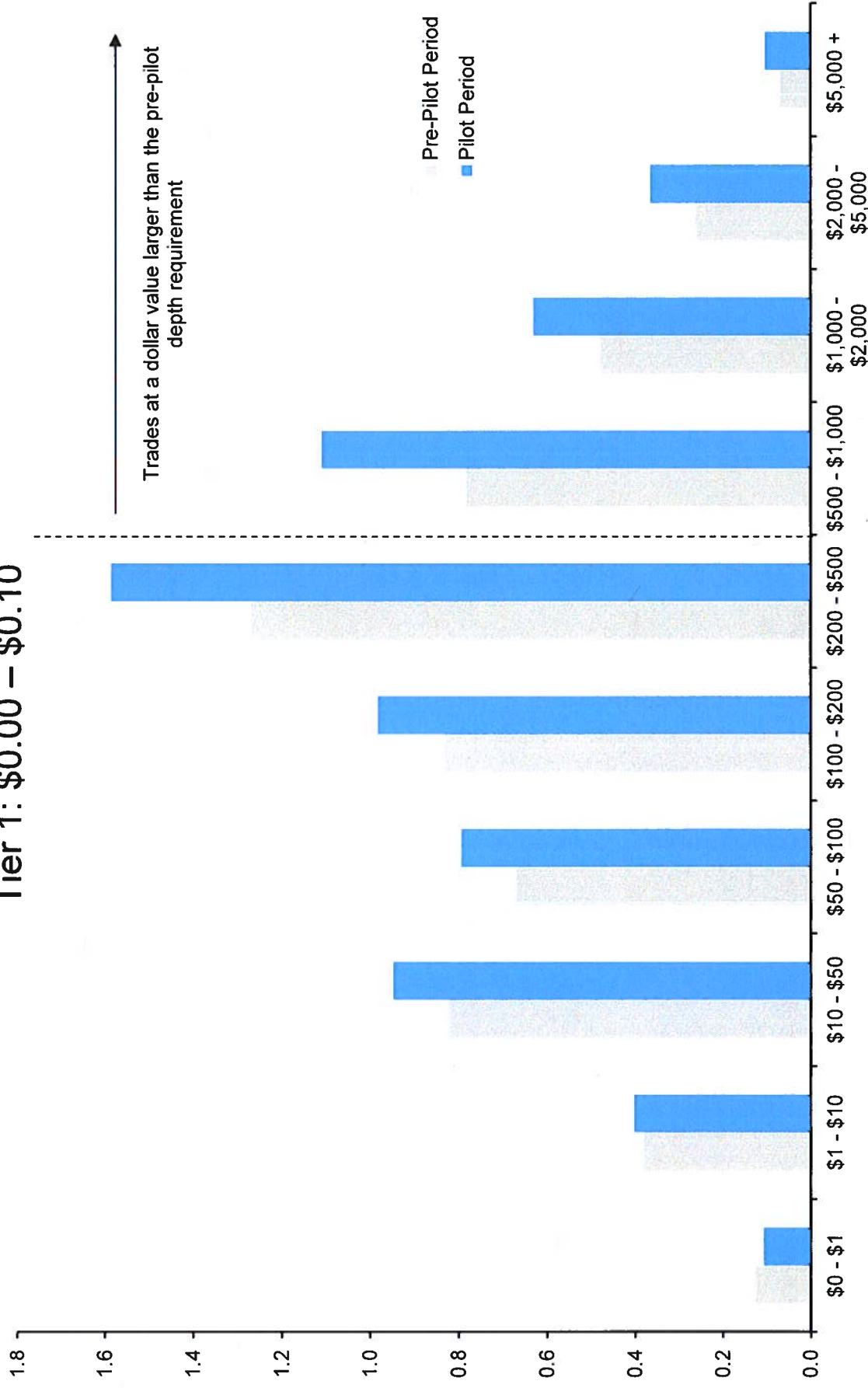


Note:  
[1] Total number of stocks is calculated daily by summing the number of stocks each market maker provides a one-sided or two-sided quote.

# Average Trades per Stock/Day by Dollar Volume

Average Number of  
Trades per Stock/Day

11/14/11 – 6/28/13  
Tier 1: \$0.00 – \$0.10

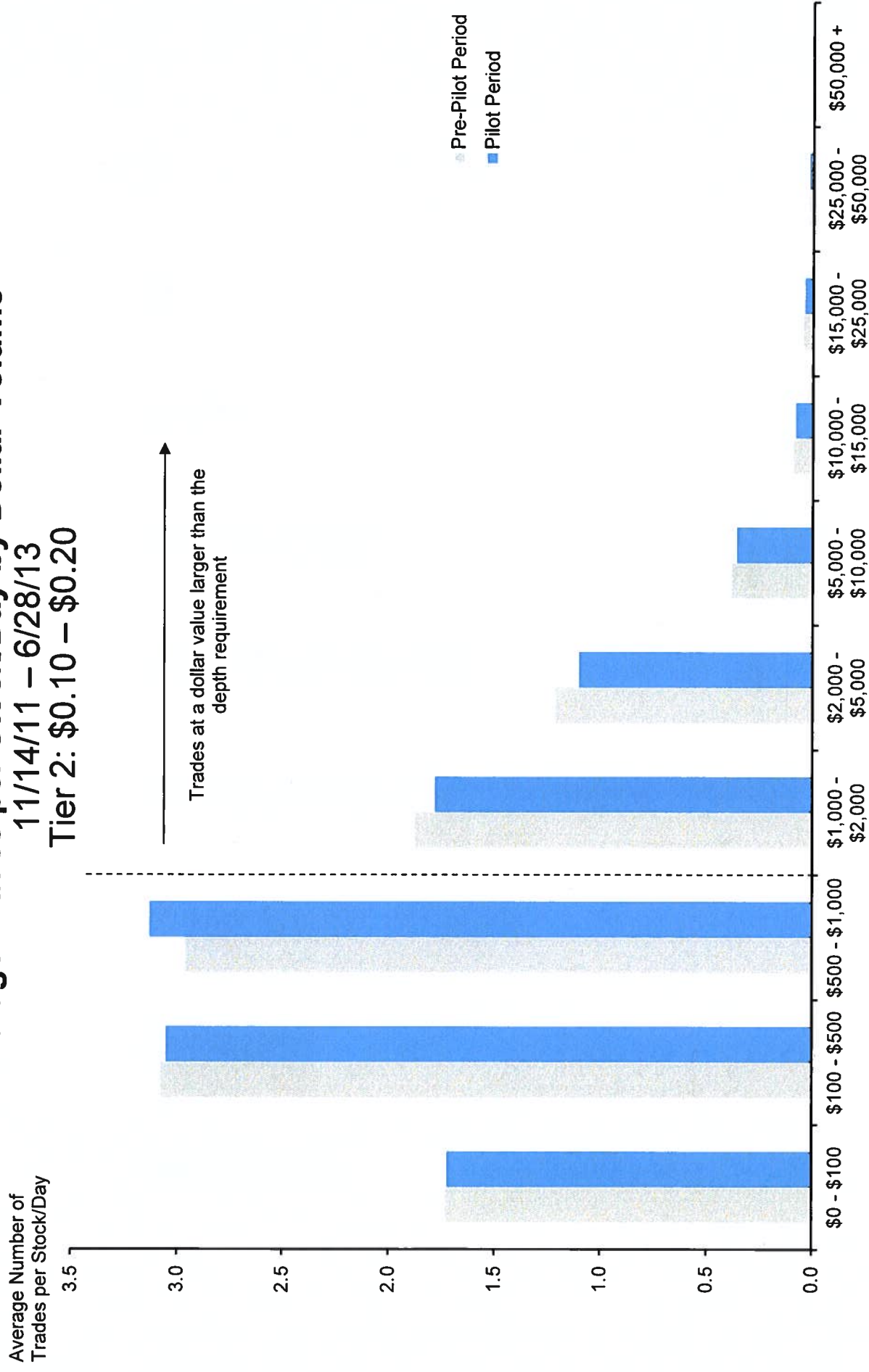


Source: OTC Link

Note:

- [1] A stock/day is day for a given stock where the quote data does not span a tier.
- [2] For stocks in this tier, FINRA Rule 6433 increased the minimum depth from 5,000 to 10,000.
- [3] Trades executed between November 1, 2012 and November 11, 2012 are excluded.

# **Average Trades per Stock/Day by Dollar Volume** **11/14/11 – 6/28/13** **Tier 2: \$0.10 – \$0.20**



Source: OTC Link  
 Note:

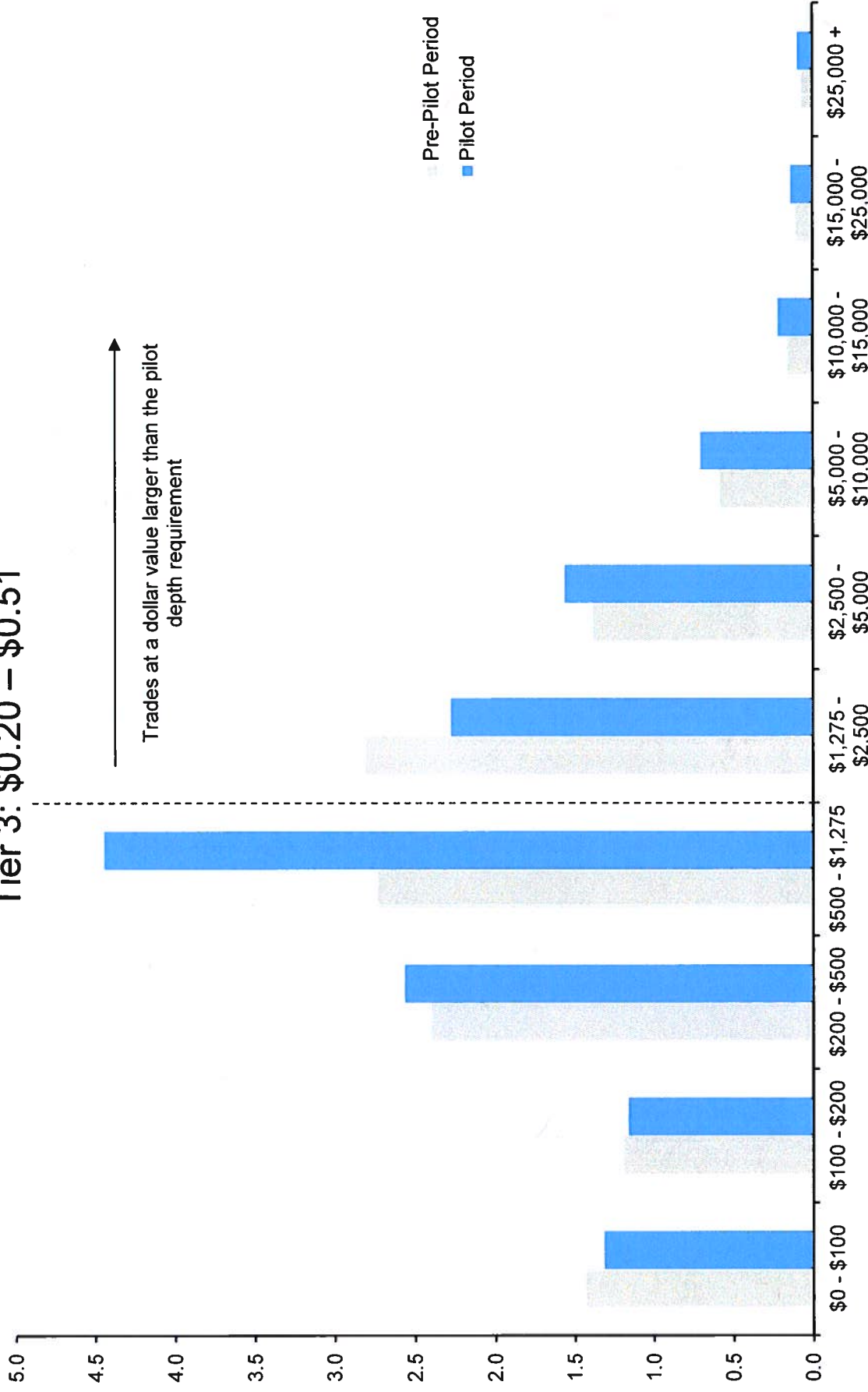
- [1] A stock/day is day for a given stock where the quote data does not span a tier.
- [2] For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirement of 5,000 shares.
- [3] Trades executed between November 1, 2012 and November 11, 2012 are excluded.



# Average Trades per Stock/Day by Dollar Volume

Average Number of  
Trades per Stock/Day

11/14/11 – 6/28/13  
Tier 3: \$0.20 – \$0.51



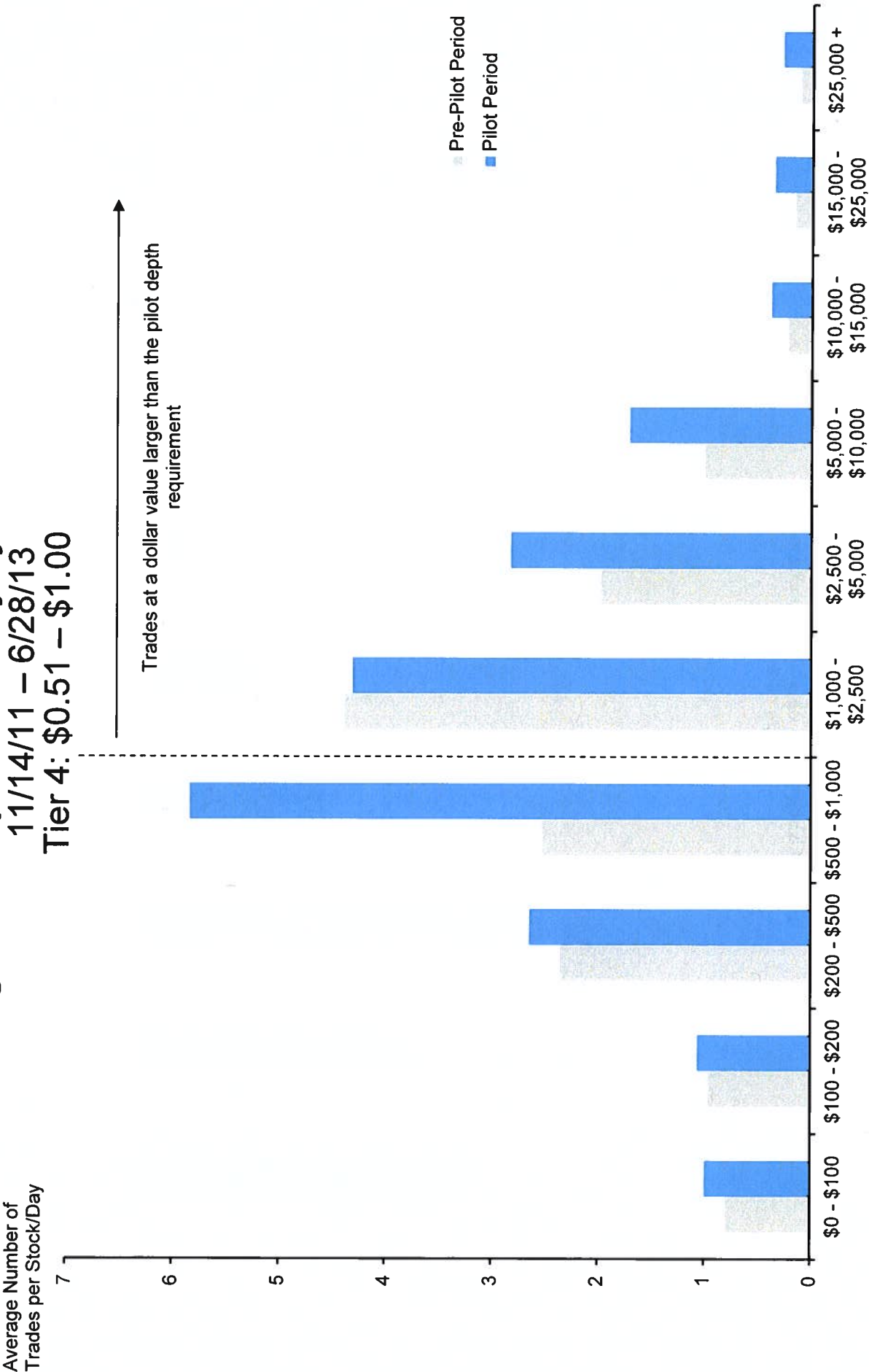
Source: OTC Link

Note:

- [1] A stock/day is day for a given stock where the quote data does not span a tier.
- [2] For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 5,000 to 2,500.
- [3] Trades executed between November 1, 2012 and November 11, 2012 are excluded.



**Average Trades per Stock/Day by Dollar Volume**  
11/14/11 – 6/28/13  
Tier 4: \$0.51 – \$1.00



Source: OTC Link  
Note:

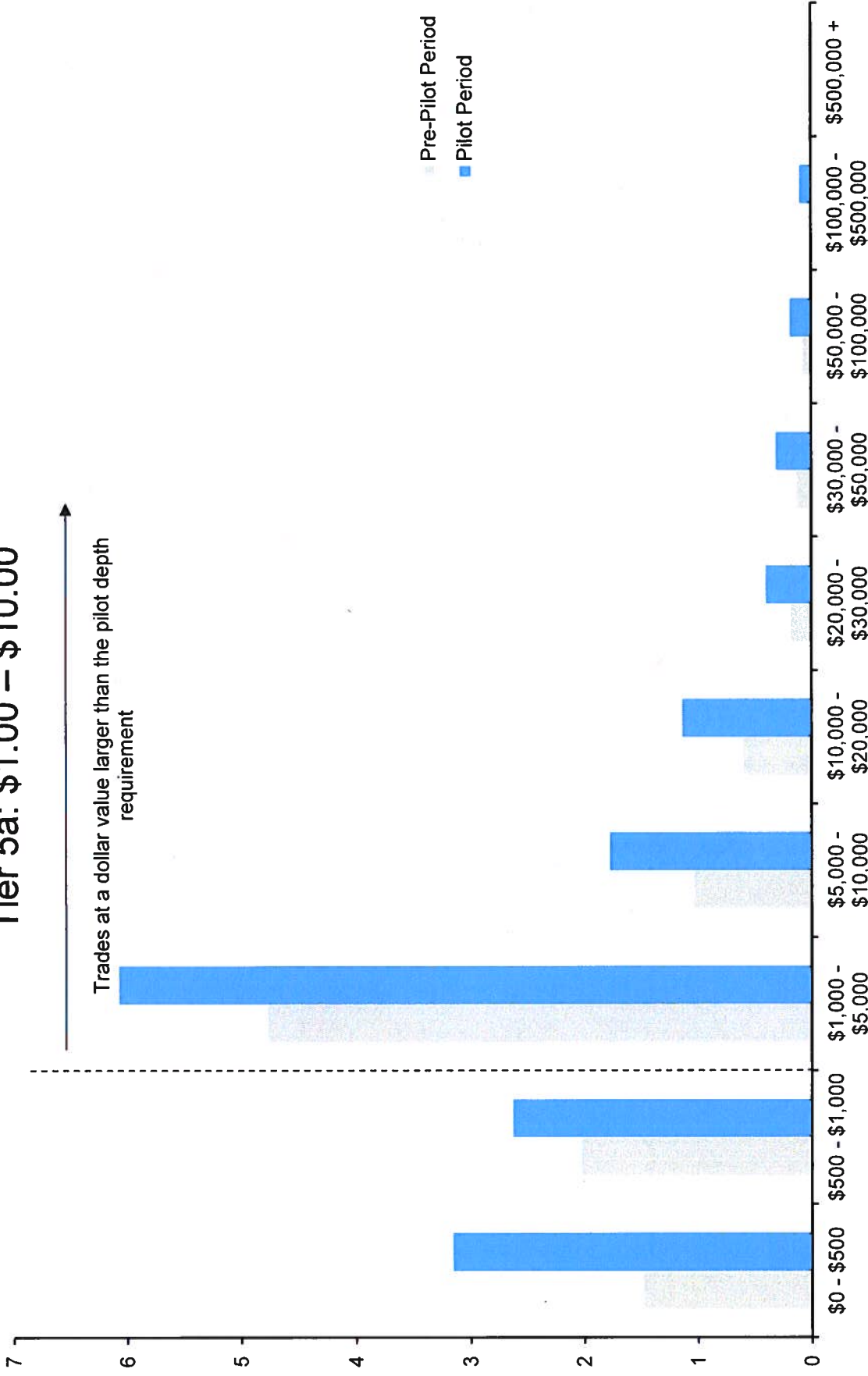
- [1] A stock/day is day for a given stock where the quote data does not span a tier.
- [2] For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 2,500 to 1,000.
- [3] Trades executed between November 1, 2012 and November 11, 2012 are excluded.

# Average Trades per Stock/Day by Dollar Volume

Average Number of  
Trades per Stock/Day

11/14/11 – 6/28/13

Tier 5a: \$1.00 – \$10.00

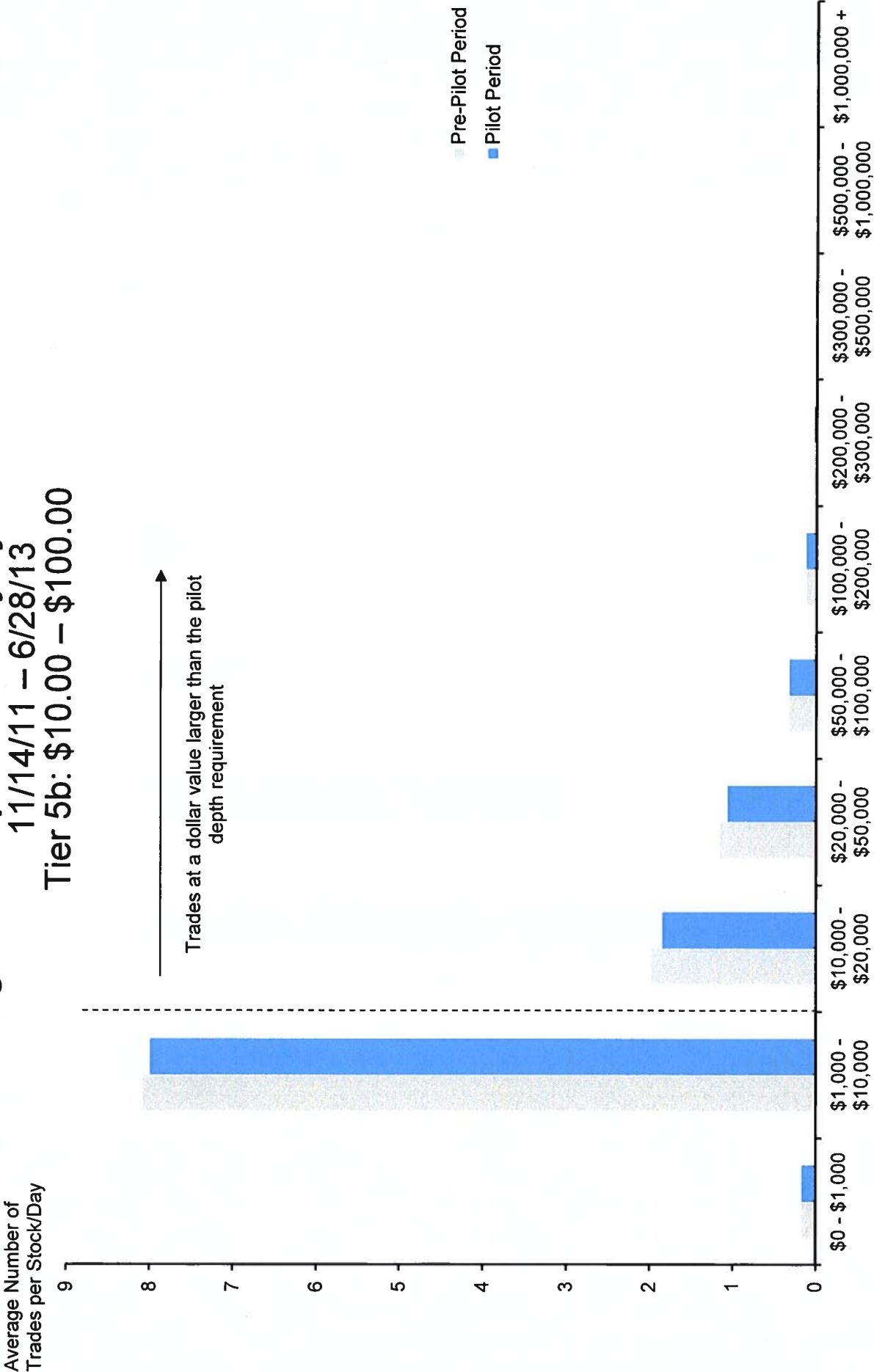


Source: OTC Link

Note:

- [1] A stock/day is day for a given stock where the quote data does not span a tier.
- [2] For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 500 to 100.
- [3] Trades executed between November 1, 2012 and November 11, 2012 are excluded.

**Average Trades per Stock/Day by Dollar Volume**  
11/14/11 – 6/28/13  
Tier 5b: \$10.00 – \$100.00



Source: OTC Link  
Note:

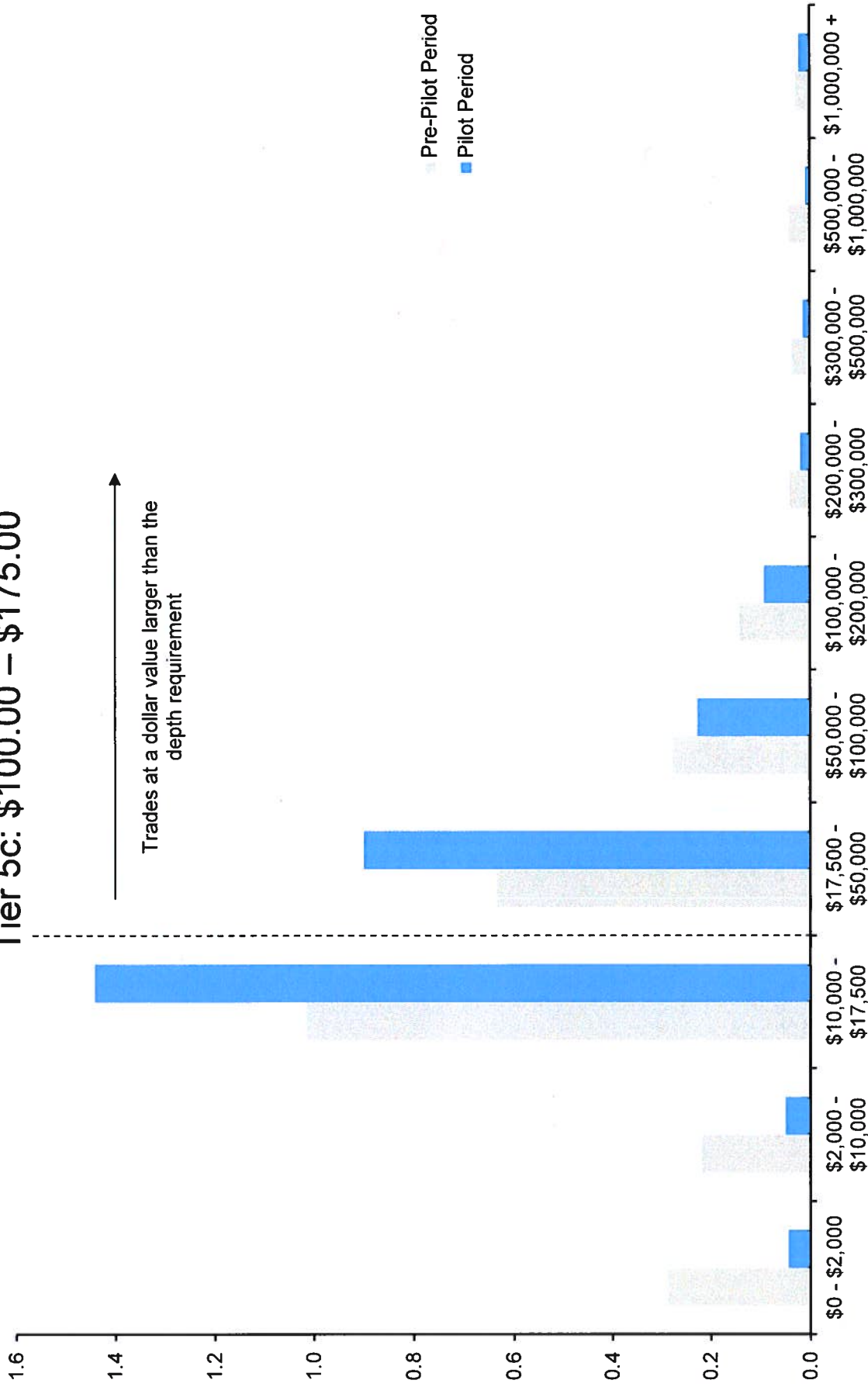
- [1] A stock/day is day for a given stock where the quote data does not span a tier.
- [2] For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 200 to 100.
- [3] Trades executed between November 1, 2012 and November 11, 2012 are excluded.

# Average Trades per Stock/Day by Dollar Volume

Average Number of  
Trades per Stock/Day

11/14/11 – 6/28/13

Tier 5c: \$100.00 – \$175.00

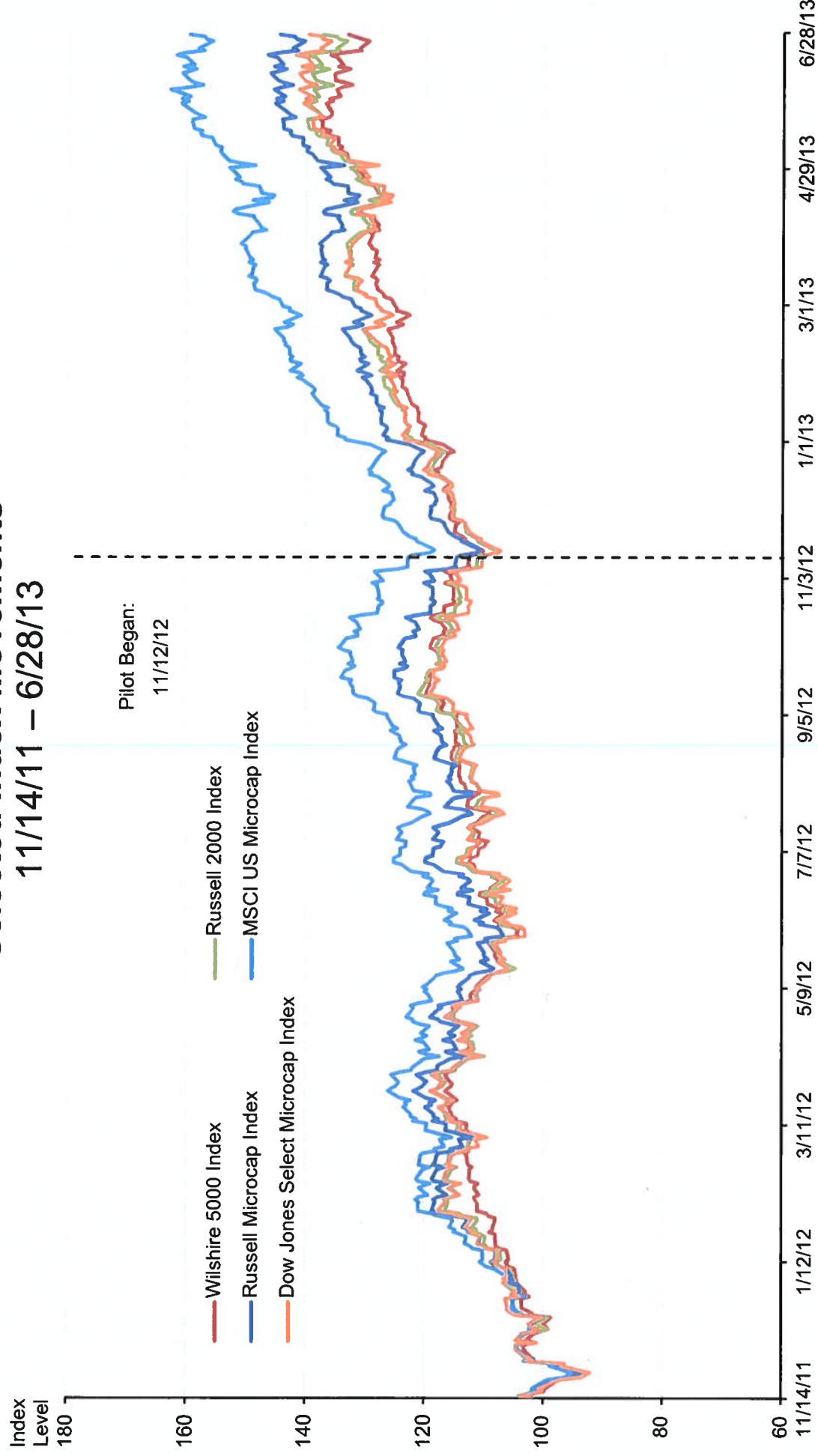


Source: OTC Link

Note:

- [1] A stock/day is day for a given stock where the quote data does not span a tier.
- [2] For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirement of 100 shares.
- [3] Trades executed between November 1, 2012 and November 11, 2012 are excluded.

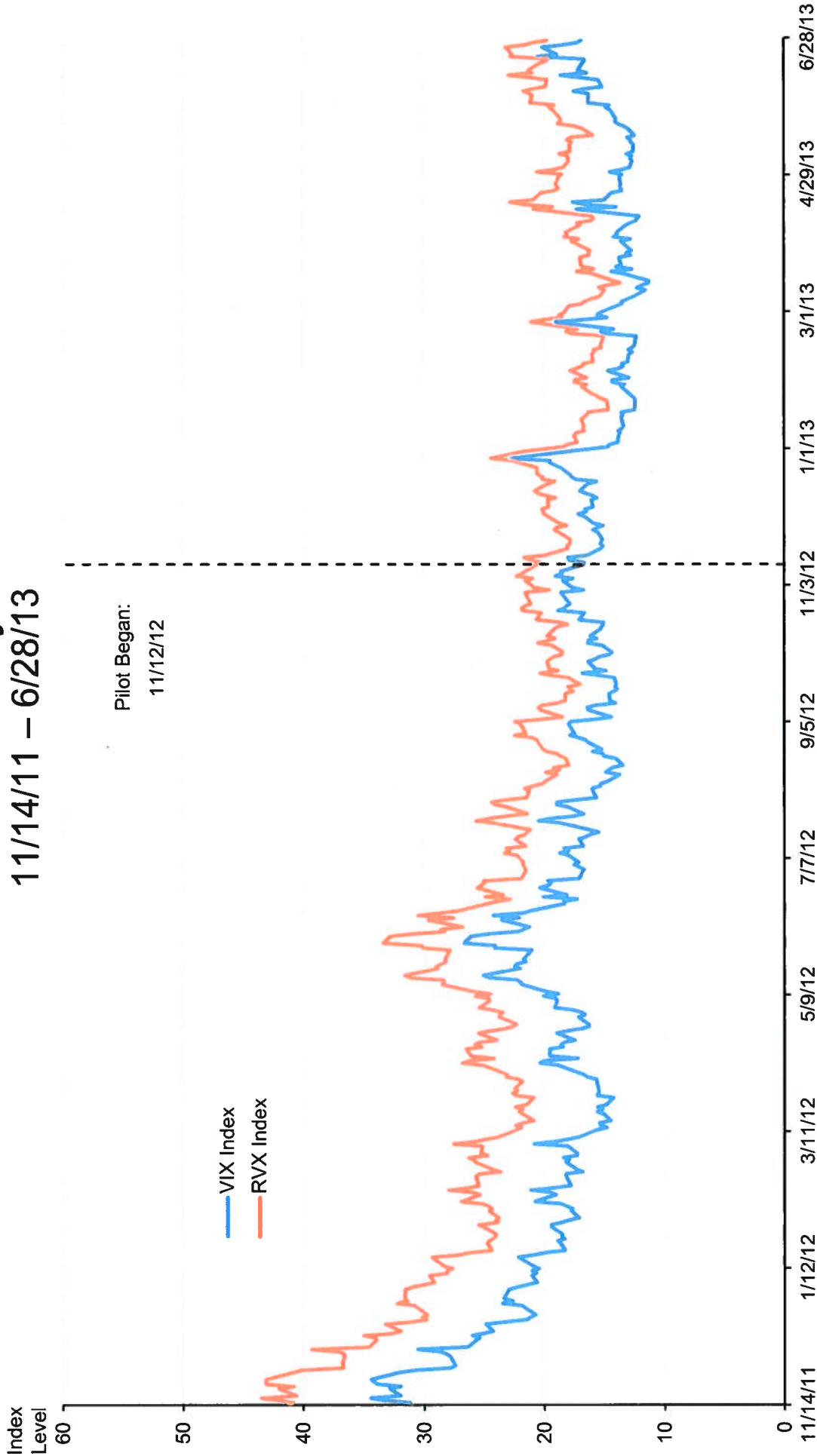
# **Selected Index Movements** 11/14/11 – 6/28/13



Source: Bloomberg

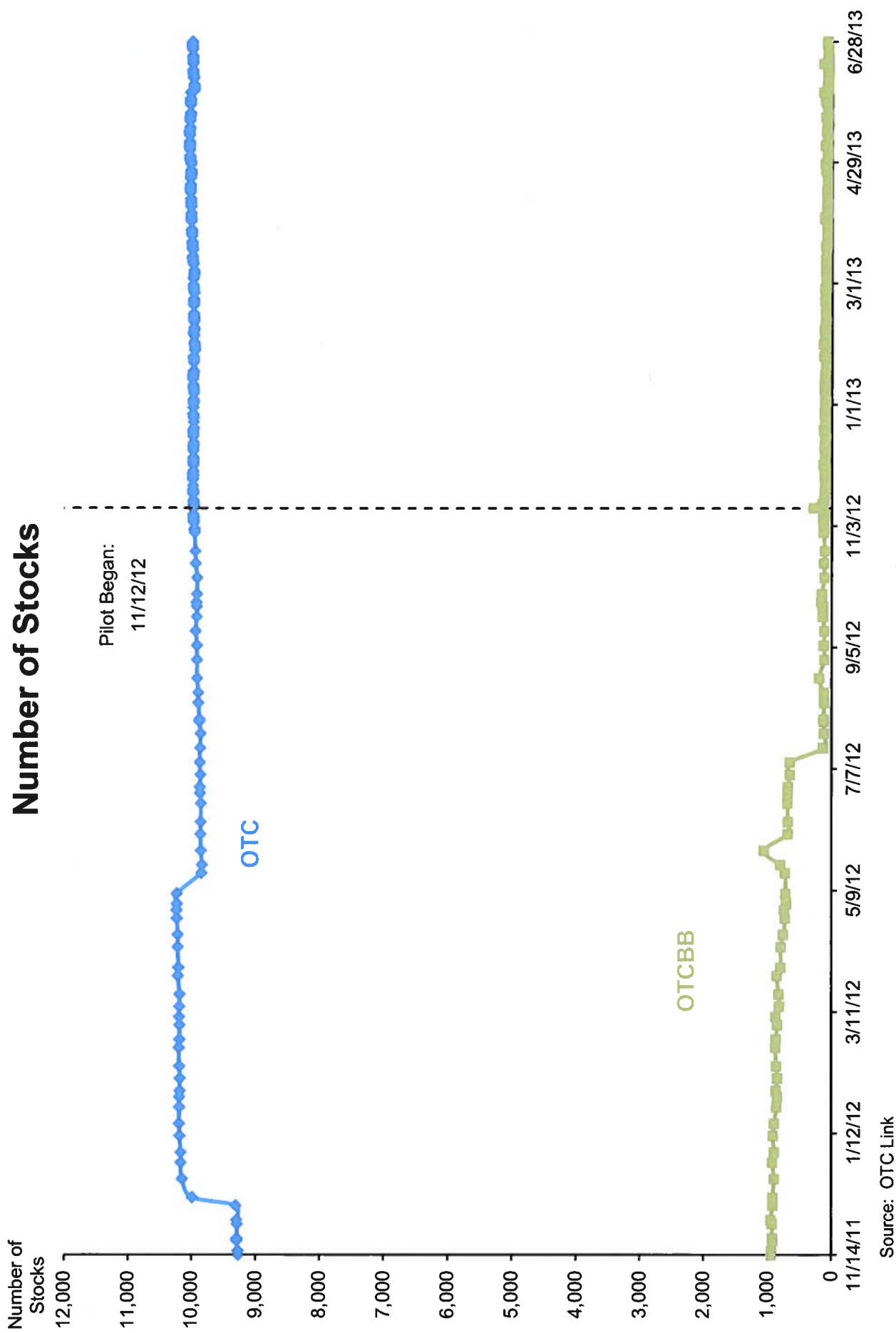
Note: The indices are scaled down by a constant deflator. The deflator is chosen for each index such that the index price on 11/1/11 is 100.

## VIX and RVX Volatility Indices 11/14/11 – 6/28/13



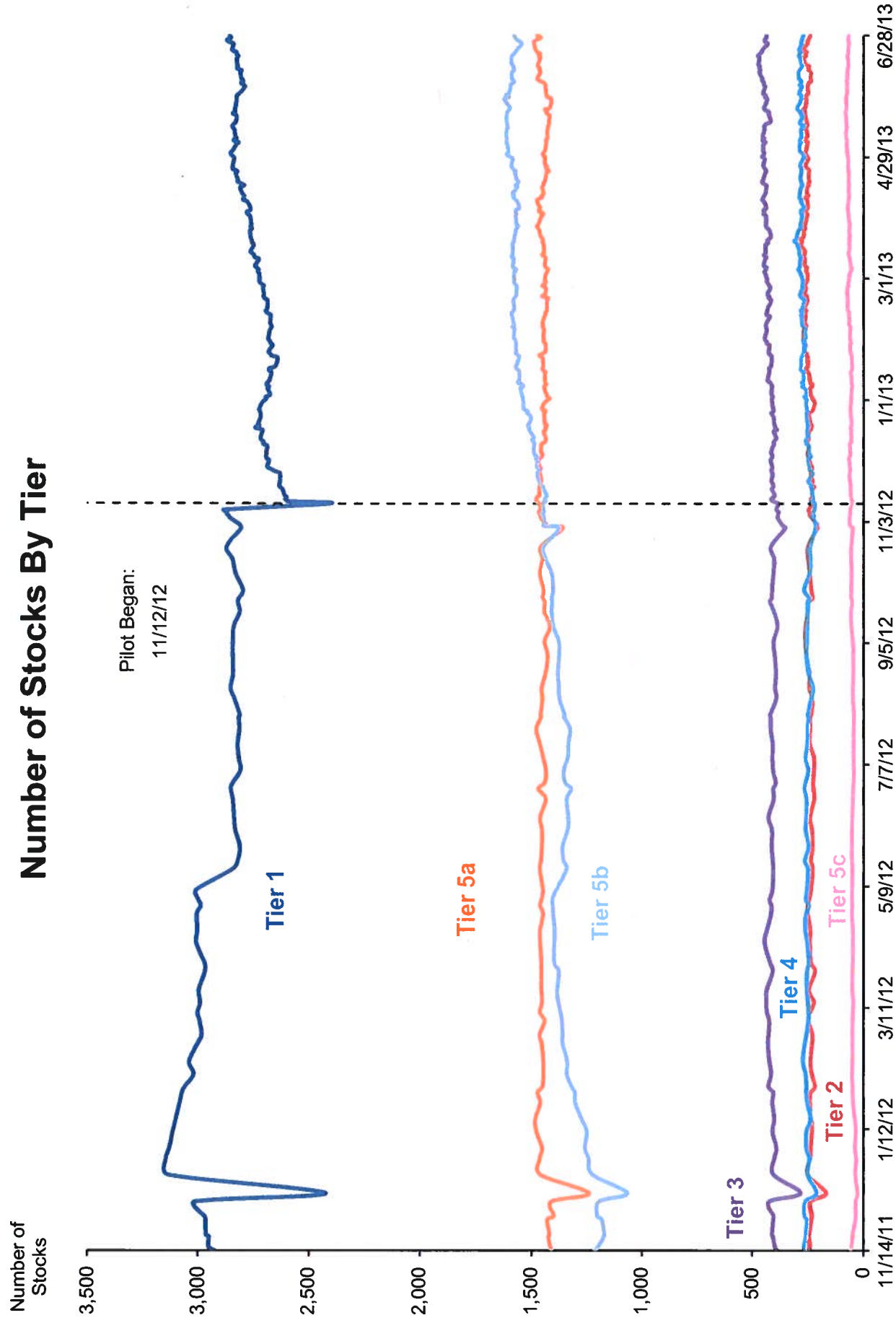
Source: Bloomberg

Note: VIX is the CBOE SPX Volatility Index and reflects implied volatilities for first-and-second-month options on the S&P 500 Index. RVX is the Russell Small Cap Volatility Index and reflects implied 30-day volatilities on Russell 2000 index options.





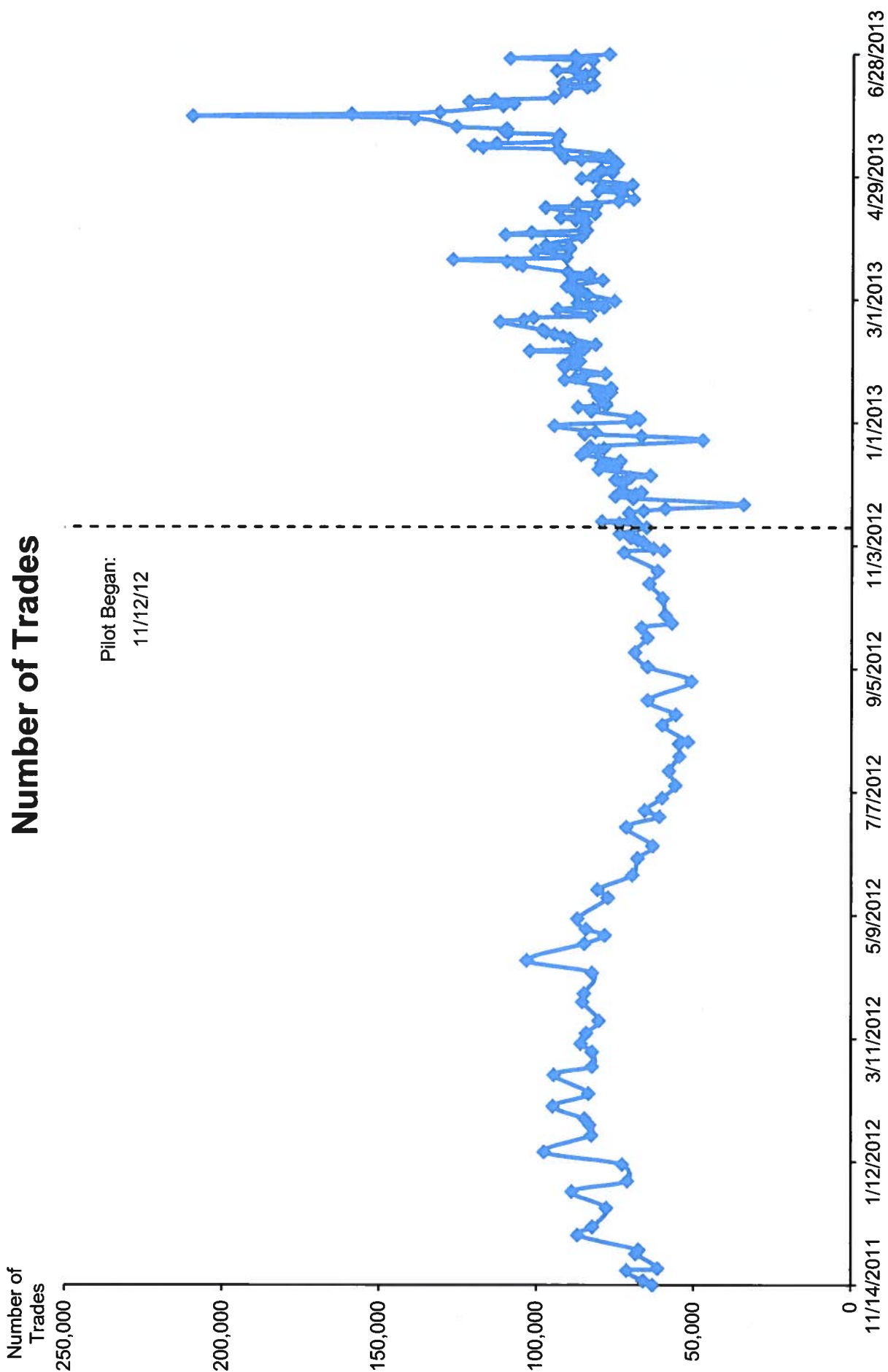
## Number of Stocks By Tier



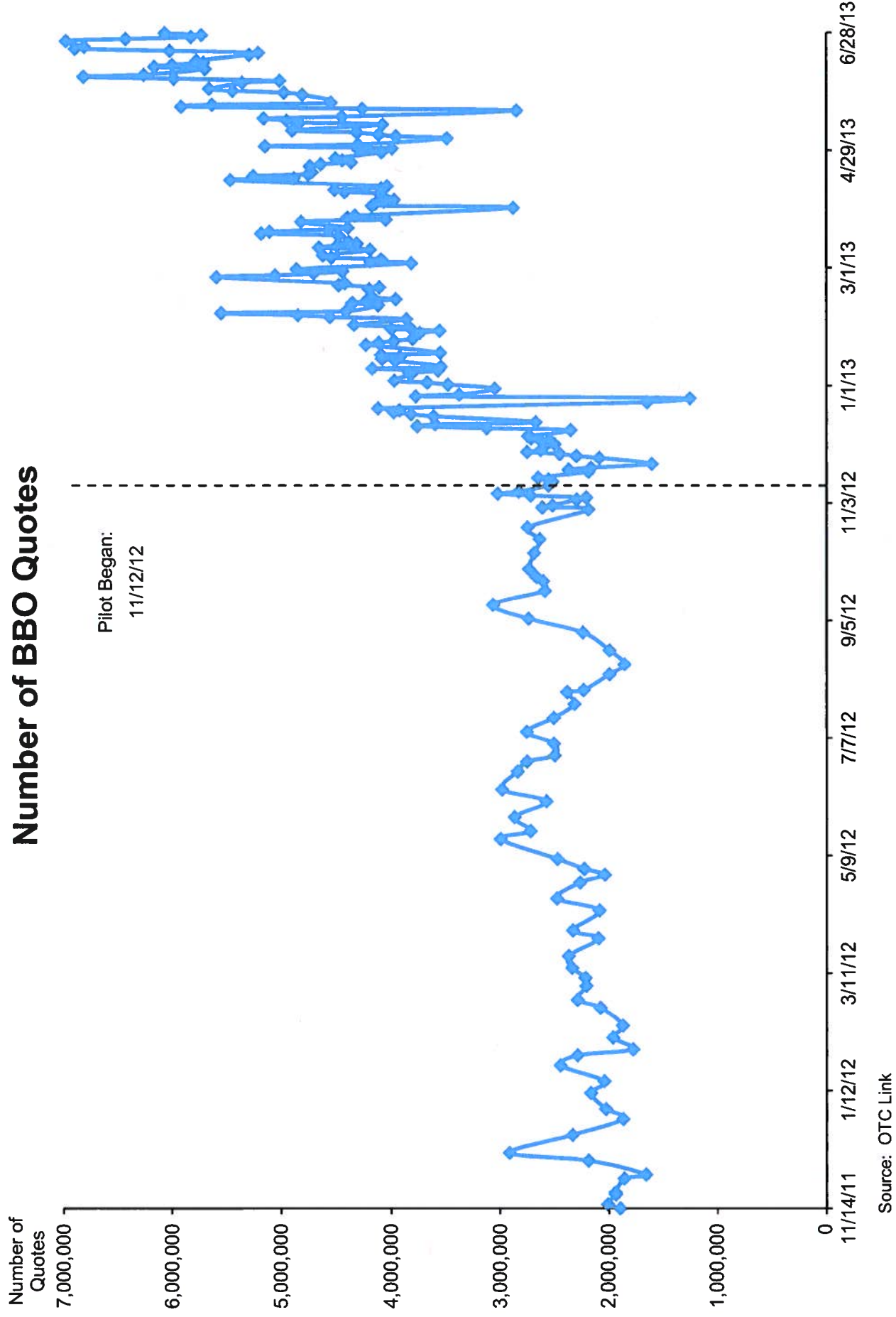
Source: OTC Link

Note: Does not include stocks traded on the OTC Bulletin Board. The maximum number of stocks in any of the Tier 6 subtiers is 41.

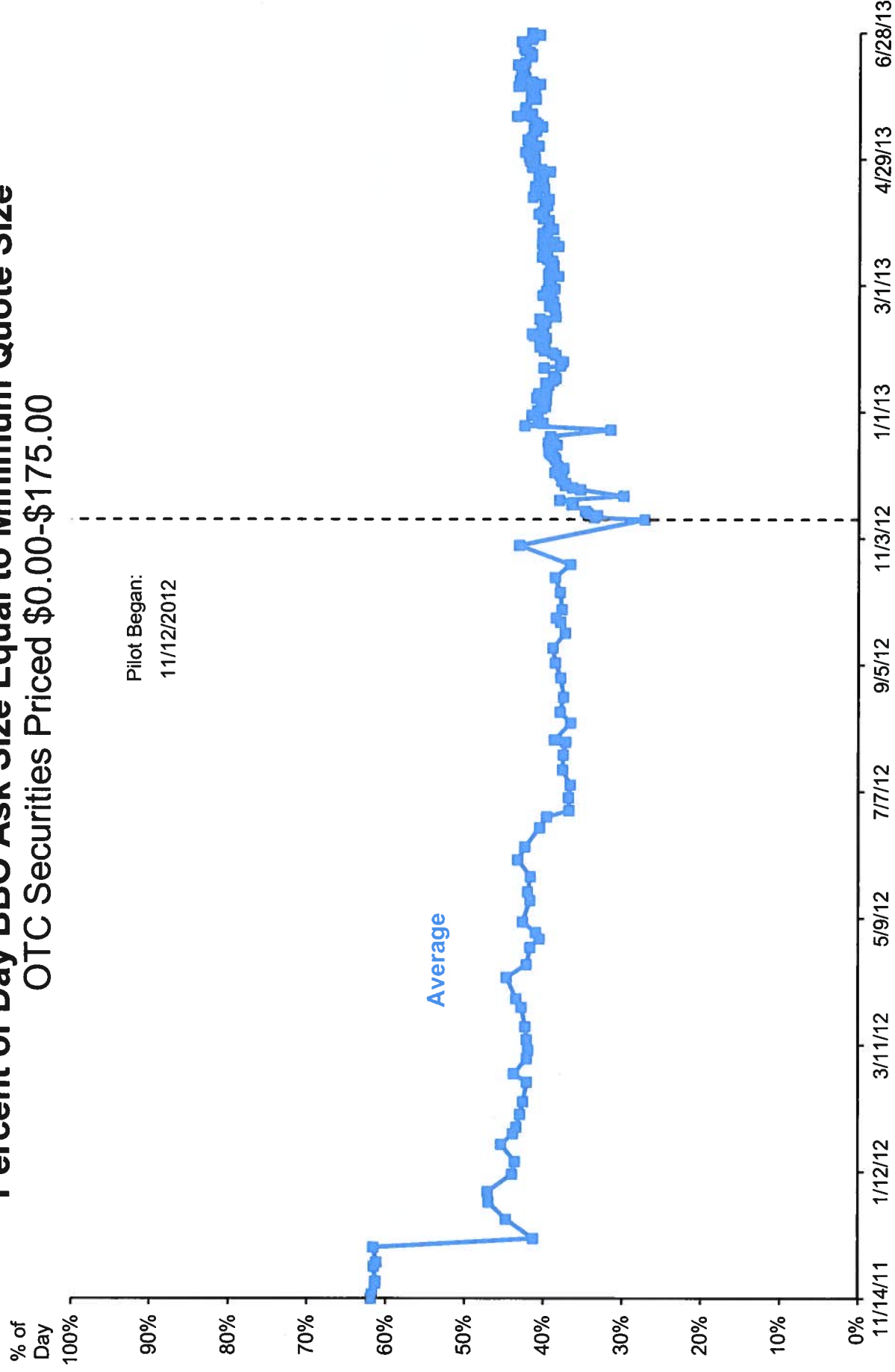




Source: OTC Link  
Note: The drop in trades occurred on early market close days, due to Thanksgiving and Christmas.



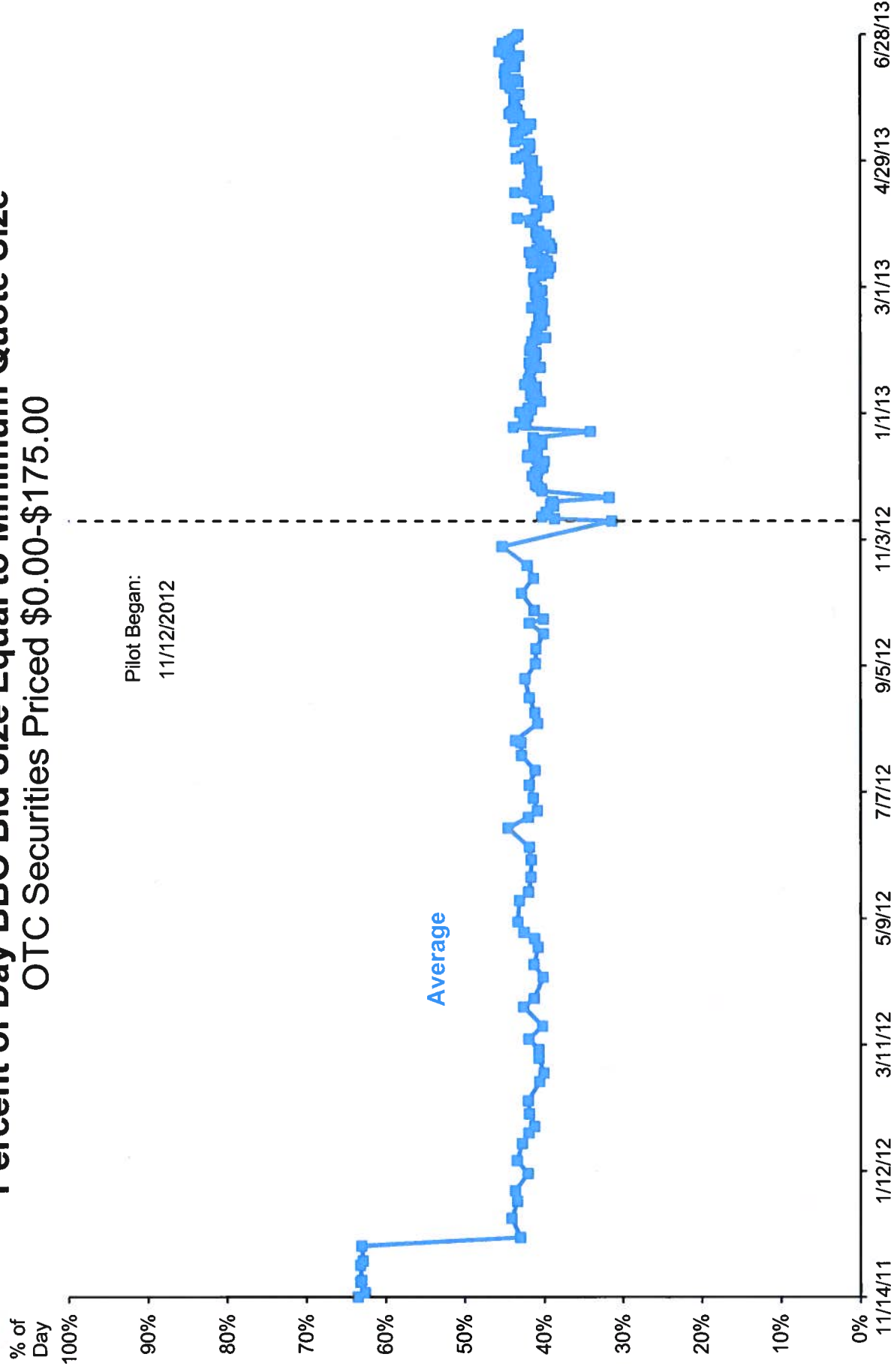
# Percent of Day BBO Ask Size Equal to Minimum Quote Size OTC Securities Priced \$0.00-\$175.00



Source: OTC Link

Note: Percents are excluded if valid quotes during the day span more than one tier.

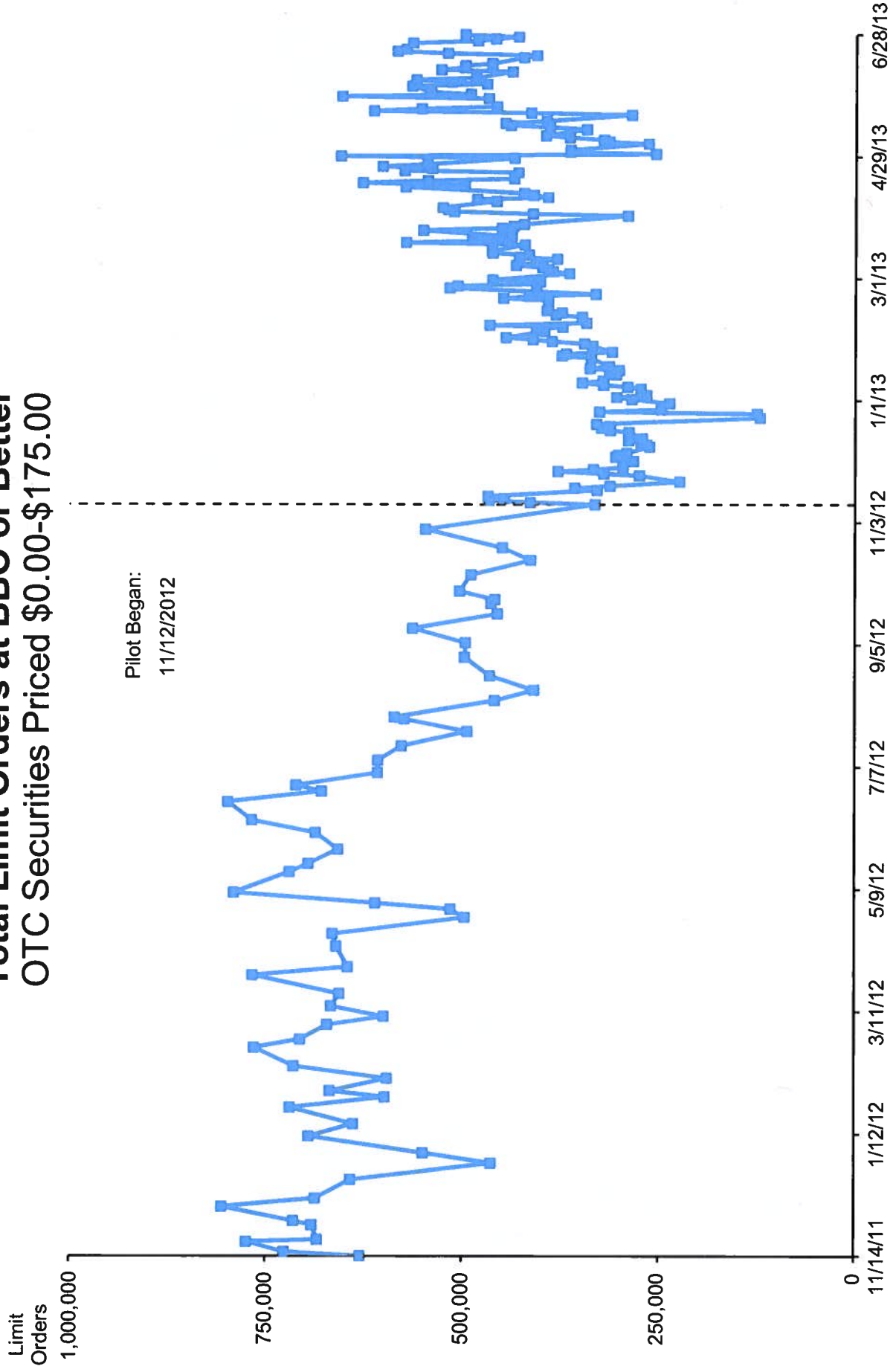
# **Percent of Day BBO Bid Size Equal to Minimum Quote Size** **OTC Securities Priced \$0.00-\$175.00**



Source: OTC Link

Note: Percents are excluded if valid quotes during the day span more than one tier.

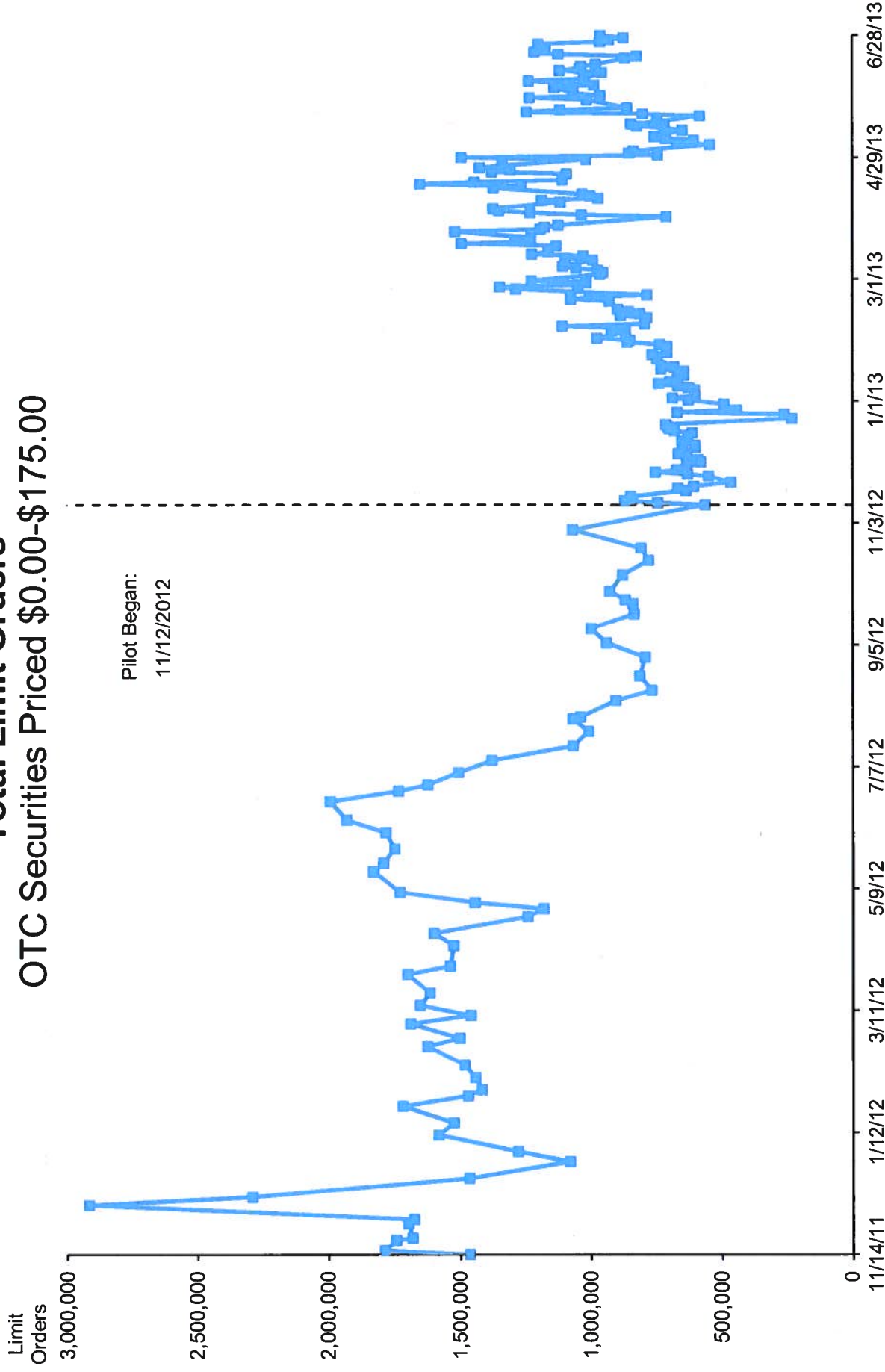
# **Total Limit Orders at BBO or Better OTC Securities Priced \$0.00-\$175.00**



Source: OTC Link

Note: Orders are excluded if valid quotes during the day span more than one tier. Includes limit orders at BBO for stocks priced according to amended tier definitions.

# Total Limit Orders OTC Securities Priced \$0.00-\$175.00

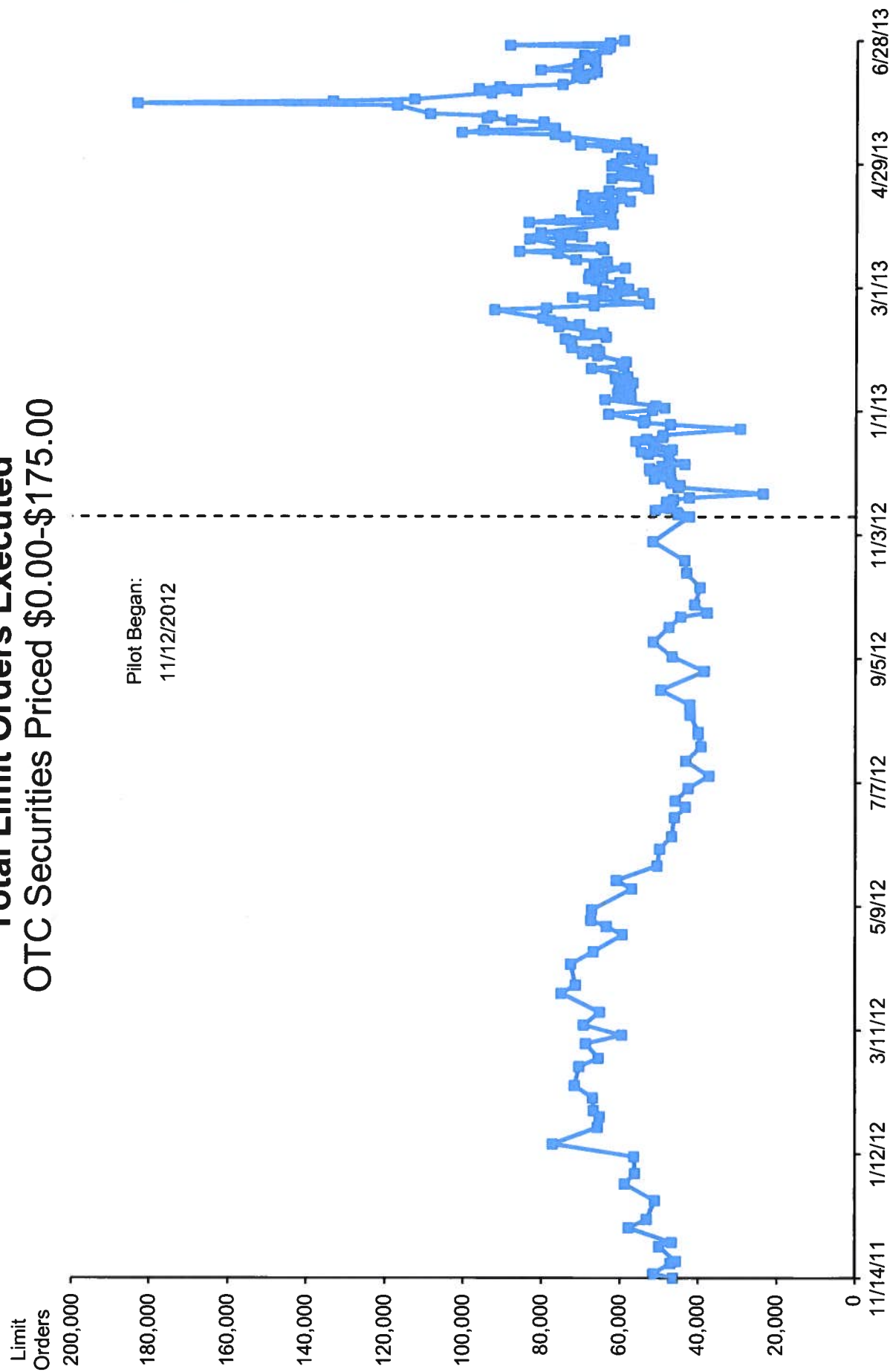


Pilot Began:  
11/12/2012

Source: OTC Link

Note: Orders are excluded if valid quotes during the day span more than one tier.

# **Total Limit Orders Executed OTC Securities Priced \$0.00-\$175.00**



Source: OTC Link

Note: Orders are excluded if valid quotes during the day span more than one tier.

## Amended Rule 6433

### Minimum Quote Size Requirement Change

Tier	Price Range	Minimum Quote Size	
		Pre-Rule	Post-Rule
1	\$0.0001 – \$0.0999	5,000	10,000
2	\$0.1000 – \$0.1999	5,000	5,000
3	\$0.2000 – \$0.5099	5,000	2,500
4	\$0.51 – \$1.00	2,500	1,000
5a	\$1.00 – \$10.00	500	100
5b	\$10.00 – \$100.00	200	100
5c	\$100.00 – \$175.00	100	100
6a	\$175.00 – \$200.00	100	1
6b	\$200.00 – \$500.00	25	1
6c	\$500.00 – \$1,000.00	10	1
6d	\$1,000.00 – \$2,500.00	5	1
6e	Over \$2,500	1	1

Source: SEC Release No. 34-67208; SR-FINRA-2011-058



## Pre-Rule Randomly Selected Dates

Month	Date 1	Date 2	Date 3	Date 4	Date 5
Nov-11	11/14/11	11/16/11	11/21/11	11/22/11	11/29/11
Dec-11	12/1/11	12/8/11	12/12/11	12/21/11	12/29/11
Jan-12	1/3/12	1/11/12	1/17/12	1/25/12	1/30/12
Feb-12	2/2/12	2/8/12	2/14/12	2/23/12	2/27/12
Mar-12	3/5/12	3/9/12	3/14/12	3/20/12	3/29/12
Apr-12	4/2/12	4/12/12	4/18/12	4/26/12	4/30/12
May-12	5/3/12	5/8/12	5/18/12	5/22/12	5/29/12
Jun-12	6/6/12	6/12/12	6/21/12	6/26/12	6/29/12
Jul-12	7/5/12	7/11/12	7/18/12	7/25/12	7/31/12
Aug-12	8/1/12	8/9/12	8/14/12	8/21/12	8/30/12
Sep-12	9/6/12	9/13/12	9/20/12	9/25/12	9/27/12
Oct-12	10/1/12	10/9/12	10/16/12	10/22/12	10/31/12

# Summary of t-tests Pre-Rule Sample v. Post-Rule

Metric	Tier				
	1	2	3	4	5c
Minimum Quotation Size Change	Increased	Maintained	Decreased	Decreased	Maintained
I. Time-weighted quoted spread					
II. Volume-weighted effective spread					
All Trades	↑	↓	↓	↓	↓
Small	↑			↓	↓
Medium				↓	↓
Large			↑	↑	↑
III. Time-weighted quoted depth (shares)					
IV. Time-weighted quoted depth at quotes around the BBO midpoint					
1% Band	↓		↓	↓	↓
2% Band	↓			↓	↓
5% Band			↓	↓	↓
10% Band			↓	↓	↓
V. Hypothetical trade price impact of sell orders					
Hypothetical Trade Size					
	5,000	2,500	2,500	1,000	100
Set Trade Size	↓	↓	↓	↓	↓
Set Trade Size X2	↓	↓	↓	↓	↓
Set Trade Size X5	↓	↓	↓	↓	↓
Set Trade Size X10	↑	↓	↓	↓	↓
VI. Hypothetical trade price impact of buy orders					
Set Trade Size	↓	↓	↓	↓	↓
Set Trade Size X2	↓	↓	↓	↓	↓
Set Trade Size X5	↓	↓	↓	↓	↓
Set Trade Size X10	↓	↓	↓	↓	↓
VII. Hypothetical trade percentage of time executed for sell orders					
Set Trade Size				↑	↑
Set Trade Size X2	↑	↑	↓	↓	↓
Set Trade Size X5	↑	↑	↑	↓	↓
Set Trade Size X10	↑	↑	↑	↓	↓
VIII. Hypothetical trade percentage of time executed for buy orders					
Set Trade Size			↑	↑	↑
Set Trade Size X2	↑	↑	↓	↓	↓
Set Trade Size X5	↑	↑	↓	↓	↓
Set Trade Size X10	↑	↑	↓	↓	↓

Source: OTC Link

Note:

This analysis tests whether there was a statistically significant difference in the average metric. "↑", "↓" and "↑" denote a statistically significant increase at the 1% and 5% levels, respectively, based on a two-tailed t-test. "↓", "↑" and "↓" denote a statistically significant decrease at the 1% and 5% levels, respectively, based on a two-tailed t-test.

## Time-Weighted Quoted Spread

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – June 2013)				
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median	t-statistic	p-value
1	Increased	4,537	0.0096	0.0055	3,968	0.0099	0.0056	1.24	0.217
2	Maintained	1,275	0.0264	0.0222	1,097	0.0250	0.0209	(2.04)	0.042
3	Decreased	1,476	0.0703	0.0500	1,338	0.0628	0.0440	(3.49)	<0.001
4	Decreased	953	0.0961	0.0659	918	0.0847	0.0540	(2.97)	0.003
5a	Decreased	2,488	0.6081	0.2581	2,315	0.4534	0.1841	(6.00)	<0.001
5b	Decreased	1,850	2.448	0.612	1,991	1.793	0.451	(4.17)	<0.001
5c	Maintained	128	8.214	3.039	150	6.705	3.224	(1.21)	0.227

Source: OTC Link

Note:

[1] Only five dates for each month, as selected by FINRA, are included.

Quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Observations were also removed if the quotes used in a given metric on a given day spanned tiers.

# Volume-Weighted Effective Spread

Minimum Quotation Size Change		Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – June 2013)				
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median	t-statistic	p-value
Tier									
1	Increased	4,197	0.0078	0.0045	3,844	0.0083	0.0049	2.33	0.020
2	Maintained	1,106	0.0209	0.0169	1,025	0.0197	0.0158	(1.85)	0.065
3	Decreased	1,303	0.0512	0.0347	1,237	0.0499	0.0339	(0.71)	0.481
4	Decreased	828	0.0715	0.0450	846	0.0656	0.0418	(1.70)	0.090
5a	Decreased	2,132	0.3740	0.1590	2,082	0.2807	0.1239	(5.01)	<0.001
5b	Decreased	1,525	1.301	0.384	1,754	1.004	0.307	(2.62)	0.009
5c	Maintained	87	4.278	1.546	123	3.578	1.345	(0.86)	0.394

Source: OTC Link

Note:

[1] Only five dates for each month, as selected by FINRA, are included.

Quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Observations were also removed if the quotes used in a given metric on a given day spanned tiers

## Volume-Weighted Effective Spread - Small Trades

Minimum Quotation Size Change		Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – June 2013)				
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median	t-statistic	p-value
1	Increased	4,196	0.0078	0.0045	3,843	0.0083	0.0049	2.34	0.019
2	Maintained	1,104	0.0208	0.0169	1,024	0.0197	0.0157	(1.76)	0.079
3	Decreased	1,302	0.0512	0.0350	1,235	0.0497	0.0339	(0.77)	0.441
4	Decreased	825	0.0713	0.0456	846	0.0655	0.0424	(1.68)	0.094
5a	Decreased	2,125	0.3720	0.1598	2,074	0.2797	0.1253	(5.00)	<0.001
5b	Decreased	1,447	1.248	0.375	1,720	0.880	0.293	(3.25)	0.001
5c	Maintained	21	3.935	1.787	26	6.161	3.559	1.55	0.137

Source: OTC Link

Note:

[1] Only five dates for each month, as selected by FINRA, are included. Quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Observations were also removed if the quotes used in a given metric on a given day spanned tiers.

## Volume-Weighted Effective Spread - Medium Trades

Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – June 2013)					
Minimum Quotation Size Change	Number of Stocks	Mean	Median	Number of Stocks	Mean	Median	t-statistic	p-value
1 Increased	454	0.0035	0.0016	664	0.0036	0.0018	0.37	0.709
2 Maintained	241	0.0101	0.0066	325	0.0097	0.0075	(0.51)	0.609
3 Decreased	465	0.0211	0.0142	593	0.0236	0.0152	1.65	0.099
4 Decreased	413	0.0316	0.0210	485	0.0313	0.0217	(0.15)	0.882
5a Decreased	1,405	0.1715	0.0783	1,531	0.1480	0.0800	(2.20)	0.028
5b Decreased	1,309	1.054	0.303	1,564	0.832	0.263	(2.12)	0.034
5c Maintained	81	4.271	1.524	119	3.653	1.345	(0.68)	0.501

Source: OTC Link

Note:

[1] Only five dates for each month, as selected by FINRA, are included.

Quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Observations were also removed if the quotes used in a given metric on a given day spanned tiers.

# Volume-Weighted Effective Spread - Large Trades

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – June 2013)				
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median	t-statistic	p-value
1	Increased	1	0.0040	0.0040	7	0.0064	0.0046	–	–
2	Maintained	3	0.0021	0.0018	6	0.0176	0.0155	3.24	0.083
3	Decreased	15	0.0076	0.0075	37	0.0288	0.0104	2.19	0.046
4	Decreased	21	0.0282	0.0135	44	0.0271	0.0149	(0.13)	0.900
5a	Decreased	264	0.1036	0.0500	411	0.1306	0.0613	1.59	0.114
5b	Decreased	517	0.412	0.151	775	0.615	0.170	2.06	0.040
5c	Maintained	29	2.543	0.954	49	1.216	0.760	(1.66)	0.107

Source: OTC Link

Note:

[1] Only five dates for each month, as selected by FINRA, are included.

Quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Observations were also removed if the quotes used in a given metric on a given day spanned tiers.

# Time-Weighted Quoted Depth (Shares)

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – June 2013)				
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median	t-statistic	p-value
1	Increased	4,537	5,330,741	60,919	3,968	6,488,478	79,264	1.34	0.179
2	Maintained	1,275	27,712	21,614	1,097	27,694	24,000	(0.02)	0.983
3	Decreased	1,476	21,176	18,180	1,338	15,470	12,734	(11.45)	<0.001
4	Decreased	953	11,727	9,469	918	7,675	5,923	(5.45)	<0.001
5a	Decreased	2,488	3,208	2,109	2,315	2,213	1,028	(6.19)	<0.001
5b	Decreased	1,850	980	741	1,991	633	431	(11.27)	<0.001
5c	Maintained	128	655	343	150	525	355	(1.23)	0.222

Source: OTC Link

Note:

[1] Only five dates for each month, as selected by FINRA, are included.

Quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Observations were also removed if the quotes used in a given metric on a given day spanned tiers



## Time-Weighted Quoted Depth around the BBO Midpoint - Share Volume

## One Percent Band

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)			t-statistic	p-value
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median		
1	Increased	2,955	369,748	28,266	2,575	232,410	20,450	(2.37)	0.018
2	Maintained	1,029	23,338	8,657	1,082	17,730	8,666	(0.96)	0.338
3	Decreased	1,248	14,924	6,863	1,315	9,440	4,757	(2.12)	0.034
4	Decreased	976	8,333	4,333	973	5,548	2,587	(3.61)	<0.001
5a	Decreased	2,249	3,018	1,043	2,296	2,313	429	(1.93)	0.054
5b	Decreased	1,741	995	347	2,034	517	173	(1.90)	0.057
5c	Maintained	250	530	179	233	341	173	(2.70)	0.007

## Two Percent Band

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)			t-statistic	p-value
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median		
1	Increased	2,955	381,163	35,825	2,575	238,557	24,448	(2.44)	0.015
2	Maintained	1,023	27,016	11,664	1,079	20,596	12,128	(1.09)	0.276
3	Decreased	1,248	16,464	8,660	1,313	11,620	7,332	(1.87)	0.062
4	Decreased	976	9,096	4,637	971	6,730	3,791	(3.08)	0.002
5a	Decreased	2,249	3,205	1,251	2,293	2,817	716	(1.02)	0.307
5b	Decreased	1,741	1,045	353	2,031	742	347	(1.21)	0.227
5c	Maintained	249	572	311	233	460	322	(1.57)	0.119

## Five Percent Band

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)			t-statistic	p-value
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median		
1	Increased	2,955	403,675	48,070	2,575	286,045	41,145	(1.96)	0.050
2	Maintained	1,021	35,118	17,787	1,062	29,703	19,947	(0.91)	0.363
3	Decreased	1,235	22,900	14,426	1,291	17,127	12,578	(2.23)	0.026
4	Decreased	969	11,817	8,656	957	9,645	6,802	(2.74)	0.006
5a	Decreased	2,248	3,465	1,448	2,293	3,399	1,141	(0.17)	0.864
5b	Decreased	1,740	1,612	1,039	2,030	1,128	866	(1.93)	0.054
5c	Maintained	247	728	432	230	616	433	(1.52)	0.130

## Ten Percent Band

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)			t-statistic	p-value
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median		
1	Increased	2,955	438,872	66,844	2,575	346,368	61,436	(1.52)	0.129
2	Maintained	1,010	44,230	22,872	1,052	40,233	28,793	(0.66)	0.508
3	Decreased	1,229	28,886	19,593	1,286	23,556	17,303	(2.65)	0.008
4	Decreased	958	16,092	11,918	953	12,642	8,764	(3.96)	<0.001
5a	Decreased	2,242	4,329	2,356	2,292	3,854	1,625	(1.24)	0.217
5b	Decreased	1,730	2,288	1,730	2,029	1,442	1,123	(1.69)	0.092
5c	Maintained	246	797	433	230	719	523	(1.08)	0.282

Source: OTC Link

Note:

[1] Only five dates for each month, as selected by FINRA, are included.

## Price Impact for Hypothetical Large Market Sell Orders

## Set Trade Size

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)			t-statistic	p-value
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median		
1	Increased	4,334	0.0062	0.0026	3,960	0.0054	0.0025	(4.53)	<0.001
2	Maintained	2,036	0.0238	0.0152	1,997	0.0196	0.0145	(6.10)	<0.001
3	Decreased	2,275	0.0616	0.0347	2,235	0.0451	0.0274	(9.00)	<0.001
4	Decreased	1,716	0.1169	0.0690	1,645	0.0930	0.0509	(6.07)	<0.001
5a	Decreased	3,062	0.4172	0.1479	2,944	0.2817	0.1000	(7.02)	<0.001
5b	Decreased	2,220	2.7296	0.3754	2,338	1.3084	0.2250	(8.95)	<0.001
5c	Maintained	341	17.4830	7.3426	316	10.8237	3.0625	(3.29)	0.001

## Set Trade Size × 2

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)			t-statistic	p-value
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median		
1	Increased	4,204	0.0064	0.0029	3,960	0.0054	0.0025	(5.31)	<0.001
2	Maintained	1,878	0.0234	0.0160	1,952	0.0206	0.0150	(4.49)	<0.001
3	Decreased	2,274	0.0617	0.0347	2,184	0.0472	0.0300	(8.11)	<0.001
4	Decreased	1,715	0.1170	0.0691	1,610	0.0972	0.0584	(4.99)	<0.001
5a	Decreased	3,059	0.4172	0.1475	2,917	0.2886	0.1103	(7.09)	<0.001
5b	Decreased	2,218	2.7309	0.3750	2,295	1.2874	0.2524	(8.57)	<0.001
5c	Maintained	340	17.8635	7.4977	308	10.6644	3.7725	(4.17)	<0.001

## Set Trade Size × 5

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)			t-statistic	p-value
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median		
1	Increased	3,931	0.0062	0.0027	3,808	0.0059	0.0029	(1.67)	0.095
2	Maintained	1,483	0.0233	0.0177	1,696	0.0213	0.0168	(3.13)	0.002
3	Decreased	1,787	0.0540	0.0320	1,899	0.0468	0.0322	(4.06)	<0.001
4	Decreased	1,676	0.1214	0.0746	1,497	0.1050	0.0695	(3.94)	<0.001
5a	Decreased	3,059	0.4170	0.1475	2,838	0.3164	0.1458	(5.48)	<0.001
5b	Decreased	2,145	2.3563	0.4405	2,171	1.4510	0.3963	(6.52)	<0.001
5c	Maintained	288	14.8135	6.9622	262	9.2650	3.9937	(3.81)	<0.001

## Set Trade Size × 10

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)			t-statistic	p-value
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median		
1	Increased	3,710	0.0058	0.0025	3,600	0.0062	0.0028	2.63	0.009
2	Maintained	1,133	0.0232	0.0179	1,419	0.0225	0.0187	(0.95)	0.344
3	Decreased	1,439	0.0534	0.0357	1,519	0.0459	0.0303	(4.08)	<0.001
4	Decreased	1,400	0.1134	0.0716	1,268	0.1043	0.0672	(2.23)	0.026
5a	Decreased	2,992	0.4181	0.1602	2,696	0.3447	0.1750	(4.00)	<0.001
5b	Decreased	1,940	2.0124	0.5774	1,886	1.5827	0.5702	(3.28)	0.001
5c	Maintained	208	12.9528	5.8717	182	8.2577	4.0231	(2.71)	0.007

Source: OTC Link

Note:

[1] Only five dates for each month, as selected by FINRA, are included.

Trade size is defined by the lowest minimum share requirement over the two periods. Subsequent iterations of this analysis take various multiples of this amount. Quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Observations were also removed if the quotes used in a given metric on a given day spanned tiers.

## Price Impact for Hypothetical Large Market Buy Orders

## Set Trade Size

		Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)				
Tier	Minimum Quotation Size Change	Number of Stocks	Mean	Median	Number of Stocks	Mean	Median	t-statistic	p-value
1	Increased	4,321	0.0062	0.0026	3,952	0.0054	0.0025	(4.56)	<0.001
2	Maintained	2,027	0.0228	0.0151	1,990	0.0193	0.0142	(6.14)	<0.001
3	Decreased	2,251	0.0547	0.0344	2,215	0.0434	0.0270	(8.19)	<0.001
4	Decreased	1,683	0.1096	0.0685	1,633	0.0899	0.0512	(5.70)	<0.001
5a	Decreased	3,048	0.4191	0.1479	2,935	0.2827	0.1000	(7.09)	<0.001
5b	Decreased	2,215	2.4586	0.3758	2,332	1.2593	0.2268	(8.39)	<0.001
5c	Maintained	336	13.2019	6.5971	313	9.1706	3.0250	(3.89)	<0.001

## Set Trade Size × 2

		Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)				
Tier	Minimum Quotation Size Change	Number of Stocks	Mean	Median	Number of Stocks	Mean	Median	t-statistic	p-value
1	Increased	4,065	0.0062	0.0025	3,949	0.0053	0.0025	(4.74)	<0.001
2	Maintained	1,771	0.0236	0.0160	1,883	0.0187	0.0139	(7.65)	<0.001
3	Decreased	2,233	0.0522	0.0339	2,089	0.0420	0.0272	(7.52)	<0.001
4	Decreased	1,676	0.1066	0.0679	1,537	0.0853	0.0500	(6.32)	<0.001
5a	Decreased	3,045	0.4191	0.1498	2,864	0.2741	0.1083	(7.66)	<0.001
5b	Decreased	2,208	1.9156	0.3750	2,250	1.2896	0.2500	(5.96)	<0.001
5c	Maintained	303	9.7865	4.1960	274	8.5459	3.0000	(1.28)	0.200

## Set Trade Size × 5

		Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)				
Tier	Minimum Quotation Size Change	Number of Stocks	Mean	Median	Number of Stocks	Mean	Median	t-statistic	p-value
1	Increased	3,586	0.0055	0.0022	3,645	0.0051	0.0024	(1.80)	0.072
2	Maintained	1,254	0.0235	0.0162	1,403	0.0200	0.0150	(4.38)	<0.001
3	Decreased	1,752	0.0506	0.0324	1,643	0.0429	0.0291	(5.33)	<0.001
4	Decreased	1,537	0.0969	0.0619	1,267	0.0834	0.0500	(3.73)	<0.001
5a	Decreased	3,038	0.3295	0.1479	2,726	0.2543	0.1294	(7.23)	<0.001
5b	Decreased	2,026	1.1630	0.3739	2,046	1.0625	0.3803	(1.48)	0.138
5c	Maintained	177	4.8322	2.3511	187	4.8921	2.0866	0.08	0.938

## Set Trade Size × 10

		Pre-Rule Sample (Nov 2011 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)				
Tier	Minimum Quotation Size Change	Number of Stocks	Mean	Median	Number of Stocks	Mean	Median	t-statistic	p-value
1	Increased	3,273	0.0050	0.0020	3,272	0.0047	0.0020	(1.58)	0.115
2	Maintained	880	0.0229	0.0159	998	0.0199	0.0150	(3.41)	<0.001
3	Decreased	1,379	0.0496	0.0329	1,253	0.0423	0.0296	(4.28)	<0.001
4	Decreased	1,208	0.0968	0.0612	988	0.0836	0.0496	(3.18)	0.002
5a	Decreased	2,880	0.3084	0.1419	2,514	0.2512	0.1393	(5.72)	<0.001
5b	Decreased	1,759	1.1131	0.5000	1,759	1.0565	0.5000	(0.87)	0.386
5c	Maintained	104	3.7889	2.2923	127	3.7797	2.2375	(0.01)	0.991

Source: OTC Link

Note:

[1] Only five dates for each month, as selected by FINRA, are included.

Trade size is defined by the lowest minimum share requirement over the two periods. Subsequent iterations of this analysis take various multiples of this amount. Quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Observations were also removed if the quotes used in a given metric on a given day spanned tiers.

# Executability of Hypothetical Large Market Sell Orders

## Set Trade Size

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Mar 2012 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)			t-statistic	p-value
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median		
1	Increased	4,422	0.9846	1.0000	3,961	0.9824	1.0000	(1.01)	0.313
2	Maintained	2,092	0.9870	1.0000	2,013	0.9898	1.0000	0.98	0.325
3	Decreased	2,330	0.9848	1.0000	2,254	0.9894	1.0000	1.62	0.105
4	Decreased	1,776	0.9837	1.0000	1,654	0.9935	1.0000	3.23	0.001
5a	Decreased	3,128	0.9928	1.0000	2,955	0.9963	1.0000	2.66	0.008
5b	Decreased	2,241	0.9946	1.0000	2,345	0.9961	1.0000	1.10	0.273
5c	Maintained	347	0.9903	1.0000	318	0.9895	1.0000	(0.14)	0.886

## Set Trade Size × 2

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Mar 2012 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)			t-statistic	p-value
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median		
1	Increased	4,422	0.8401	1.0000	3,961	0.9819	1.0000	32.48	<0.001
2	Maintained	2,092	0.8042	1.0000	2,013	0.9668	1.0000	21.65	<0.001
3	Decreased	2,330	0.9842	1.0000	2,254	0.9571	1.0000	(6.68)	<0.001
4	Decreased	1,776	0.9827	1.0000	1,654	0.9733	1.0000	(2.29)	0.022
5a	Decreased	3,128	0.9905	1.0000	2,955	0.9465	1.0000	(13.01)	<0.001
5b	Decreased	2,241	0.9930	1.0000	2,345	0.9148	1.0000	(16.40)	<0.001
5c	Maintained	347	0.9683	1.0000	318	0.9115	1.0000	(4.04)	<0.001

## Set Trade Size × 5

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Mar 2012 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)			t-statistic	p-value
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median		
1	Increased	4,422	0.6768	0.9998	3,961	0.7601	1.0000	11.20	<0.001
2	Maintained	2,092	0.4781	0.3808	2,013	0.6344	0.9997	12.63	<0.001
3	Decreased	2,330	0.6250	0.9991	2,254	0.6909	1.0000	5.83	<0.001
4	Decreased	1,776	0.9549	1.0000	1,654	0.8367	1.0000	(14.18)	<0.001
5a	Decreased	3,128	0.9897	1.0000	2,955	0.8337	1.0000	(26.99)	<0.001
5b	Decreased	2,241	0.8410	1.0000	2,345	0.7181	1.0000	(12.22)	<0.001
5c	Maintained	347	0.5634	0.9042	318	0.6500	1.0000	2.94	0.003

## Set Trade Size × 10

Tier	Minimum Quotation Size Change	Pre-Rule Sample (Mar 2012 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)			t-statistic	p-value
		Number of Stocks	Mean	Median	Number of Stocks	Mean	Median		
1	Increased	4,422	0.5599	0.9949	3,961	0.6248	0.9997	7.91	<0.001
2	Maintained	2,092	0.2816	0.0000	2,013	0.3981	0.0000	10.08	<0.001
3	Decreased	2,330	0.4190	0.0131	2,254	0.4640	0.2236	3.81	<0.001
4	Decreased	1,776	0.6802	0.9998	1,654	0.5818	0.9935	(7.48)	<0.001
5a	Decreased	3,128	0.9052	1.0000	2,955	0.6821	1.0000	(27.67)	<0.001
5b	Decreased	2,241	0.6274	1.0000	2,345	0.4370	0.0134	(15.70)	<0.001
5c	Maintained	347	0.2425	0.0000	318	0.2656	0.0000	0.88	0.379

Source: OTC Link

Note:

[1] Only five dates for each month, as selected by FINRA, are included.

Trade size is defined by the lowest minimum share requirement was over the two periods. Subsequent iterations of this analysis take various multiples of this amount. Quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Observations were also removed if the quotes used in a given metric on a given day spanned tiers.

# Executability of Hypothetical Large Market Buy Orders

## Set Trade Size

		Pre-Rule Sample (Mar 2012 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)				
Tier	Minimum Quotation Size Change	Number of Stocks	Mean	Median	Number of Stocks	Mean	Median	t-statistic	p-value
1	Increased	4,363	0.9875	1.0000	3,960	0.9893	1.0000	0.90	0.369
2	Maintained	2,069	0.9845	1.0000	2,008	0.9818	1.0000	(0.85)	0.397
3	Decreased	2,307	0.9722	1.0000	2,251	0.9800	1.0000	2.13	0.033
4	Decreased	1,744	0.9635	1.0000	1,652	0.9814	1.0000	4.06	<0.001
5a	Decreased	3,091	0.9916	1.0000	2,954	0.9951	1.0000	2.29	0.022
5b	Decreased	2,227	0.9908	1.0000	2,340	0.9931	1.0000	1.25	0.211
5c	Maintained	342	0.9436	1.0000	317	0.9605	1.0000	1.29	0.199

## Set Trade Size × 2

		Pre-Rule Sample (Mar 2012 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)				
Tier	Minimum Quotation Size Change	Number of Stocks	Mean	Median	Number of Stocks	Mean	Median	t-statistic	p-value
1	Increased	4,363	0.7817	1.0000	3,960	0.9853	1.0000	42.23	<0.001
2	Maintained	2,069	0.7656	1.0000	2,008	0.8084	1.0000	4.17	<0.001
3	Decreased	2,307	0.9541	1.0000	2,251	0.7997	1.0000	(20.08)	<0.001
4	Decreased	1,744	0.9549	1.0000	1,652	0.8105	1.0000	(16.24)	<0.001
5a	Decreased	3,090	0.9899	1.0000	2,954	0.8693	1.0000	(23.52)	<0.001
5b	Decreased	2,227	0.9733	1.0000	2,340	0.8611	1.0000	(17.92)	<0.001
5c	Maintained	342	0.6064	0.9850	317	0.6668	1.0000	2.11	0.036

## Set Trade Size × 5

		Pre-Rule Sample (Mar 2012 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)				
Tier	Minimum Quotation Size Change	Number of Stocks	Mean	Median	Number of Stocks	Mean	Median	t-statistic	p-value
1	Increased	4,363	0.5805	0.9984	3,960	0.6652	0.9997	10.38	<0.001
2	Maintained	2,069	0.4329	0.0962	2,008	0.4628	0.2188	2.36	0.018
3	Decreased	2,307	0.5709	0.9826	2,251	0.5094	0.6128	(5.13)	<0.001
4	Decreased	1,744	0.7841	1.0000	1,652	0.5670	0.9696	(16.96)	<0.001
5a	Decreased	3,091	0.9724	1.0000	2,954	0.7154	1.0000	(35.82)	<0.001
5b	Decreased	2,227	0.7203	1.0000	2,340	0.6105	1.0000	(9.28)	<0.001
5c	Maintained	342	0.2550	0.0000	317	0.2821	0.0000	0.94	0.350

## Set Trade Size × 10

		Pre-Rule Sample (Mar 2012 – Oct 2012) [1]			Post-Rule (Nov 12, 2012 – Jun 2013)				
Tier	Minimum Quotation Size Change	Number of Stocks	Mean	Median	Number of Stocks	Mean	Median	t-statistic	p-value
1	Increased	4,363	0.4609	0.1936	3,960	0.4965	0.7129	4.15	<0.001
2	Maintained	2,069	0.2551	0.0000	2,008	0.2588	0.0000	0.34	0.732
3	Decreased	2,307	0.3499	0.0000	2,251	0.2958	0.0000	(4.87)	<0.001
4	Decreased	1,744	0.5118	0.5714	1,652	0.3584	0.0000	(11.25)	<0.001
5a	Decreased	3,091	0.8150	1.0000	2,954	0.5215	0.8080	(31.54)	<0.001
5b	Decreased	2,227	0.5186	0.8237	2,340	0.3491	0.0000	(13.62)	<0.001
5c	Maintained	342	0.0950	0.0000	317	0.1019	0.0000	0.37	0.711

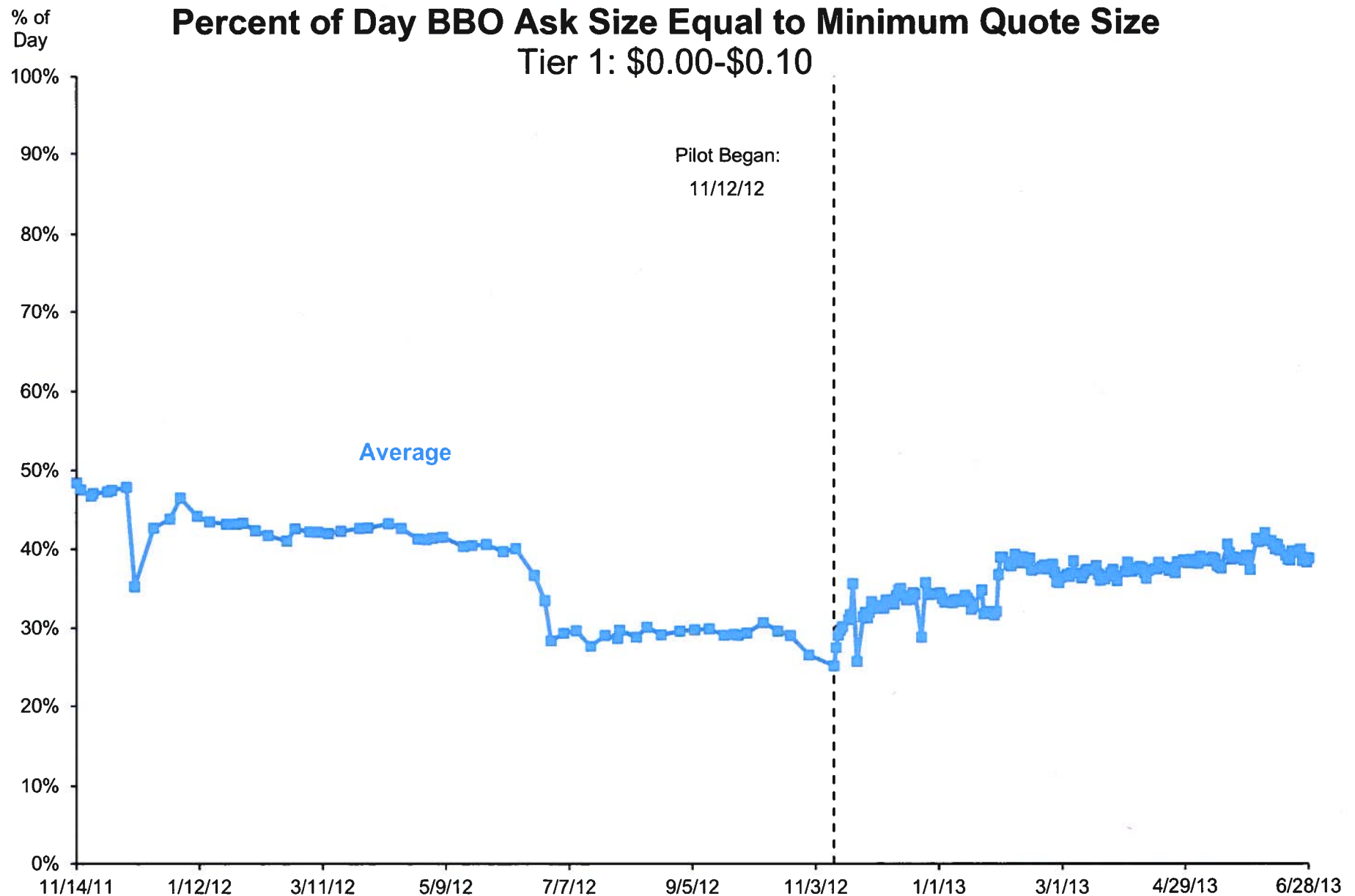
Source: OTC Link

Note:

[1] Only five dates for each month, as selected by FINRA, are included.

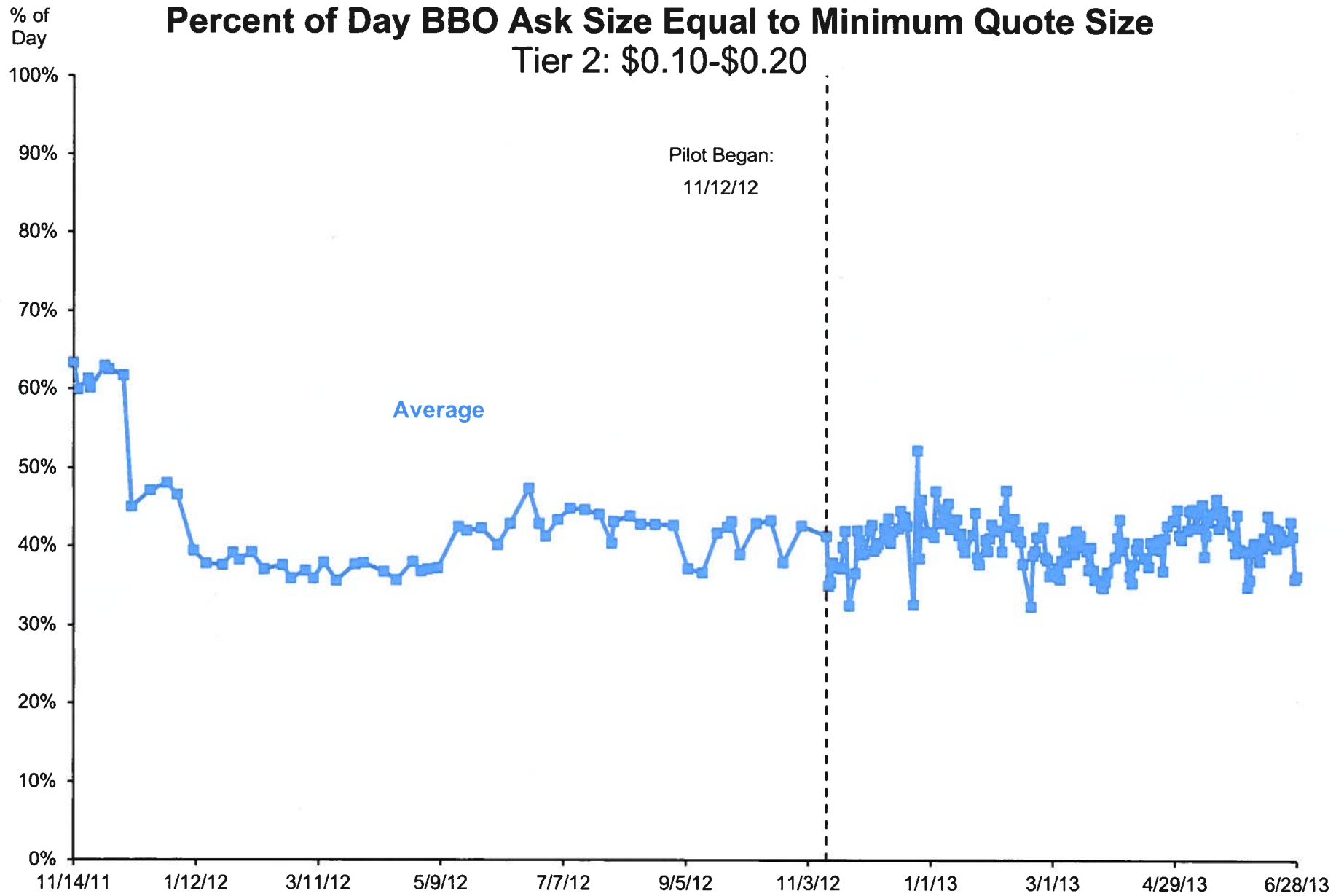
Trade size is defined by the lowest minimum share requirement was over the two periods. Subsequent iterations of this analysis take various multiples of this amount. Quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Observations were also removed if the quotes used in a given metric on a given day spanned tiers.





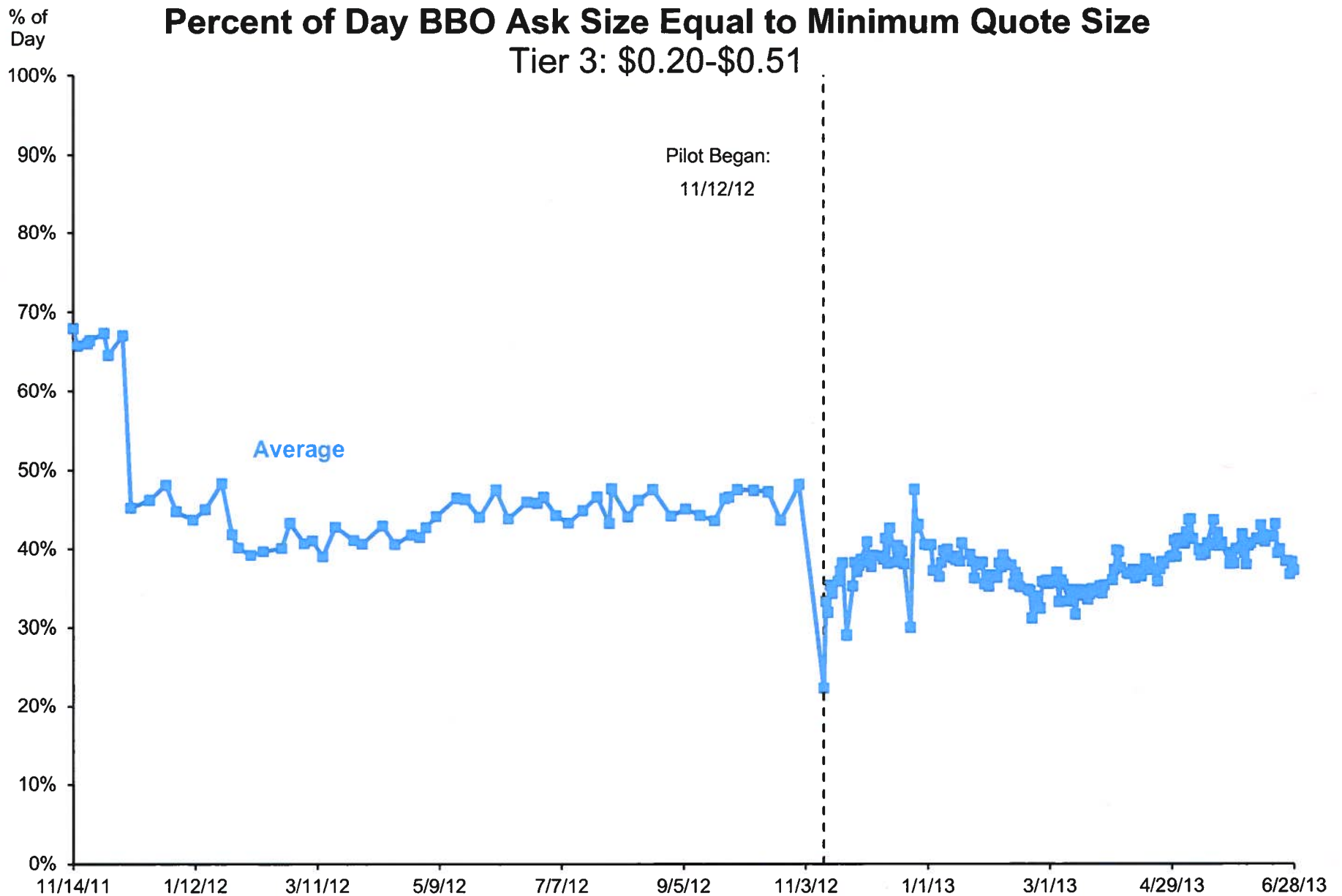
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Note: Percents are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 increased the minimum depth from 5,000 to 10,000.

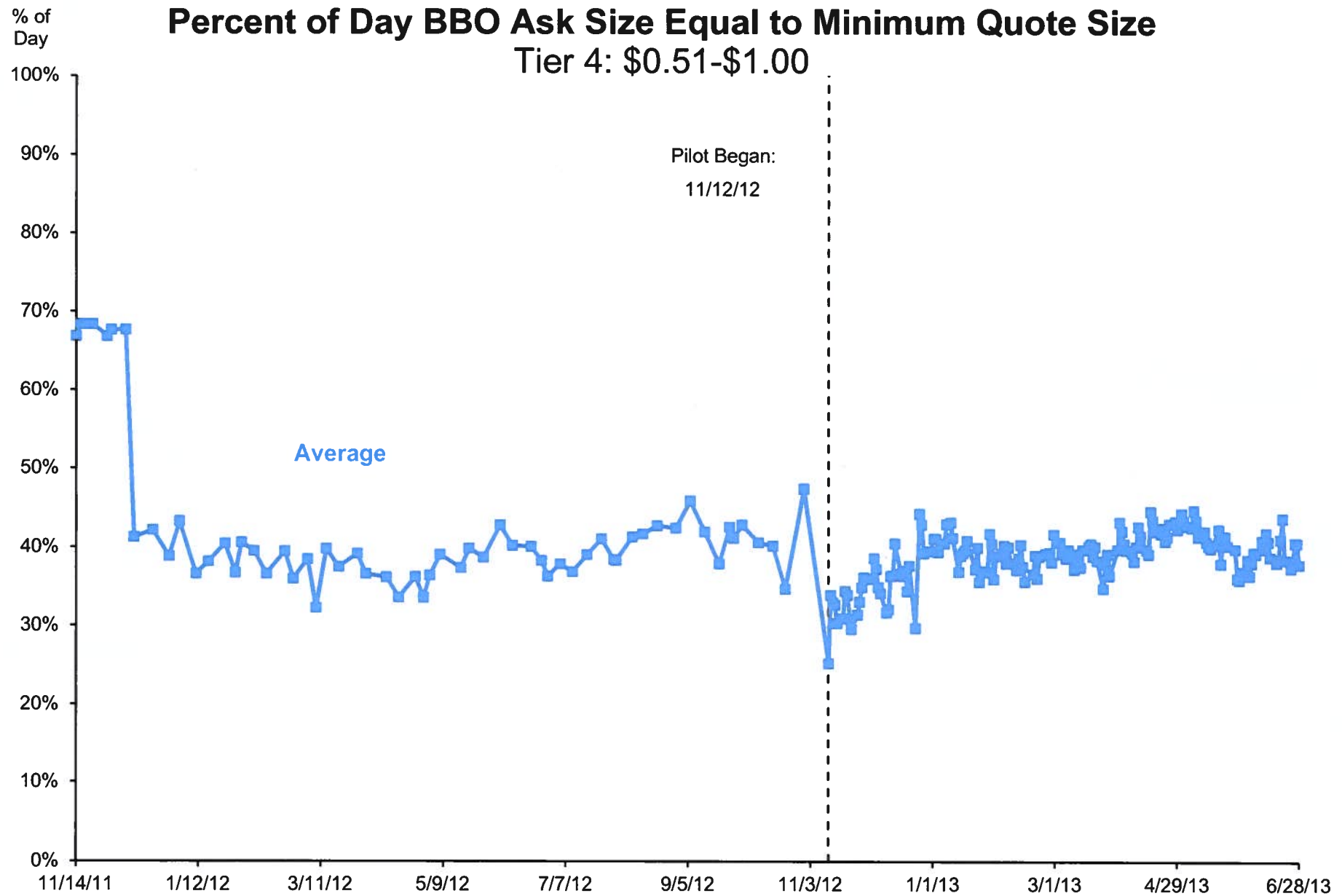


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Note: Percents are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements.

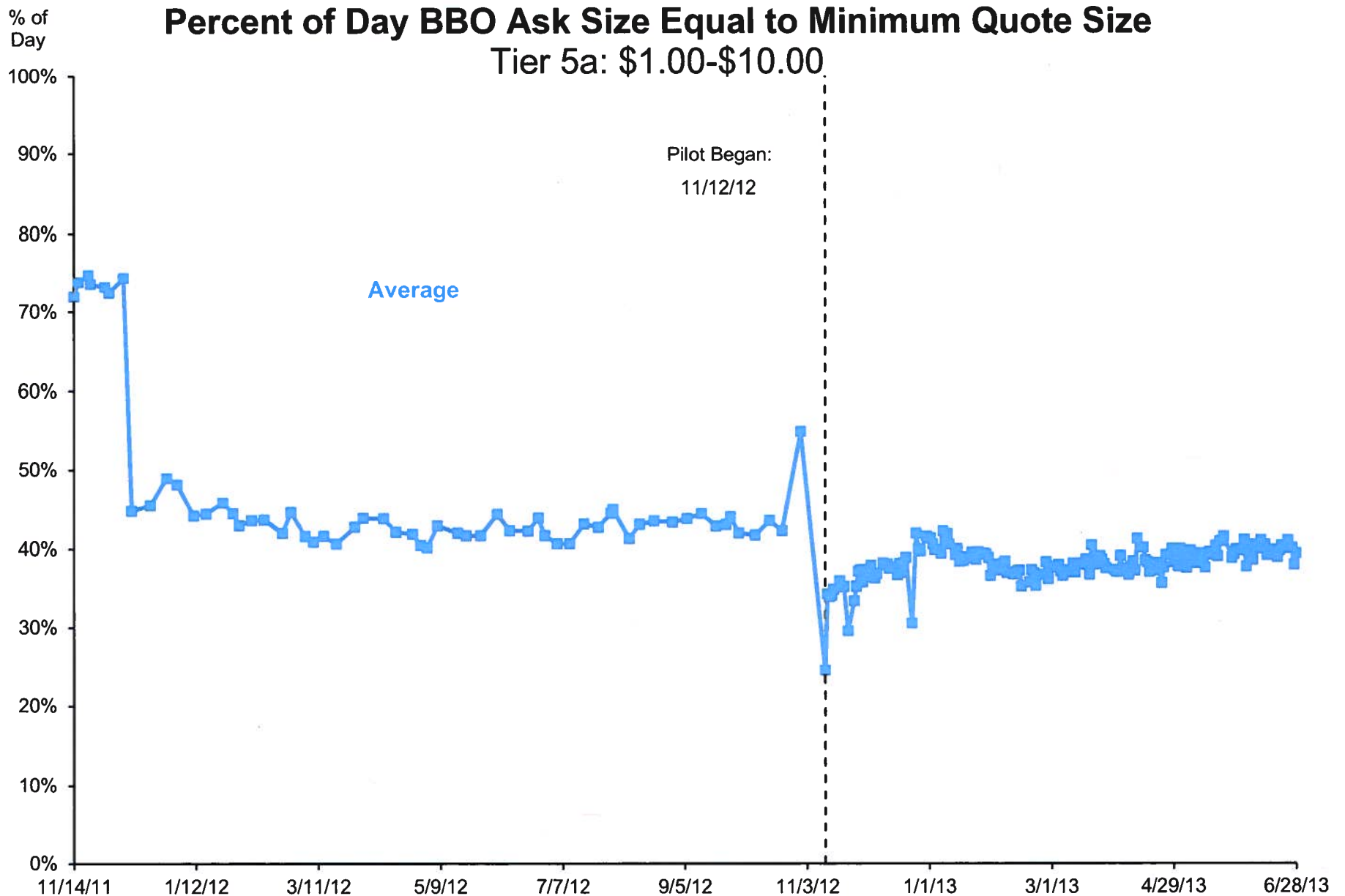






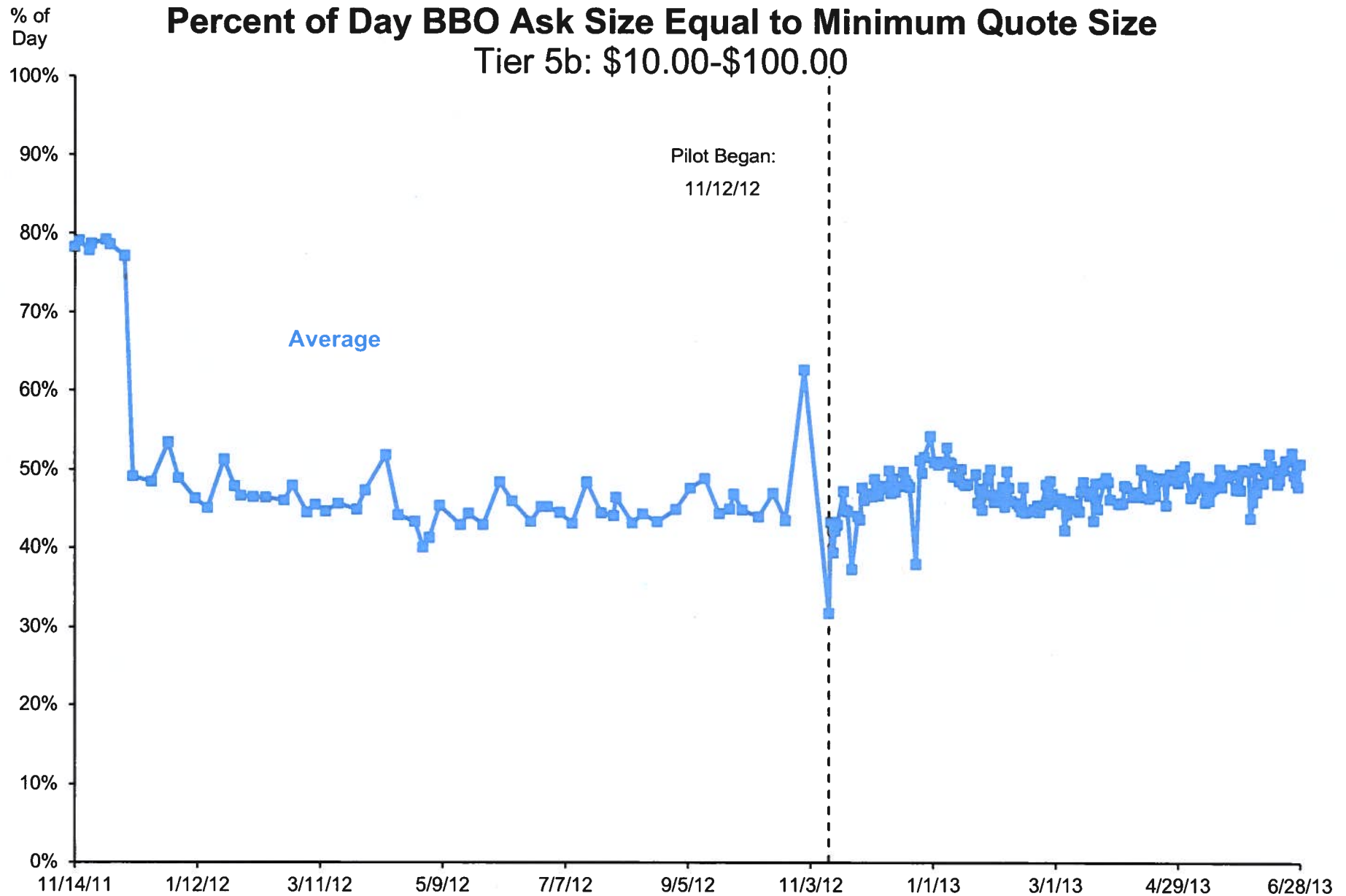
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Note: Percents are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 2,500 to 1,000.



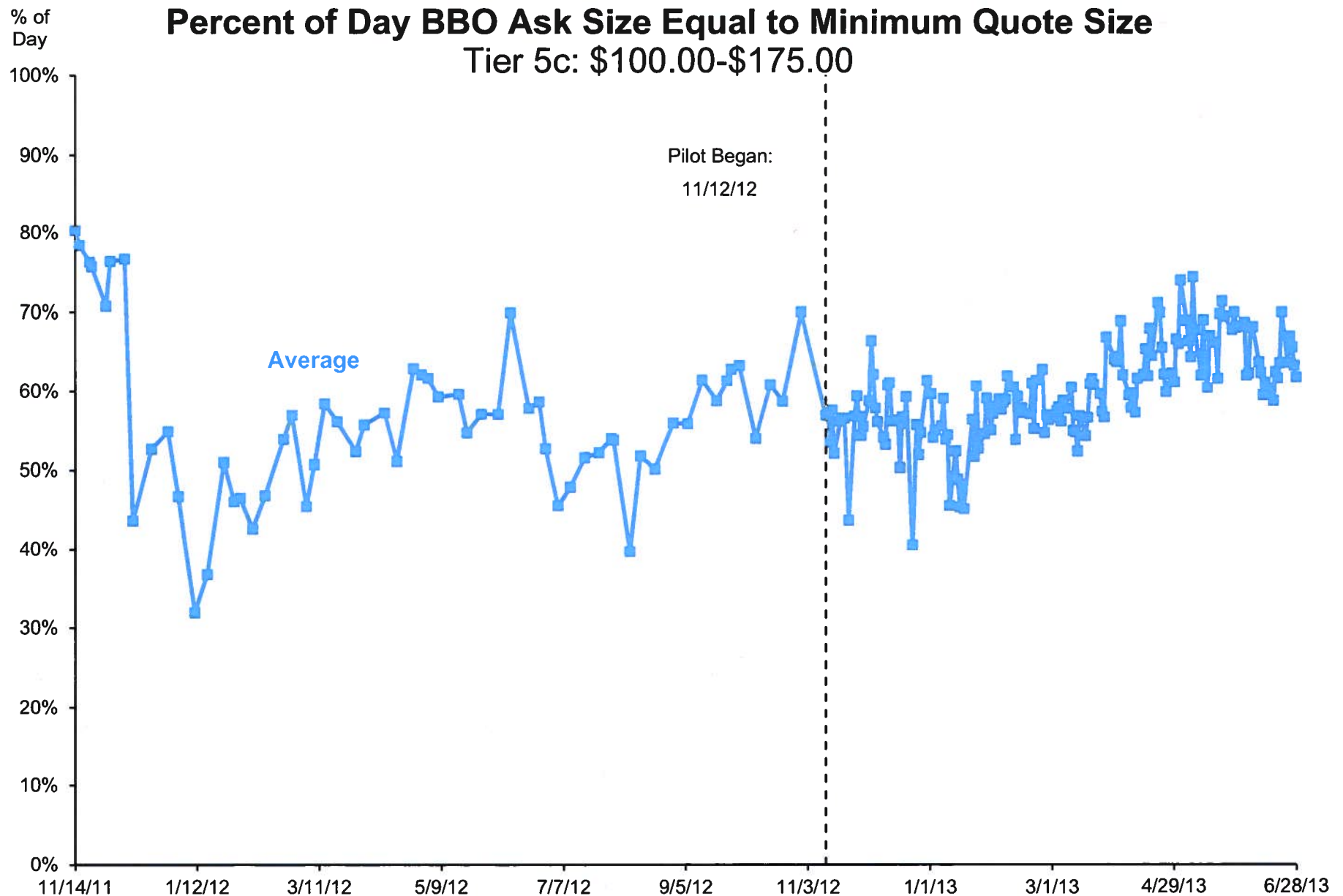
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Note: Percents are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 500 to 100.



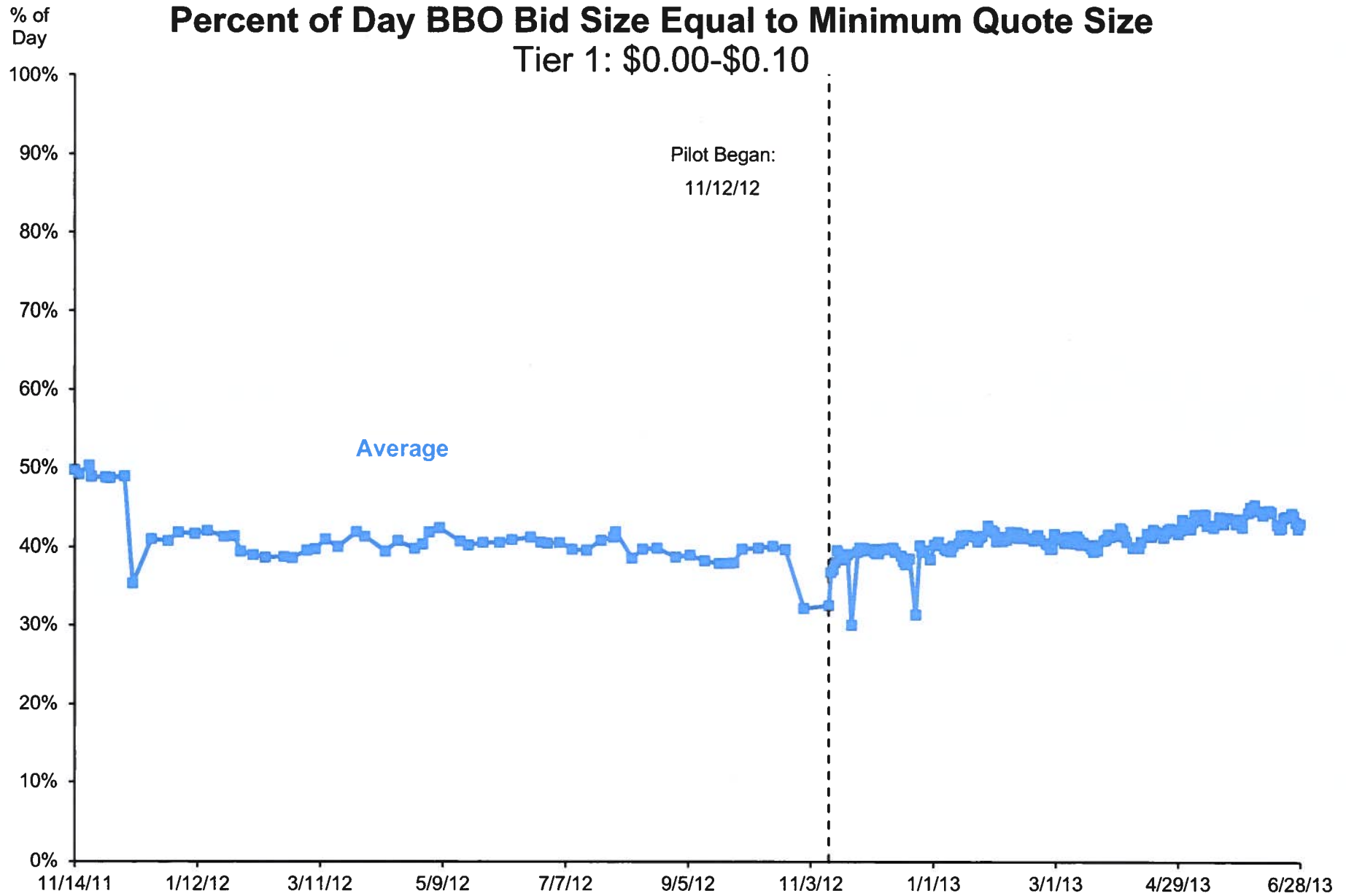
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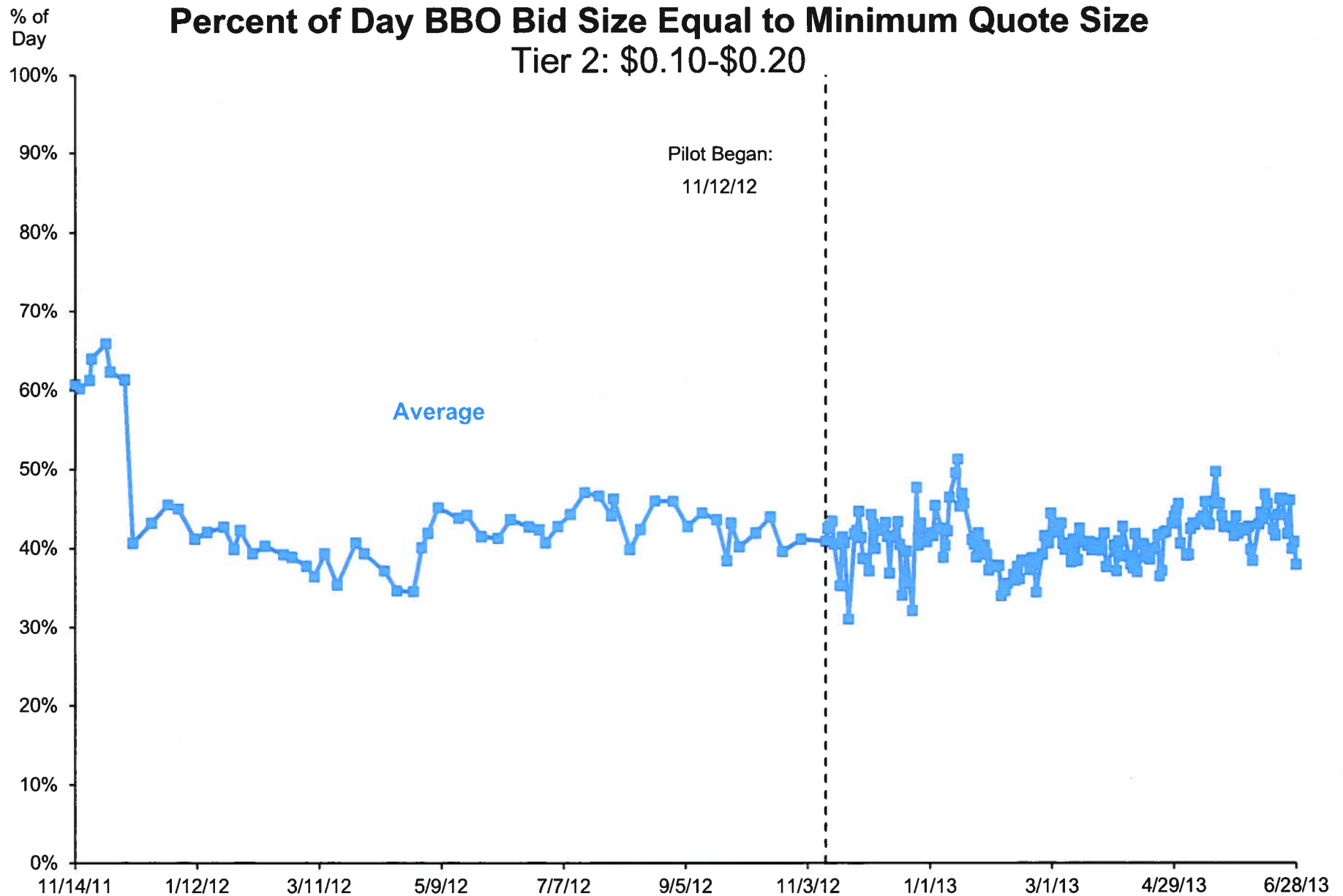
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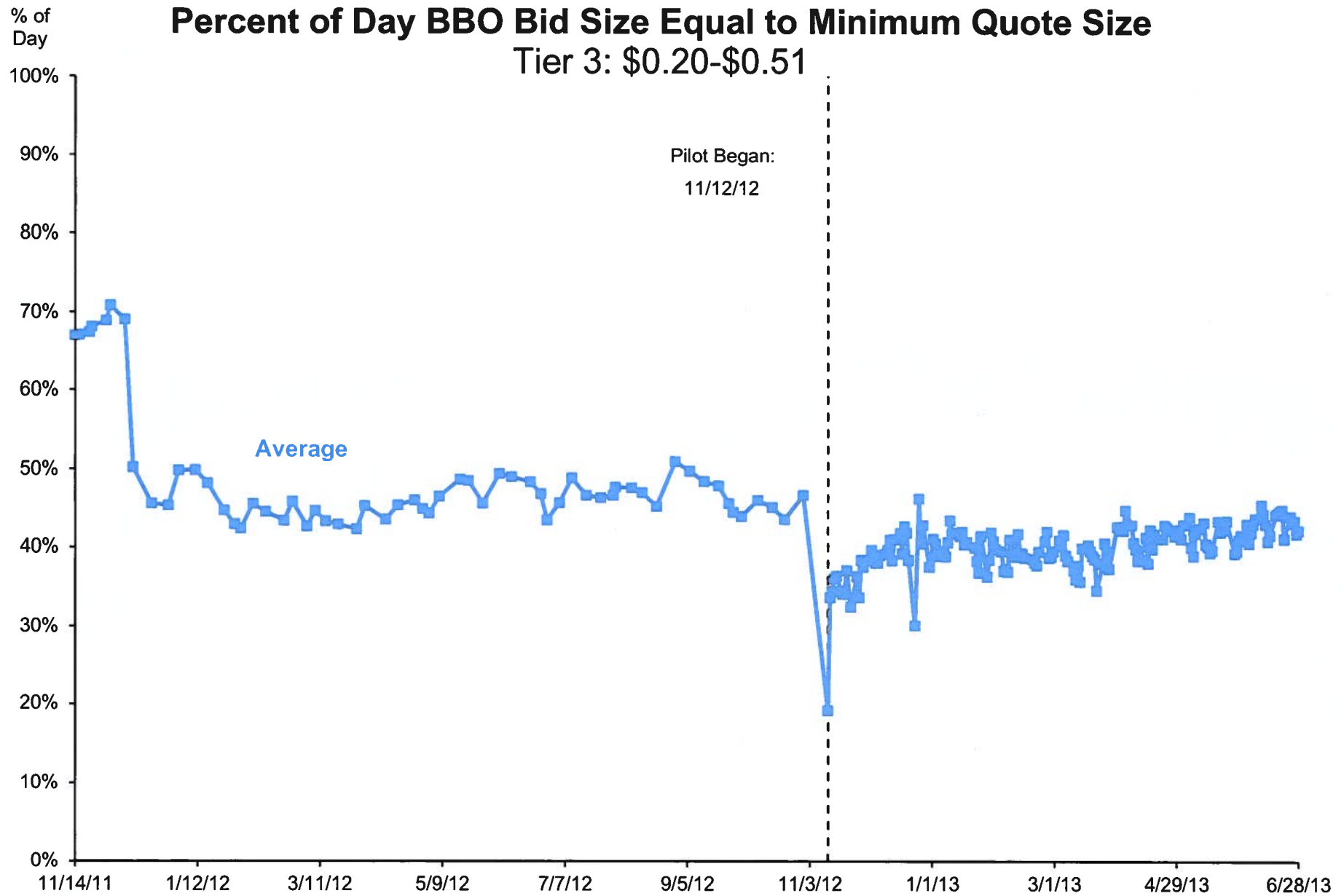
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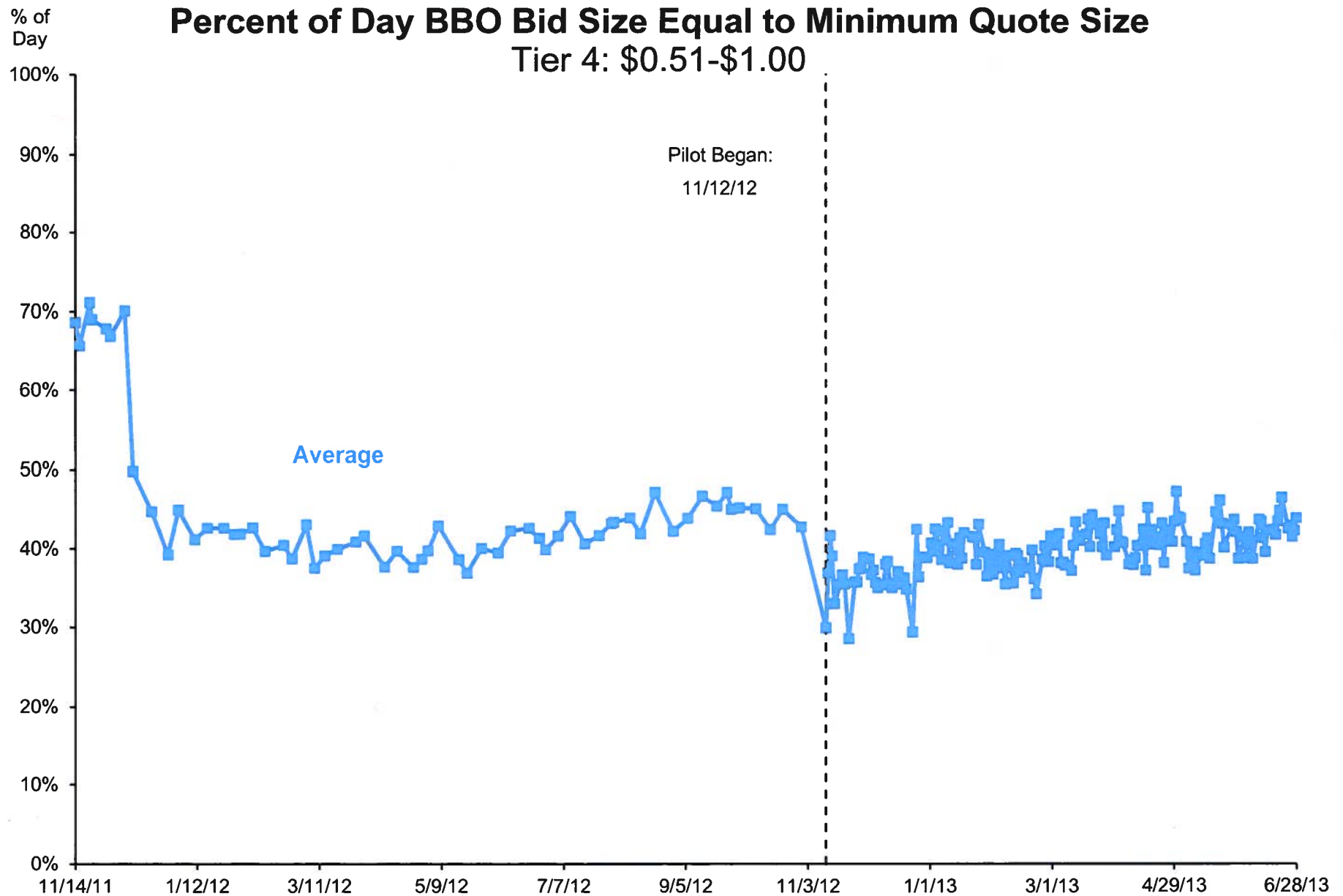
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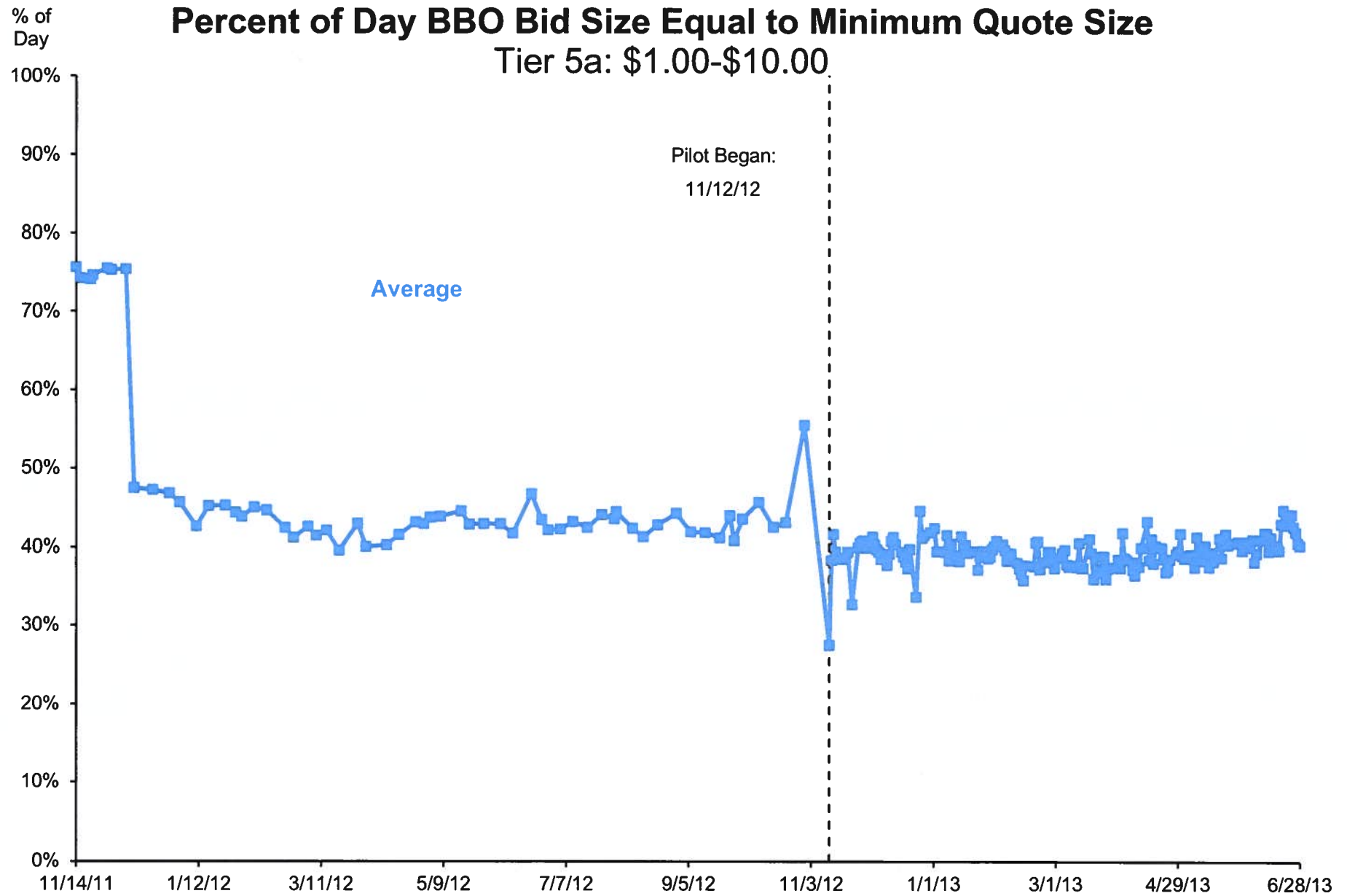


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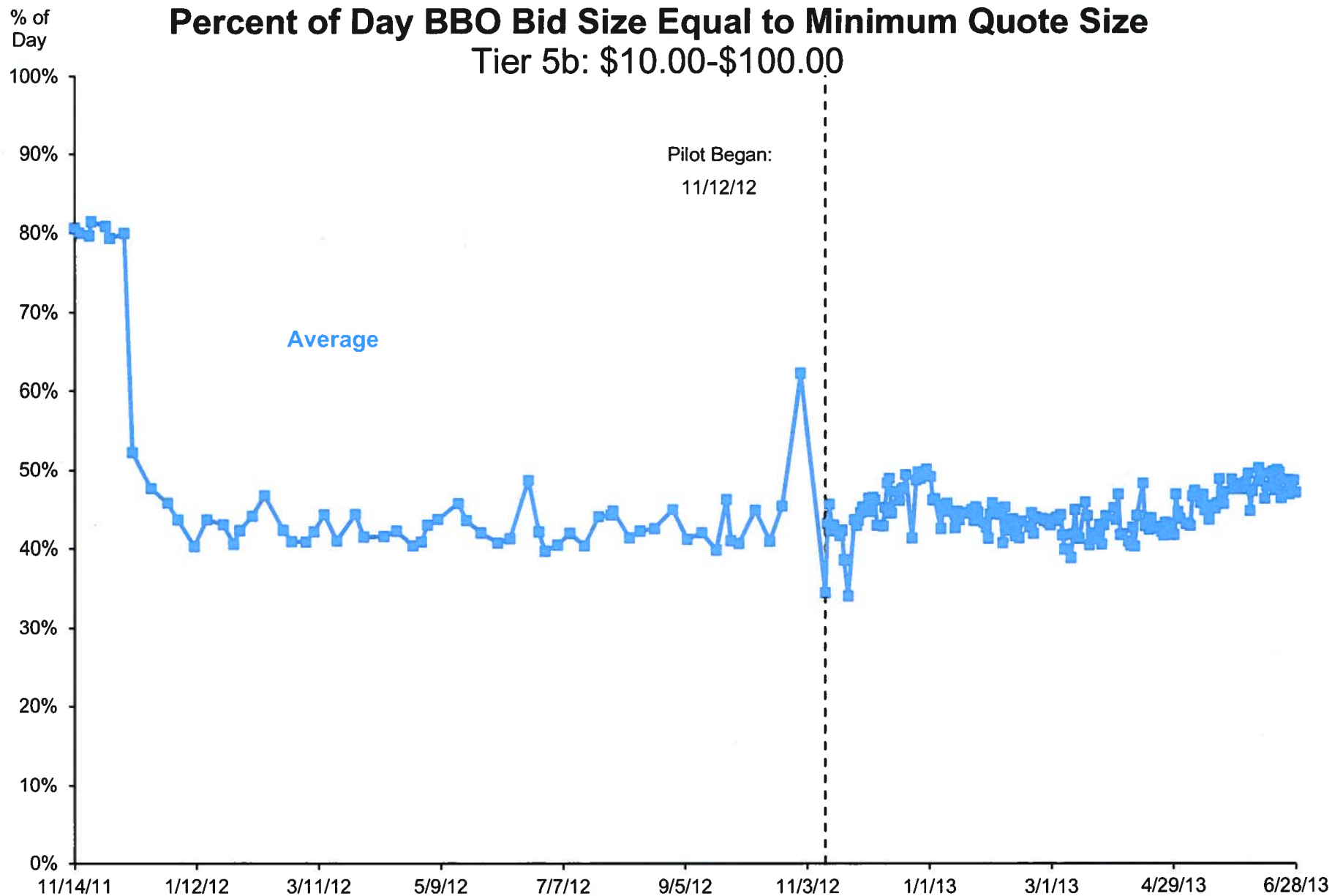






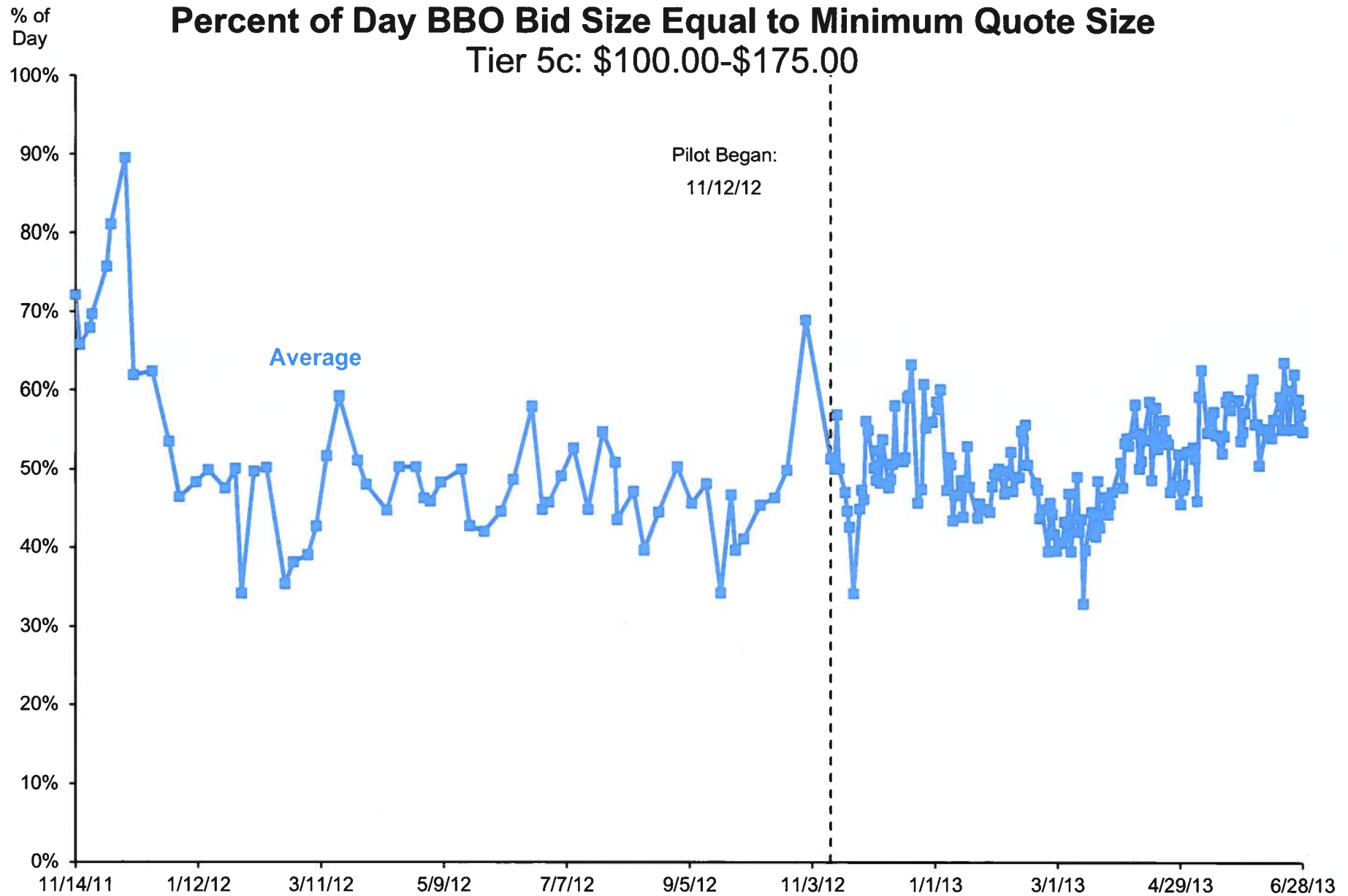
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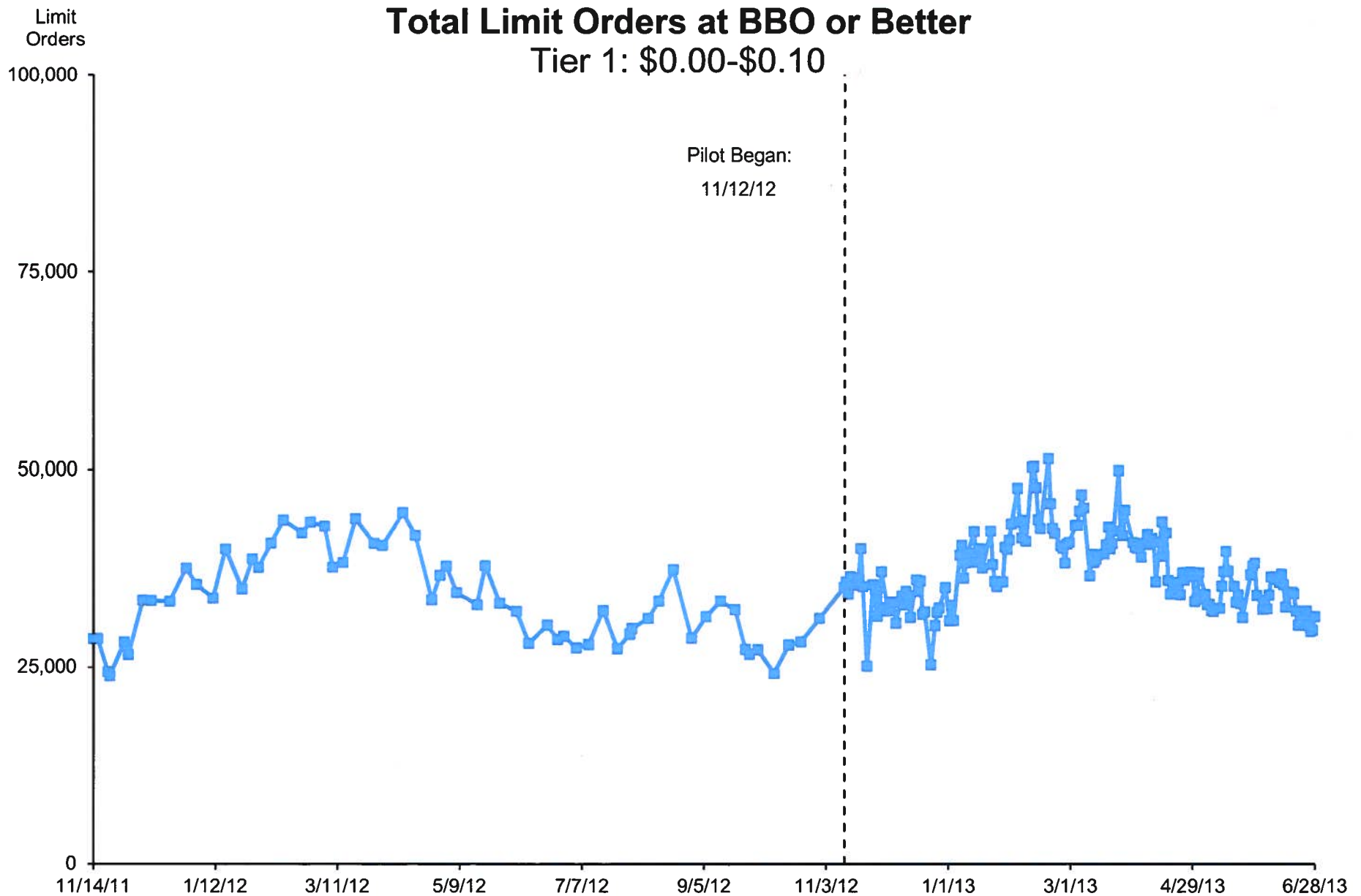
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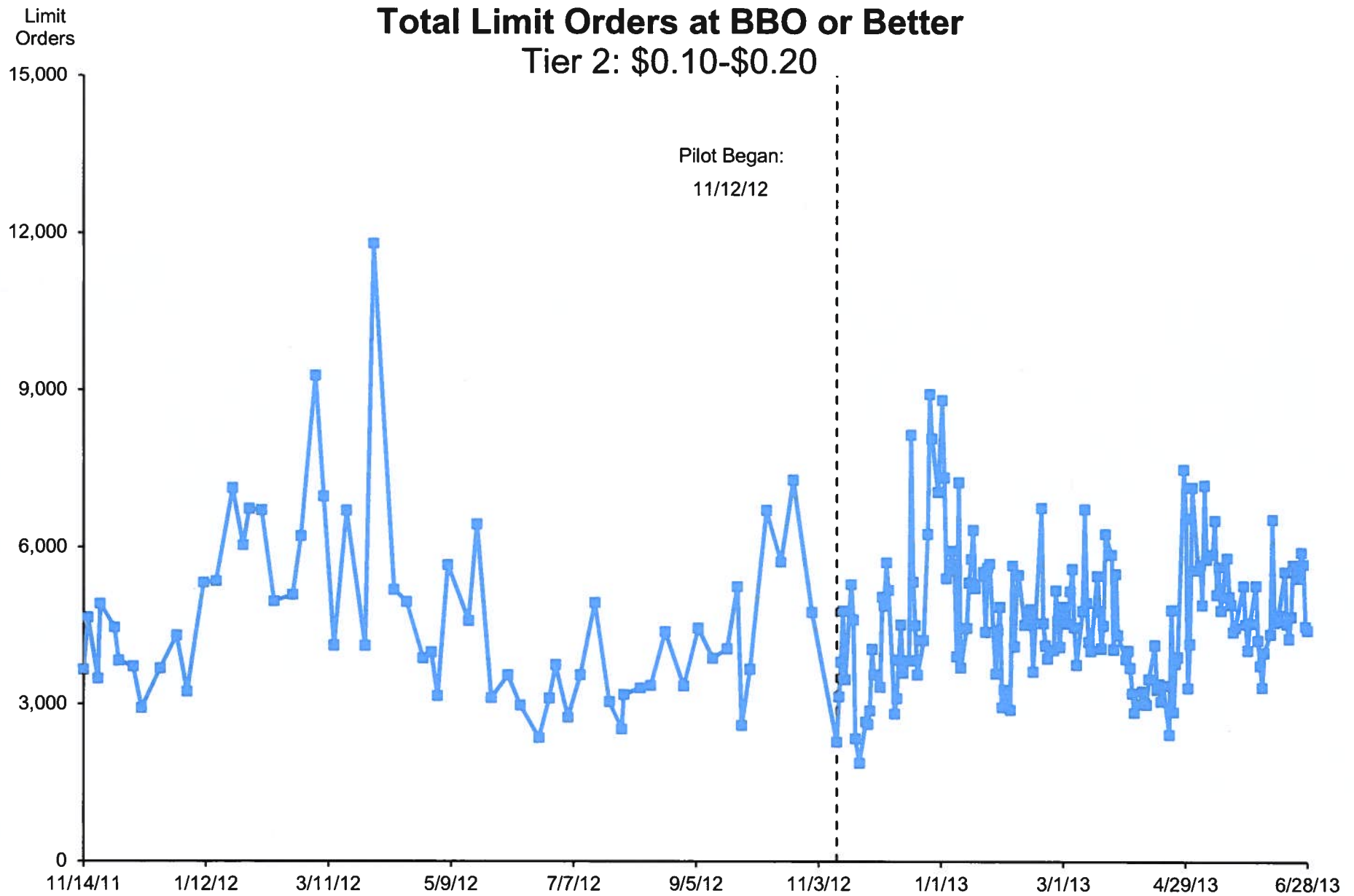
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Note: Percents are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements.



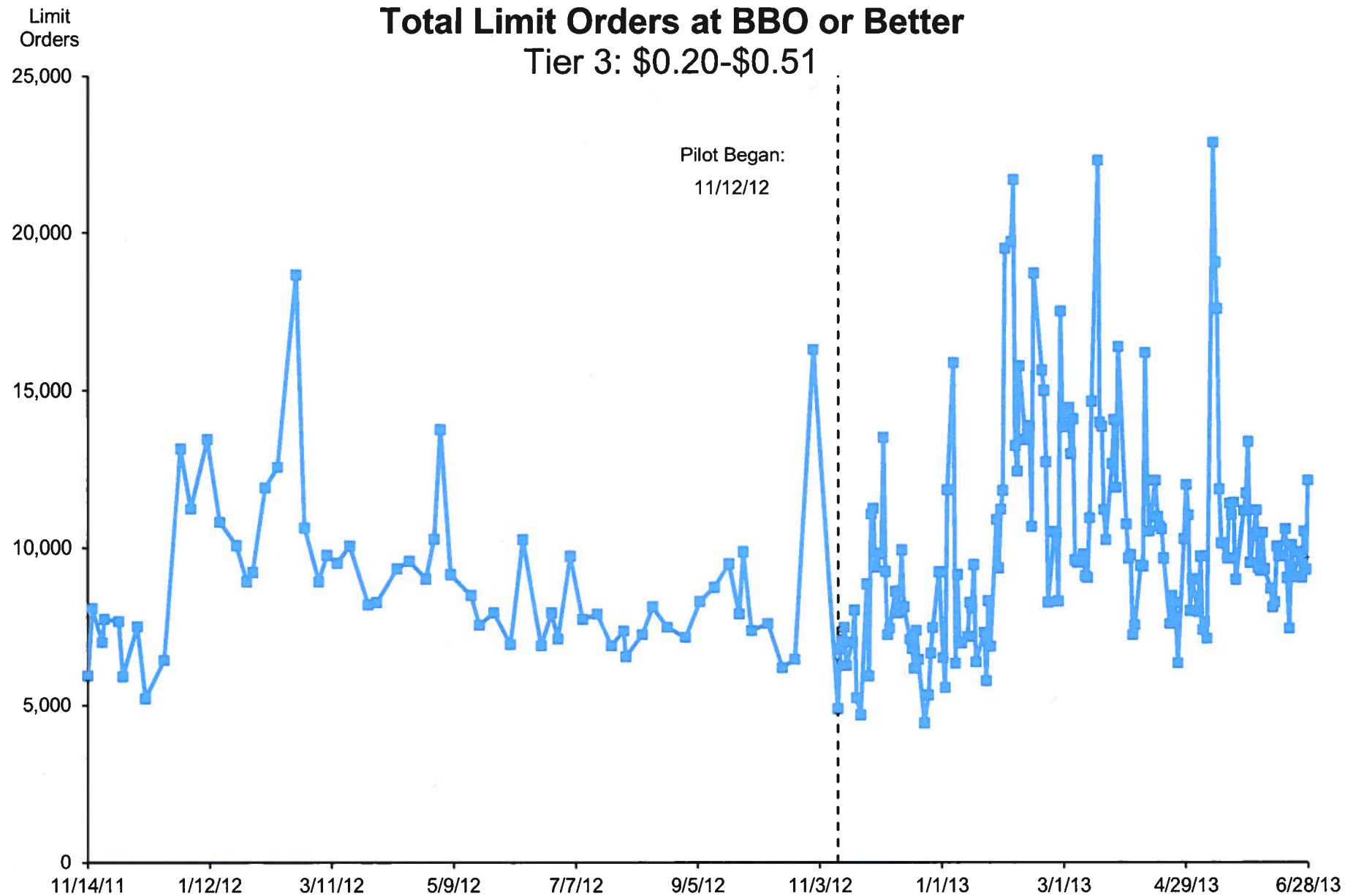
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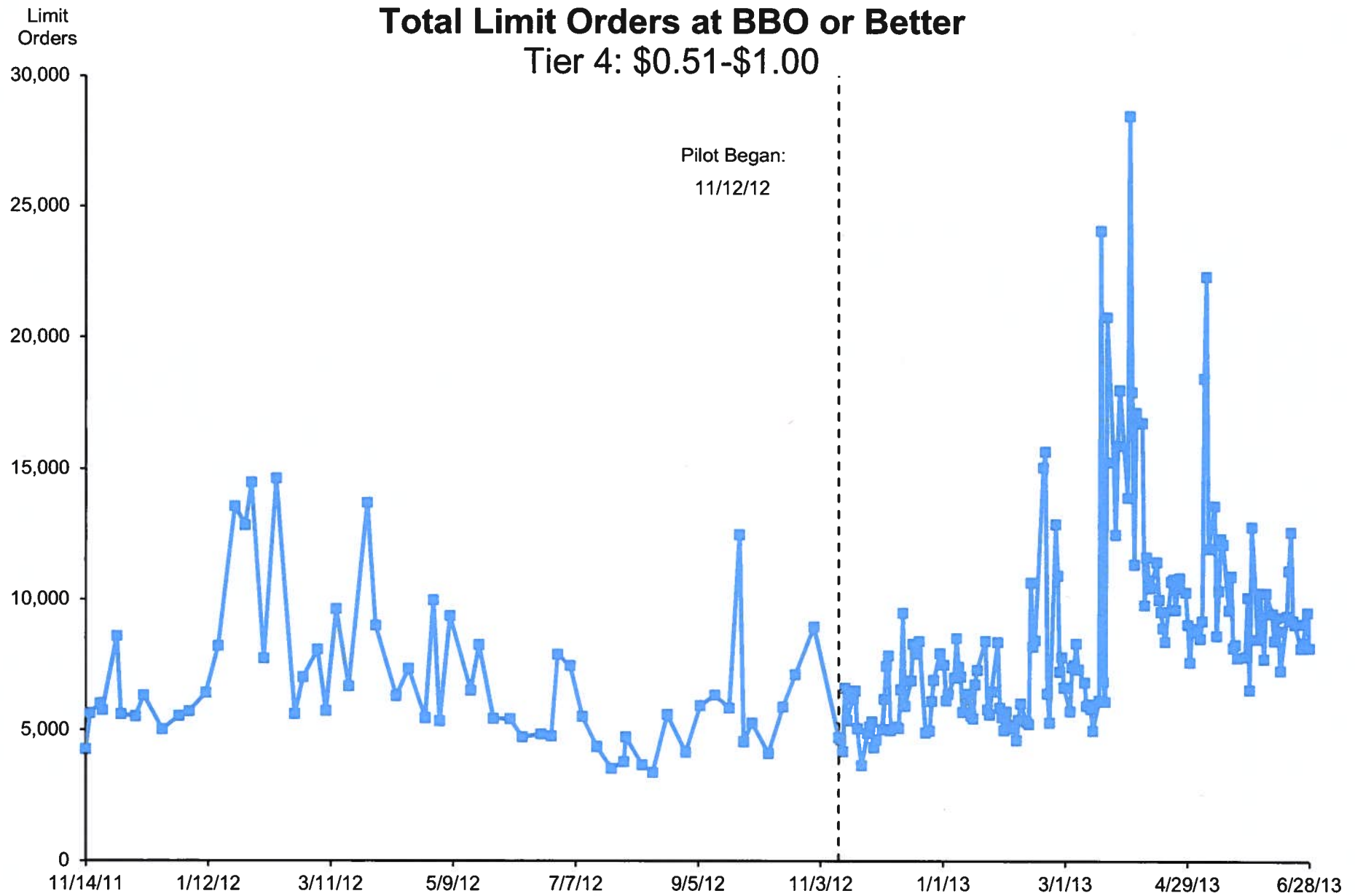
Note: Orders are excluded if valid quotes during the day span more than one tier. Includes limit orders at BBO or better for stocks priced according to amended tier definitions. For stocks in this tier, FINRA Rule 6433 increased the minimum depth from 5,000 to 10,000.



Source: OTC Link

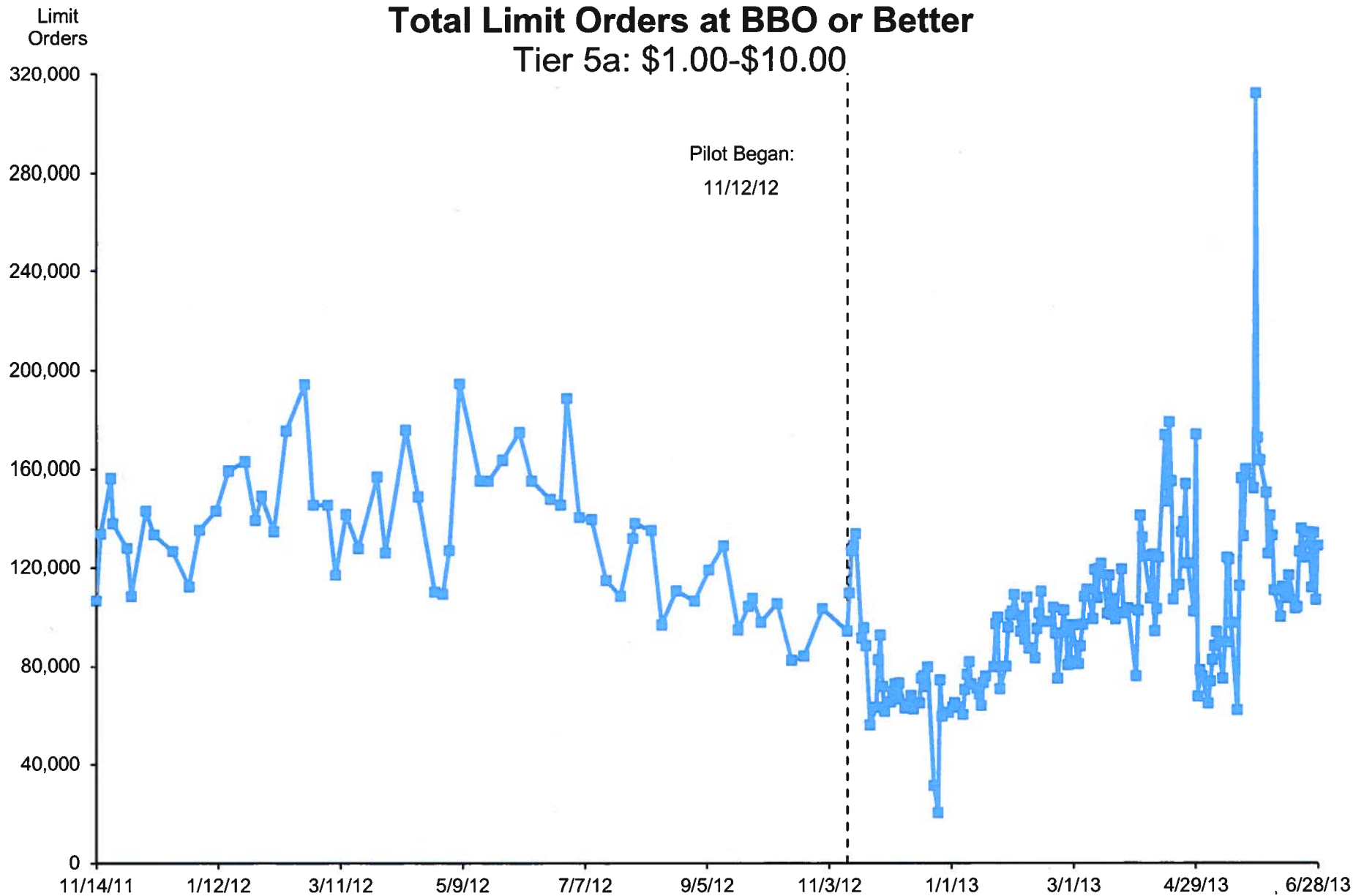
Note: Orders are excluded if valid quotes during the day span more than one tier. Includes limit orders at BBO or better for stocks priced according to amended tier definitions. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements.





Source: OTC Link

Note: Orders are excluded if valid quotes during the day span more than one tier. Includes limit orders at BBO or better for stocks priced according to amended tier definitions. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 2,500 to 1,000.

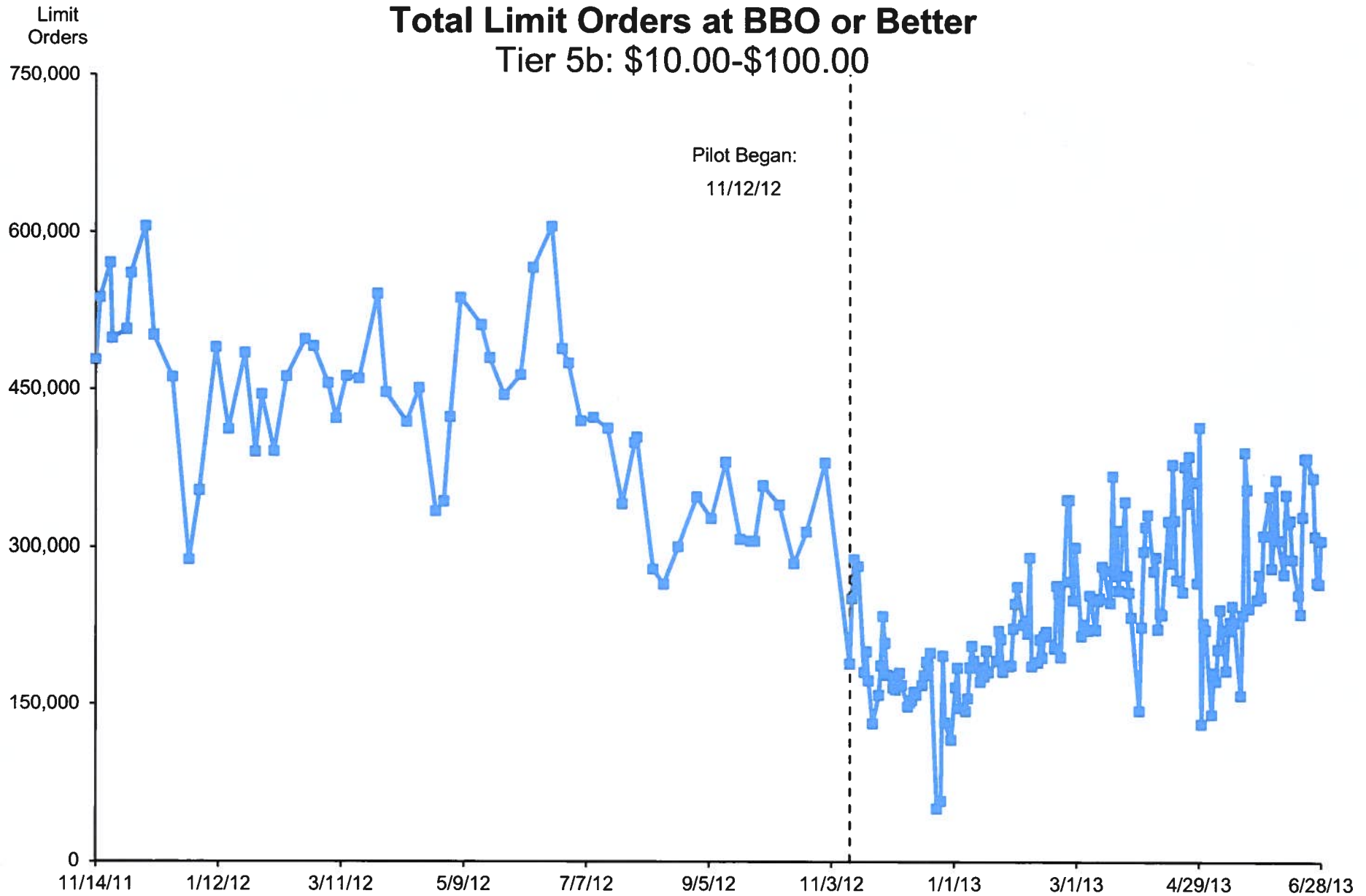


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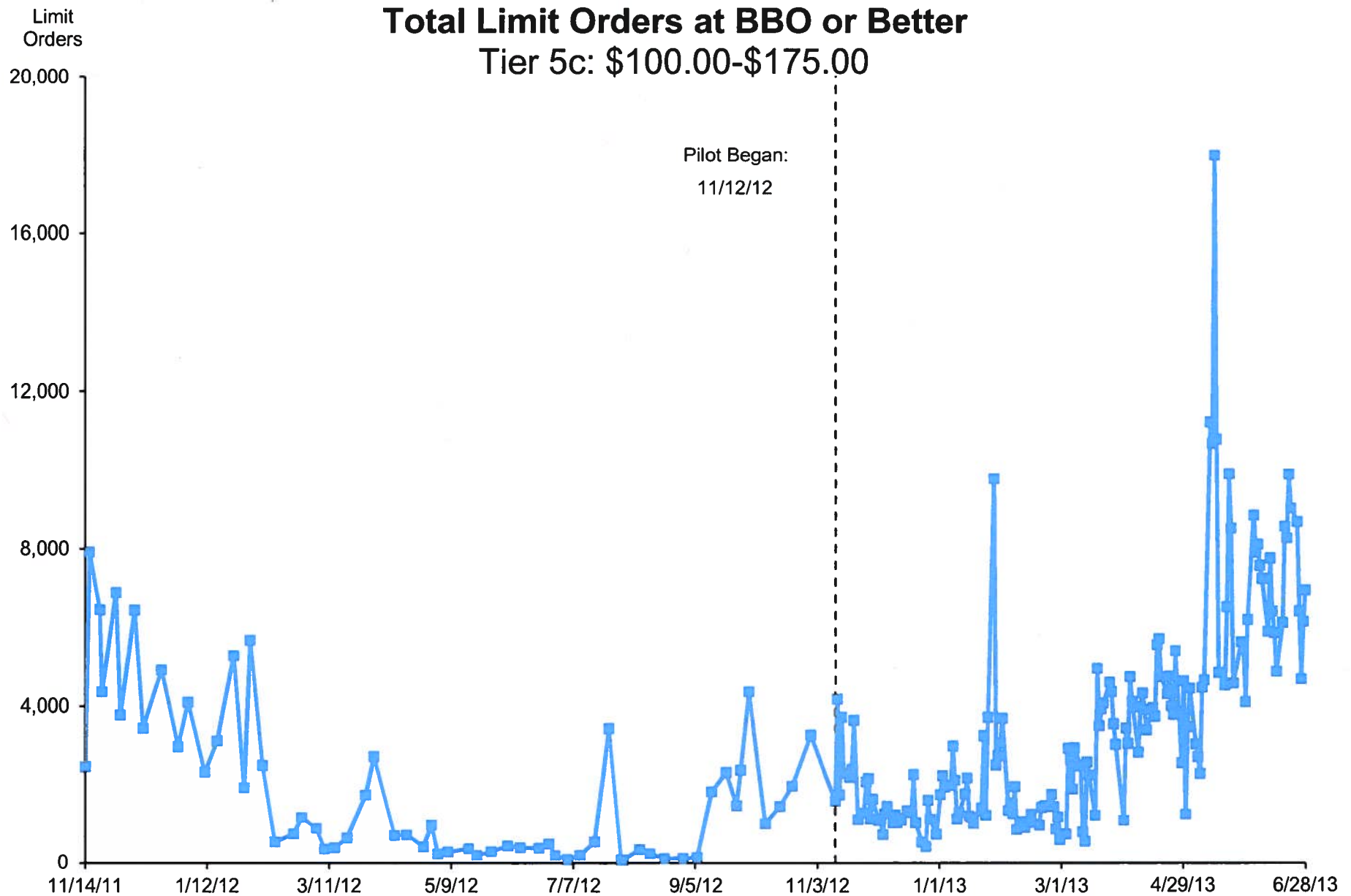


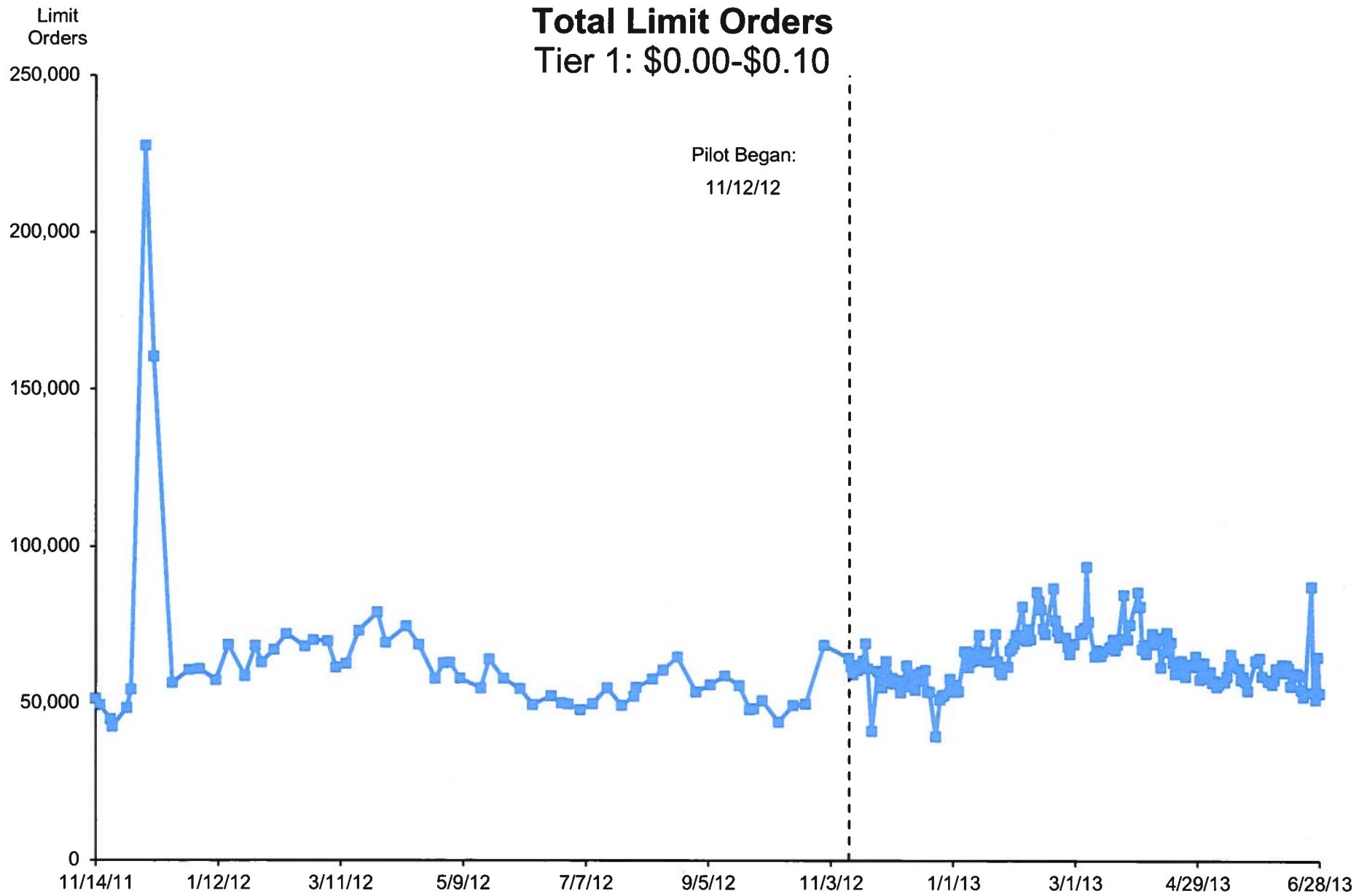
# **Total Limit Orders at BBO or Better** **Tier 5b: \$10.00-\$100.00**

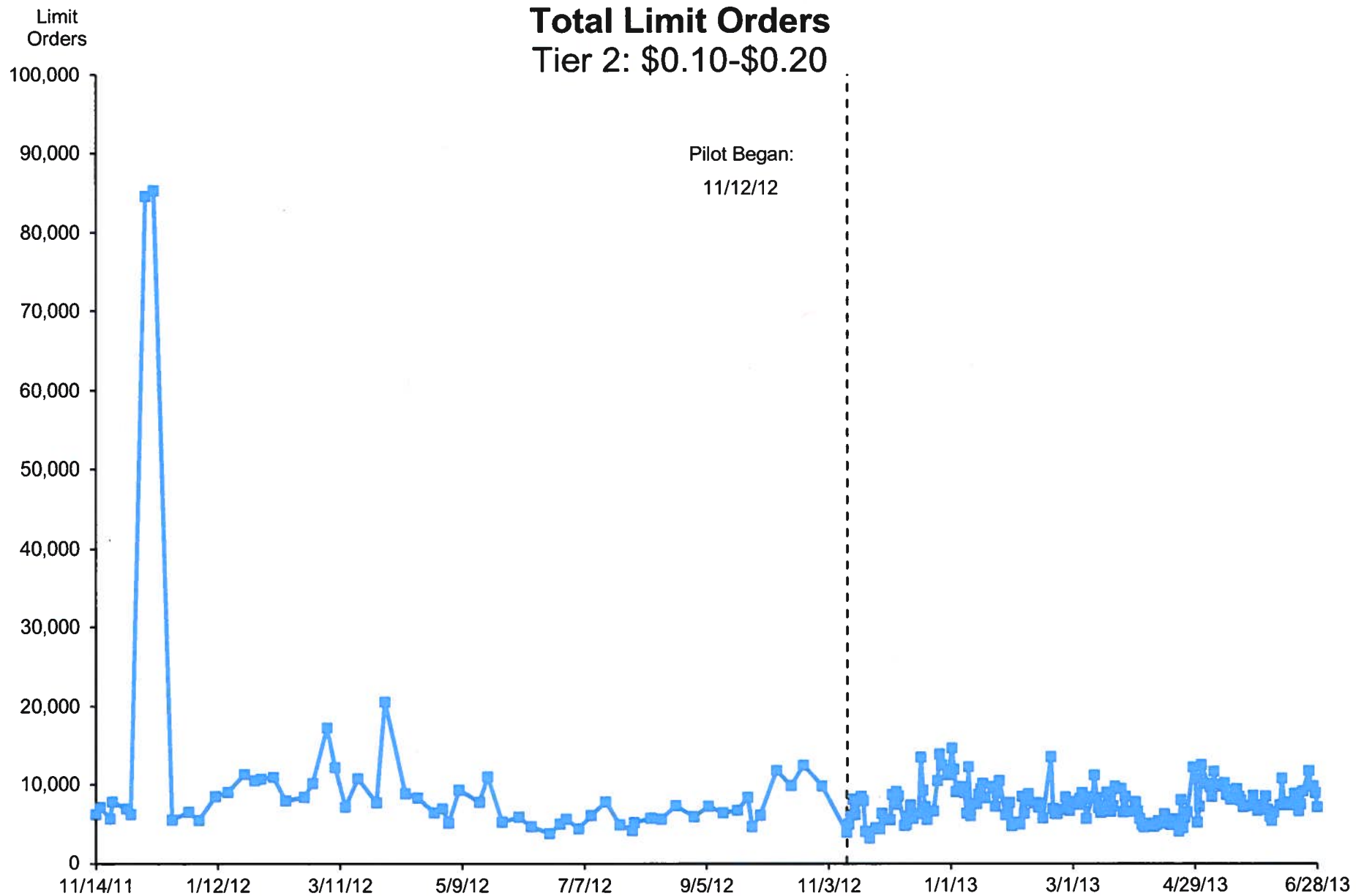


Source: OTC Link

Note: Orders are excluded if valid quotes during the day span more than one tier. Includes limit orders at BBO or better for stocks priced according to amended tier definitions. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 200 to 100.

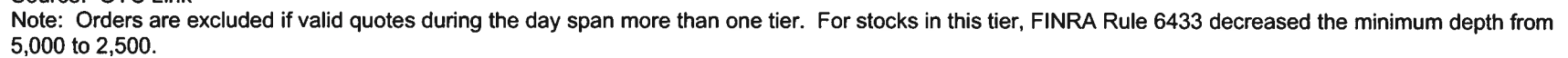


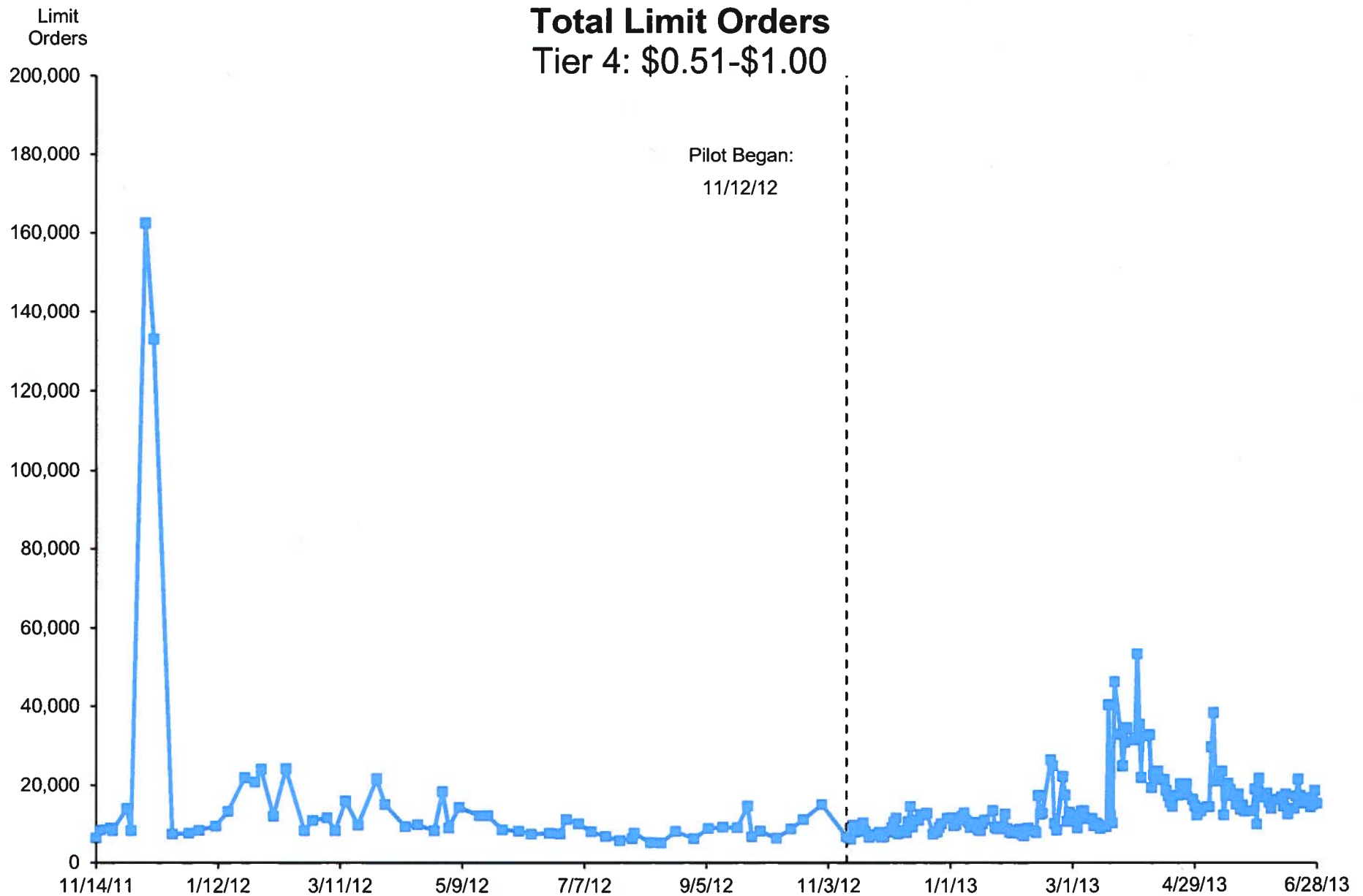


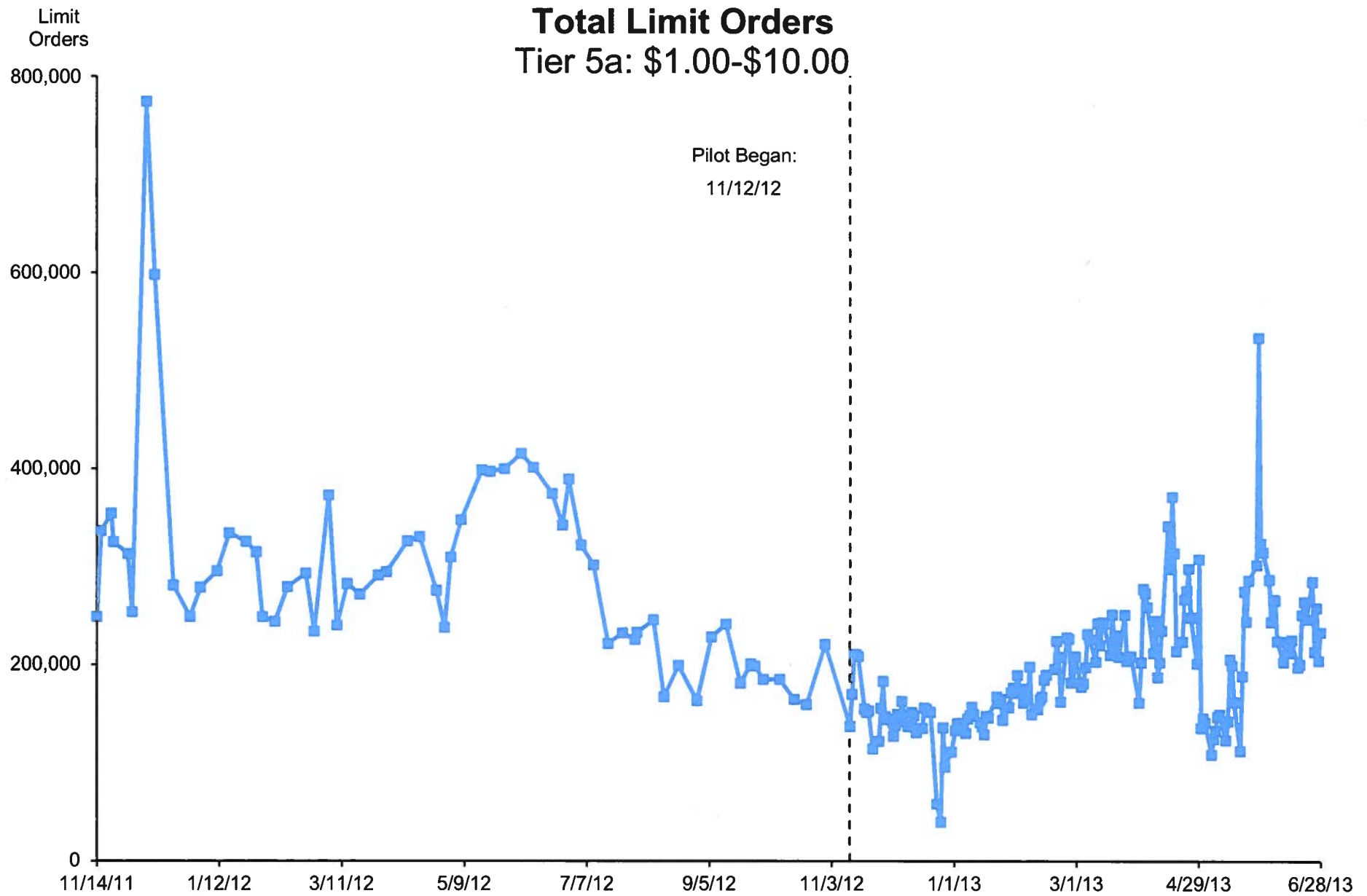


Source: OTC Link

Note: Orders are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements.

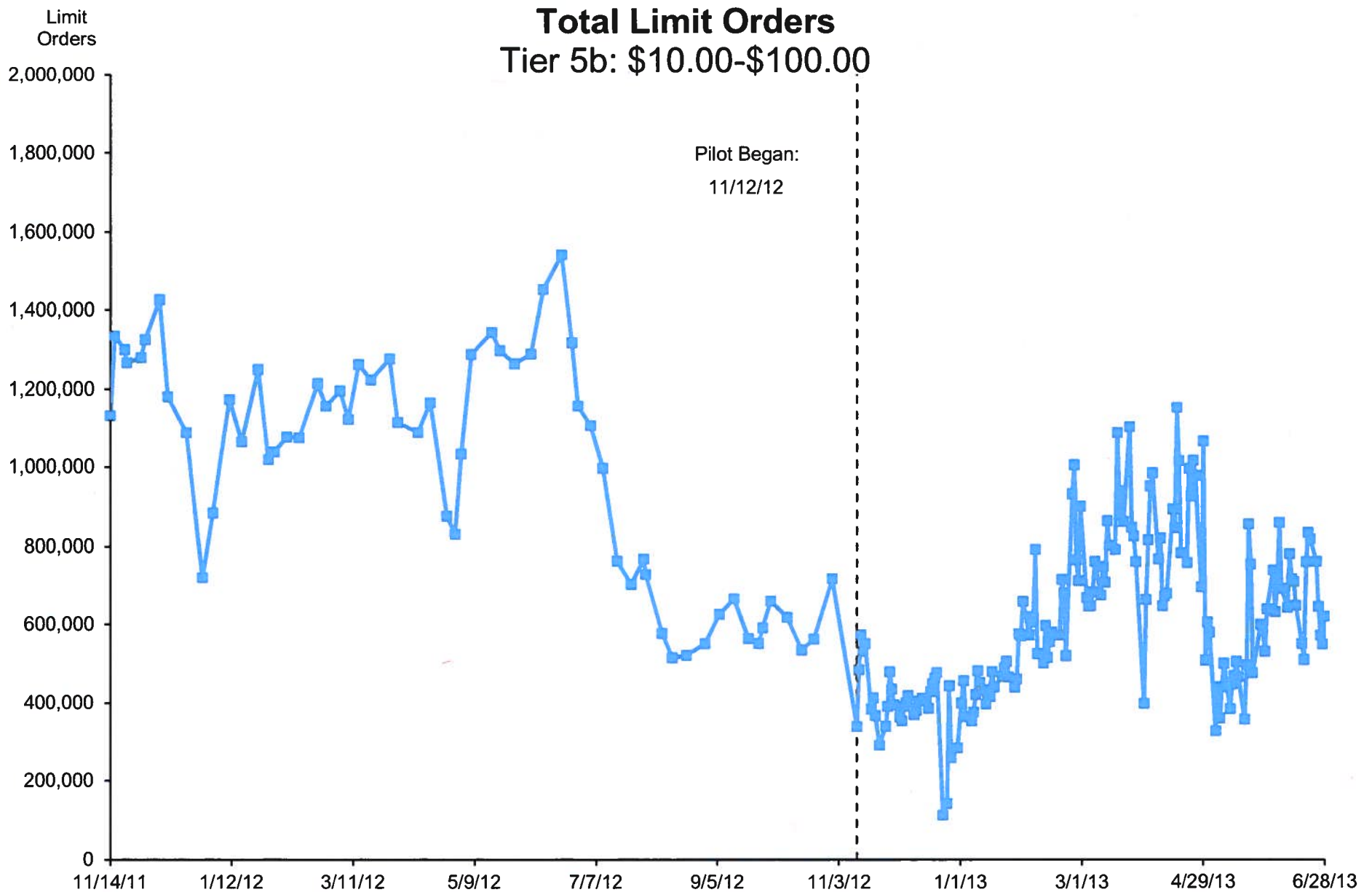




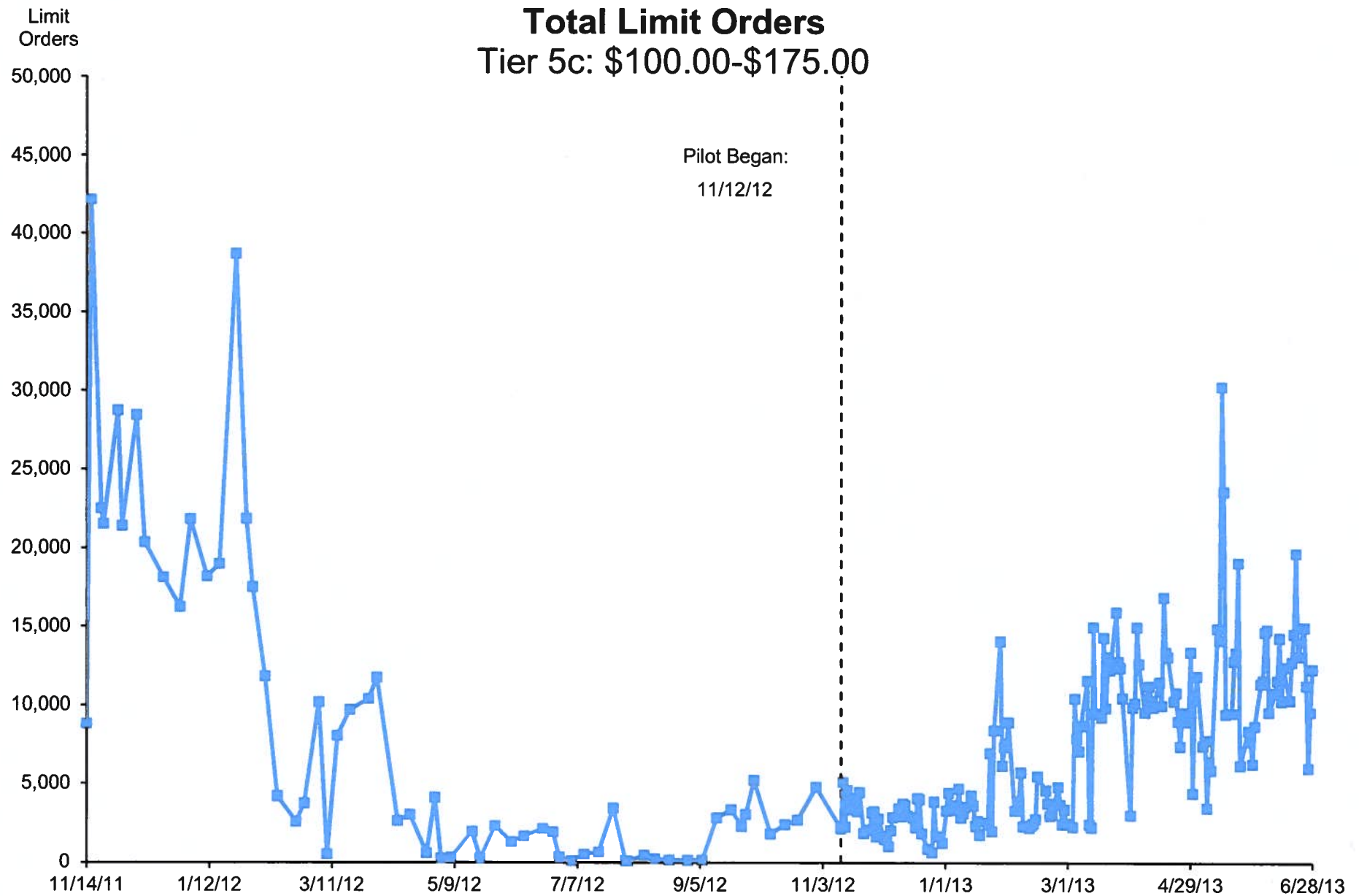


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Note: Orders are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 500 to 100.

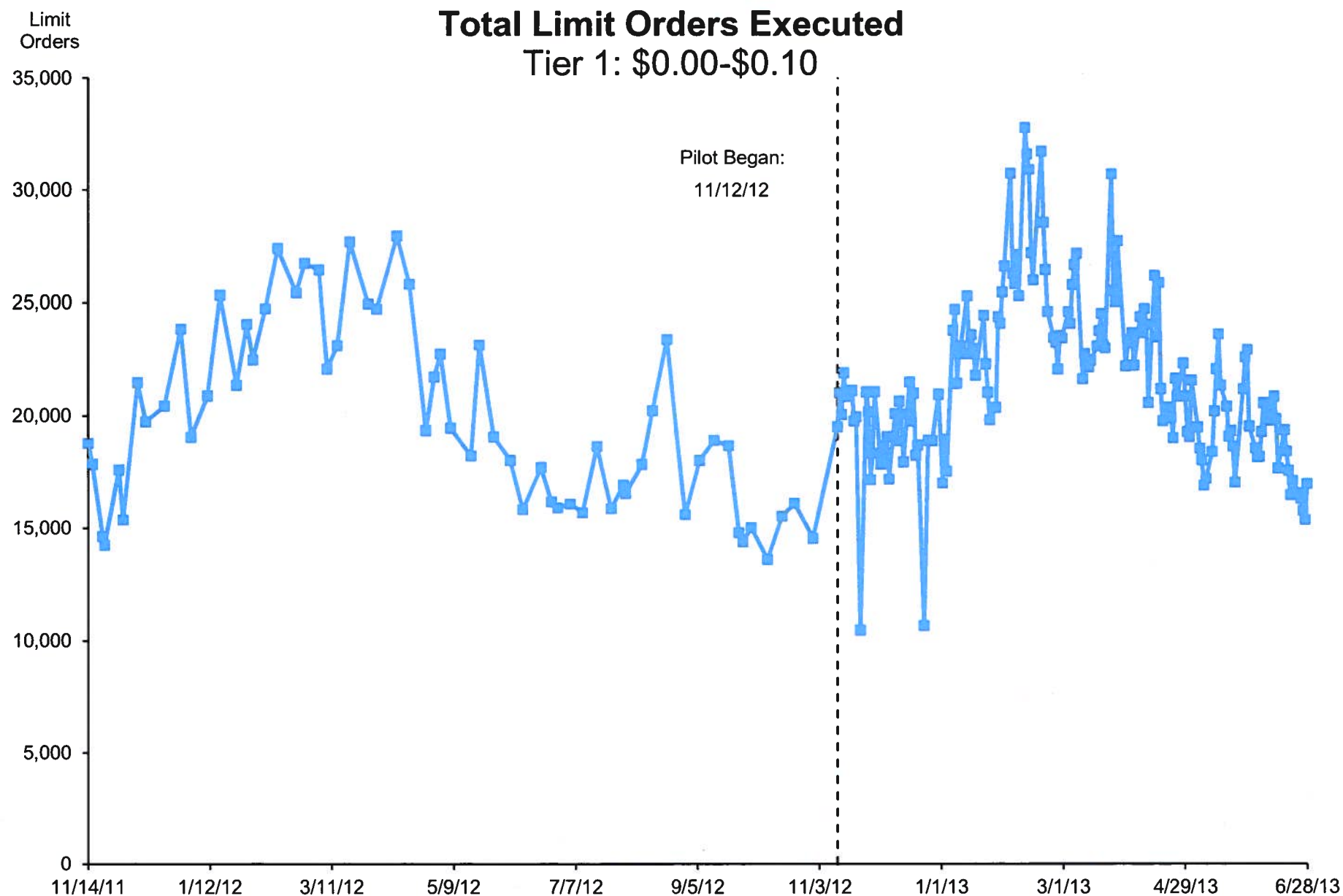






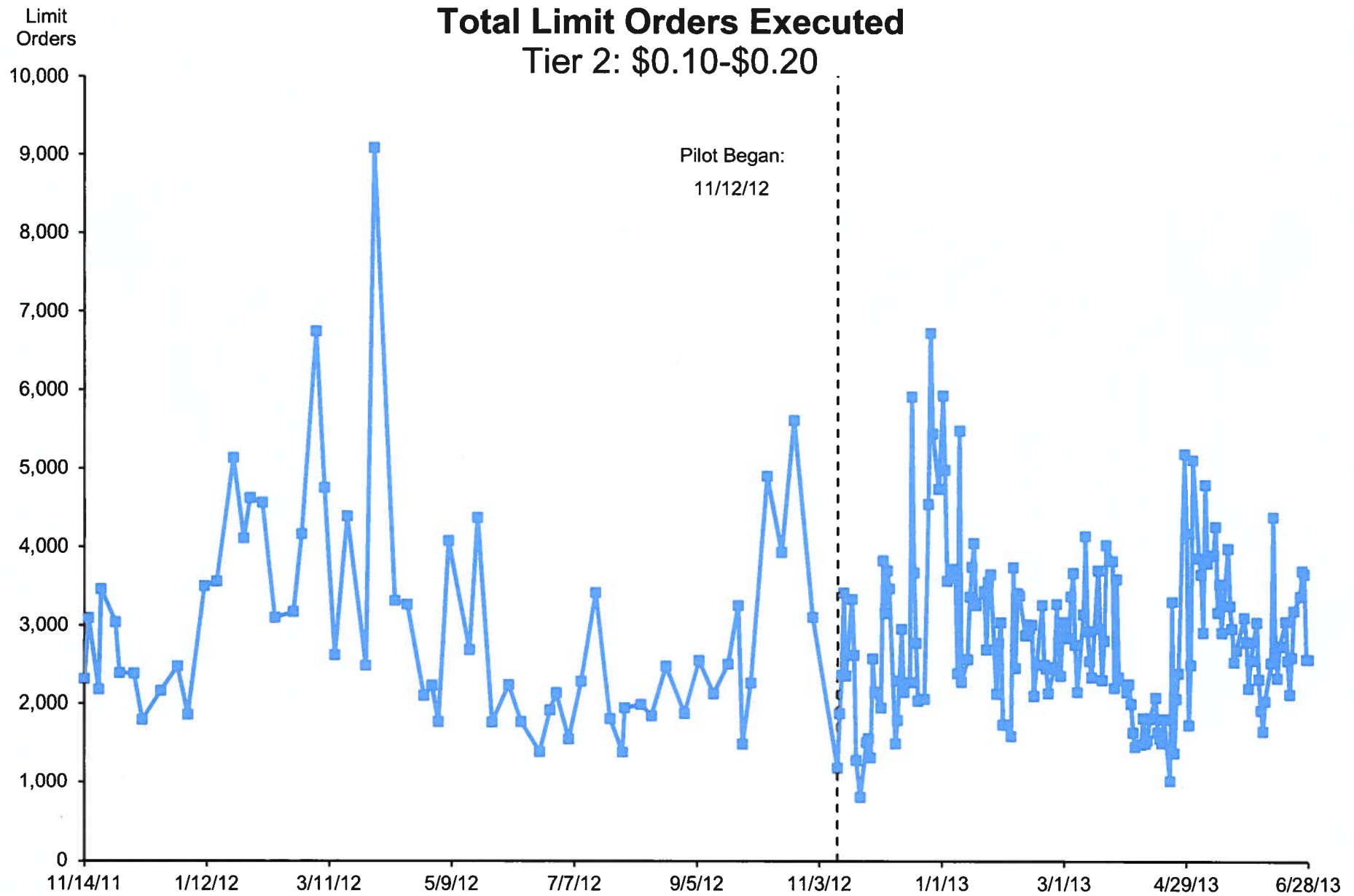
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Note: Orders are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements.



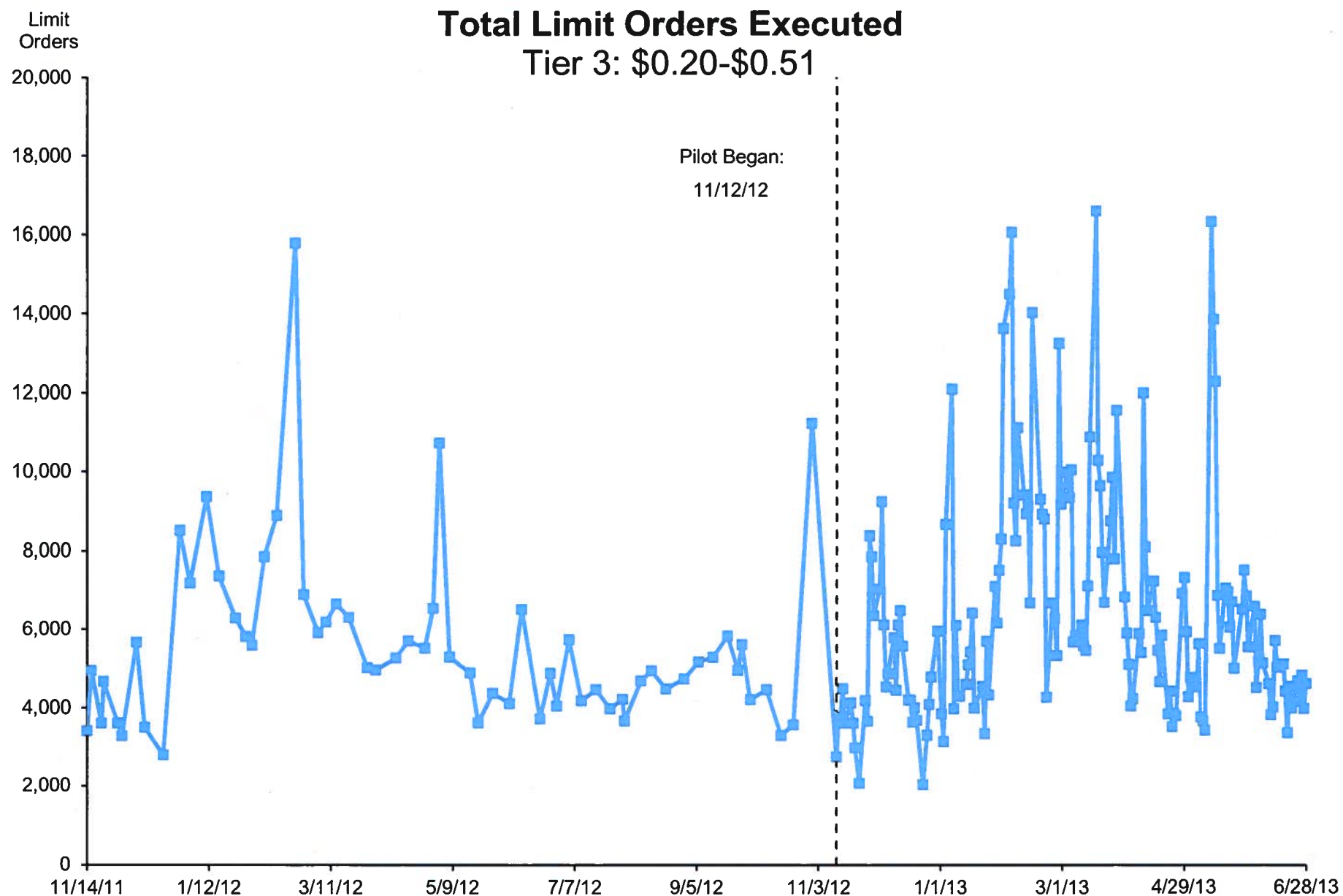
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Note: Orders are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 increased the minimum depth from 5,000 to 10,000.



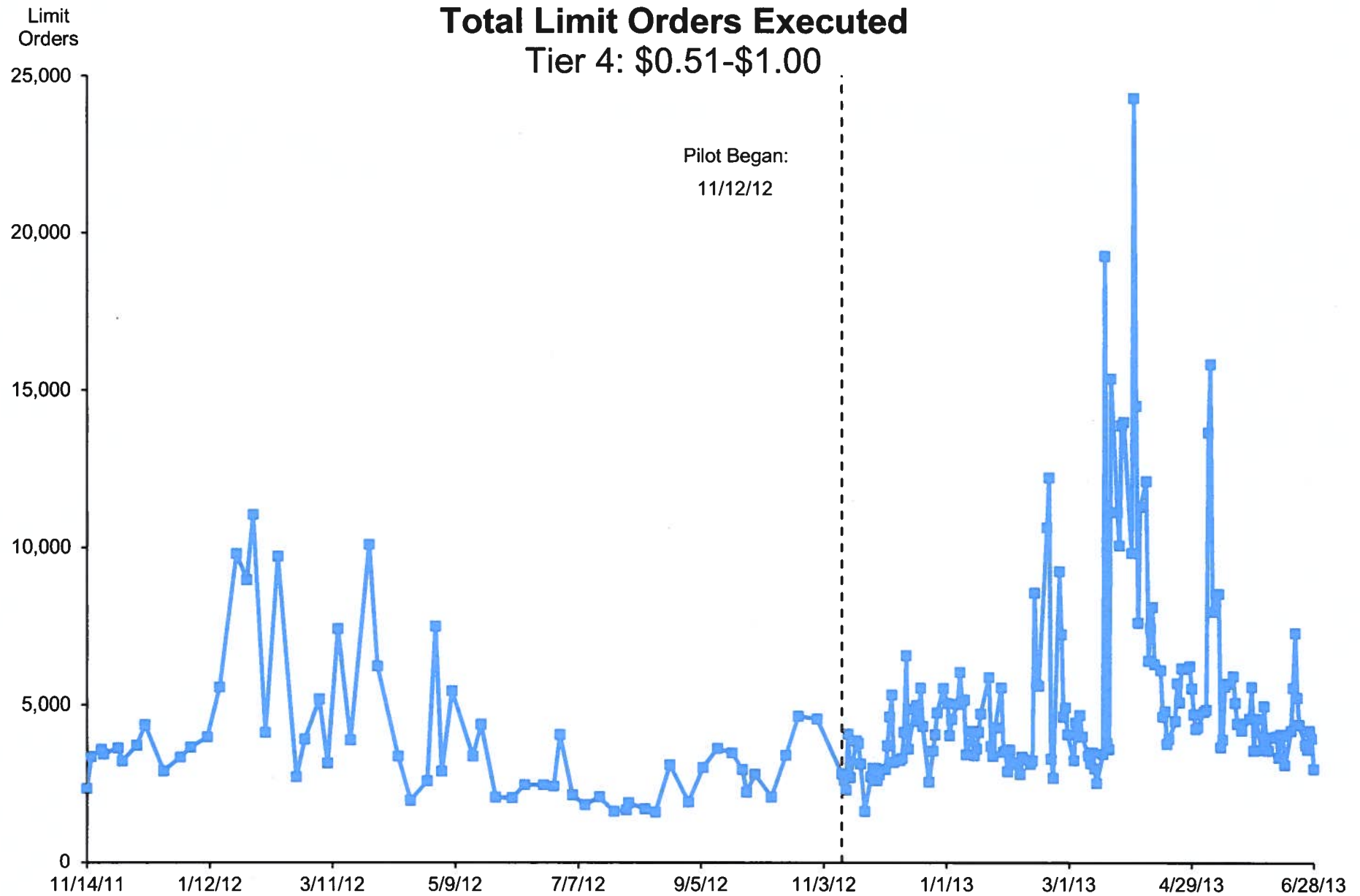
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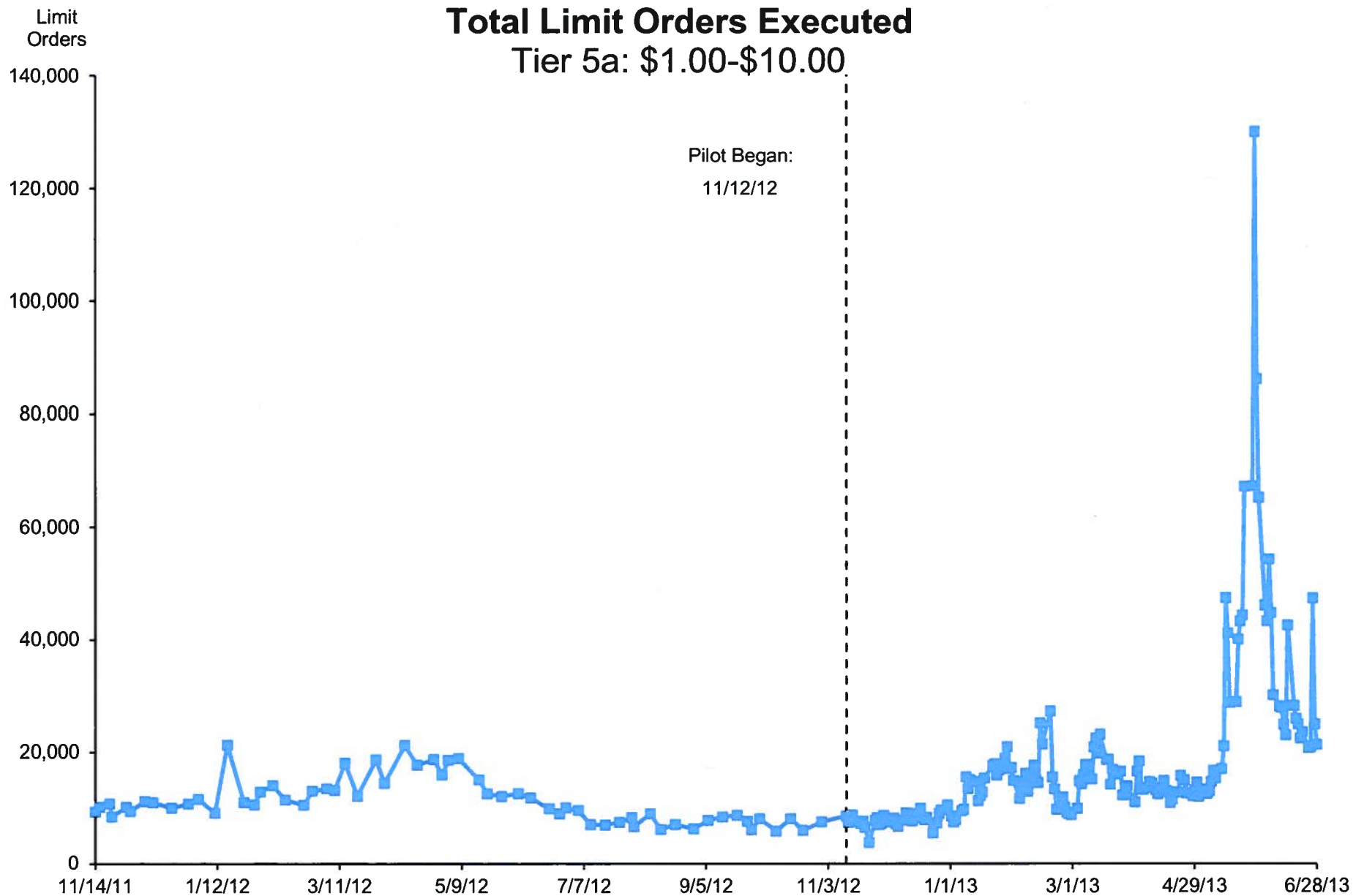
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Source: OTC Link

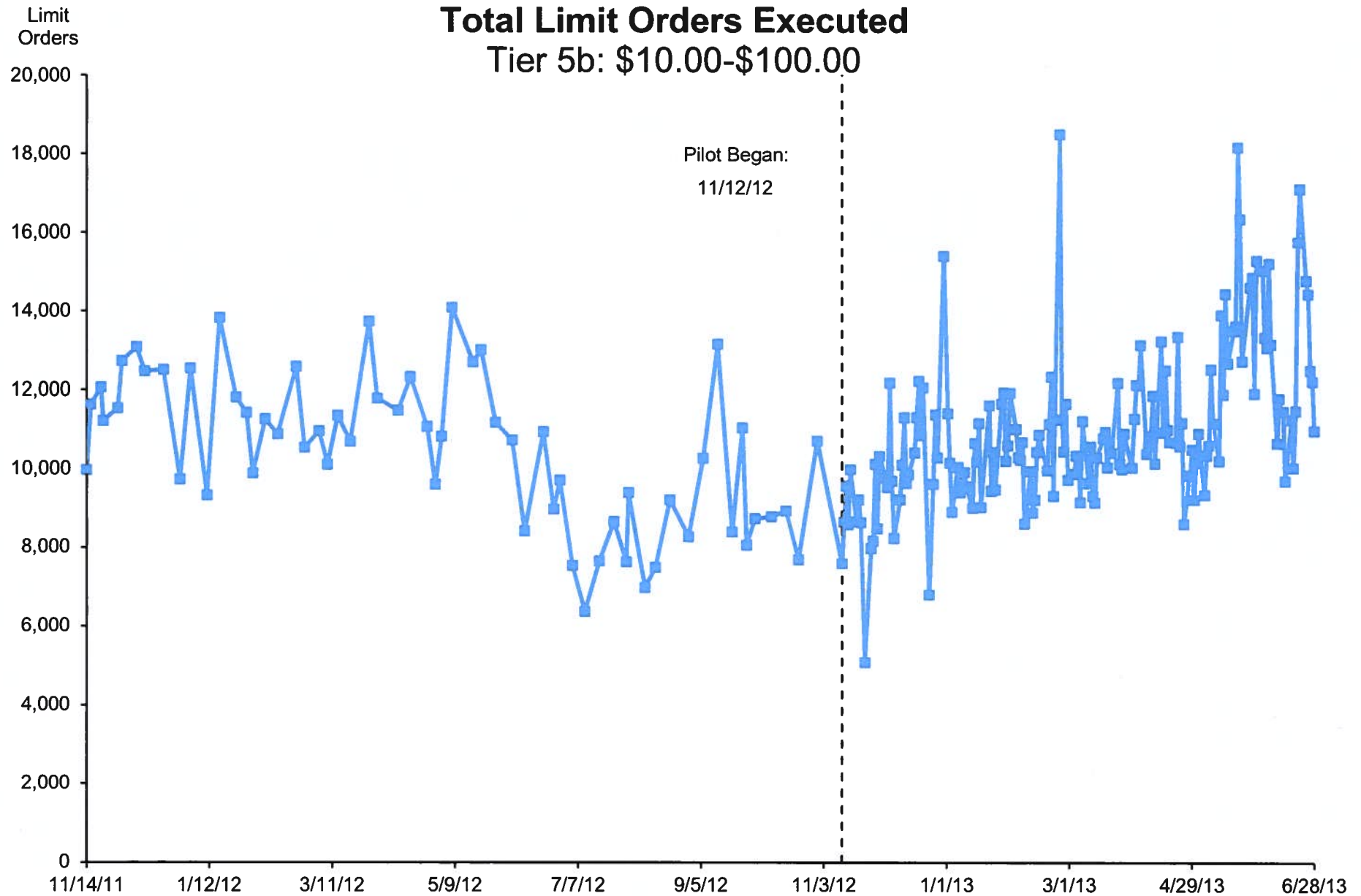
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Source: OTC Link

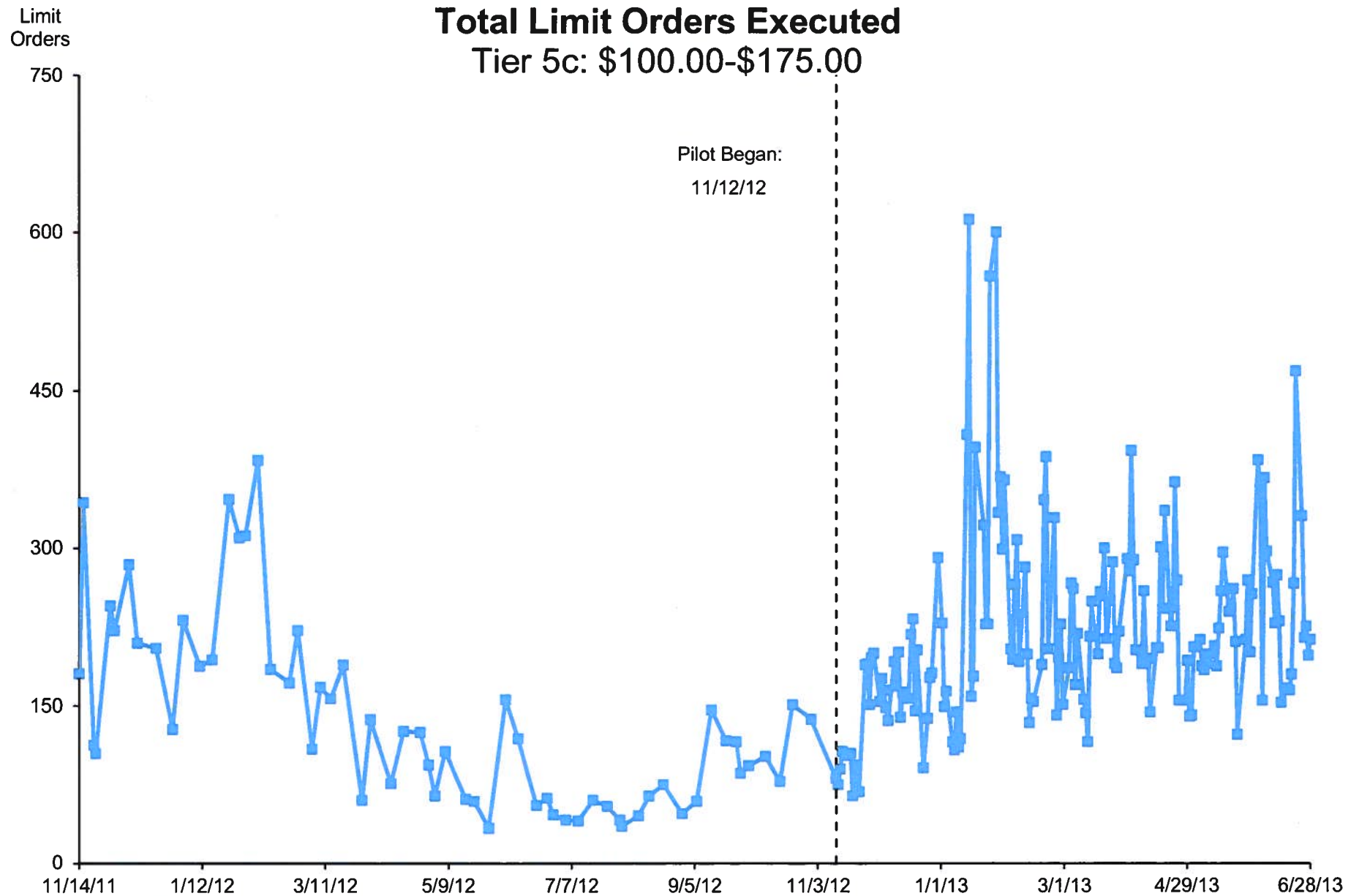
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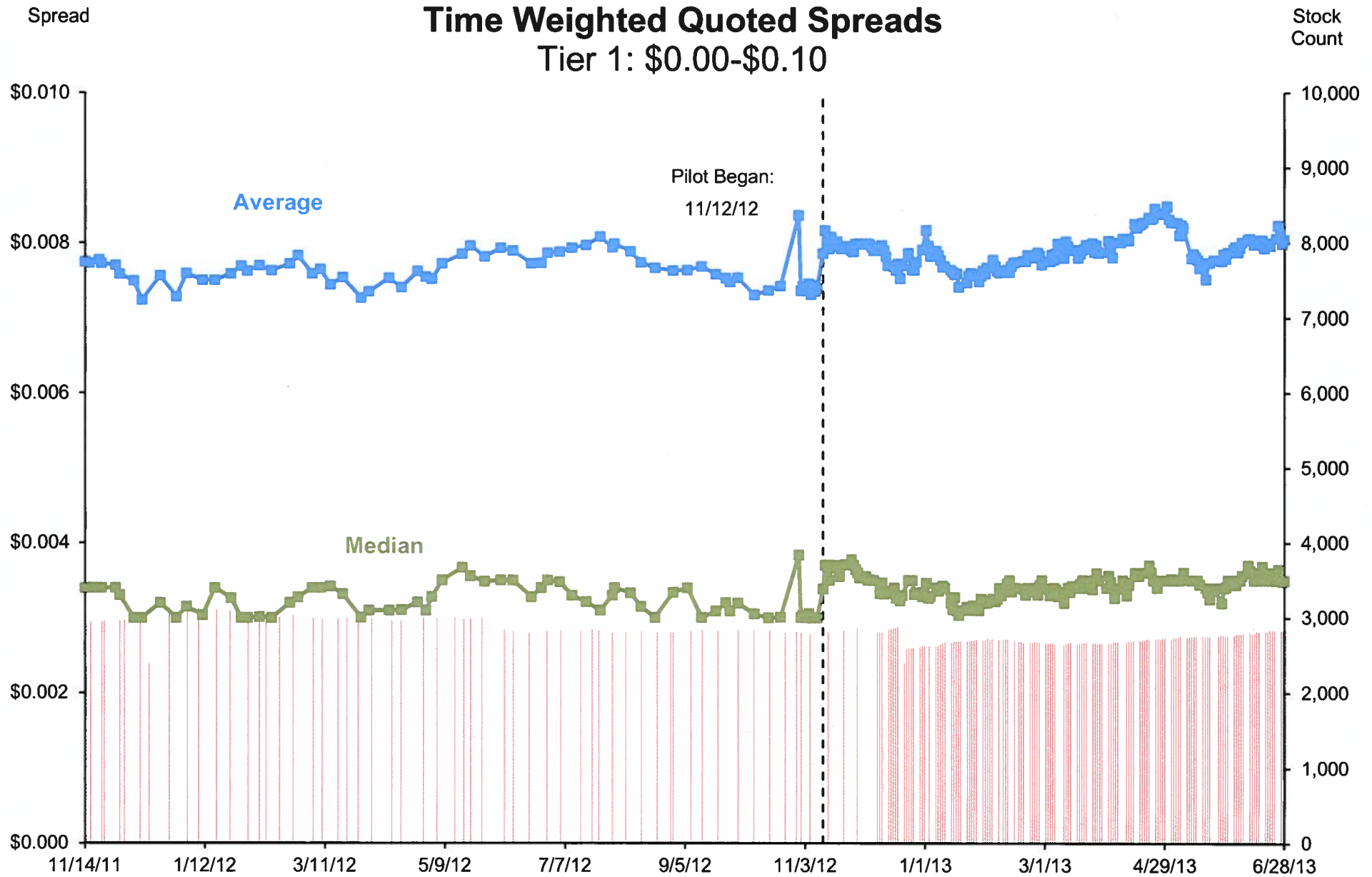
Source: OTC Link

Note: Orders are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 200 to 100.



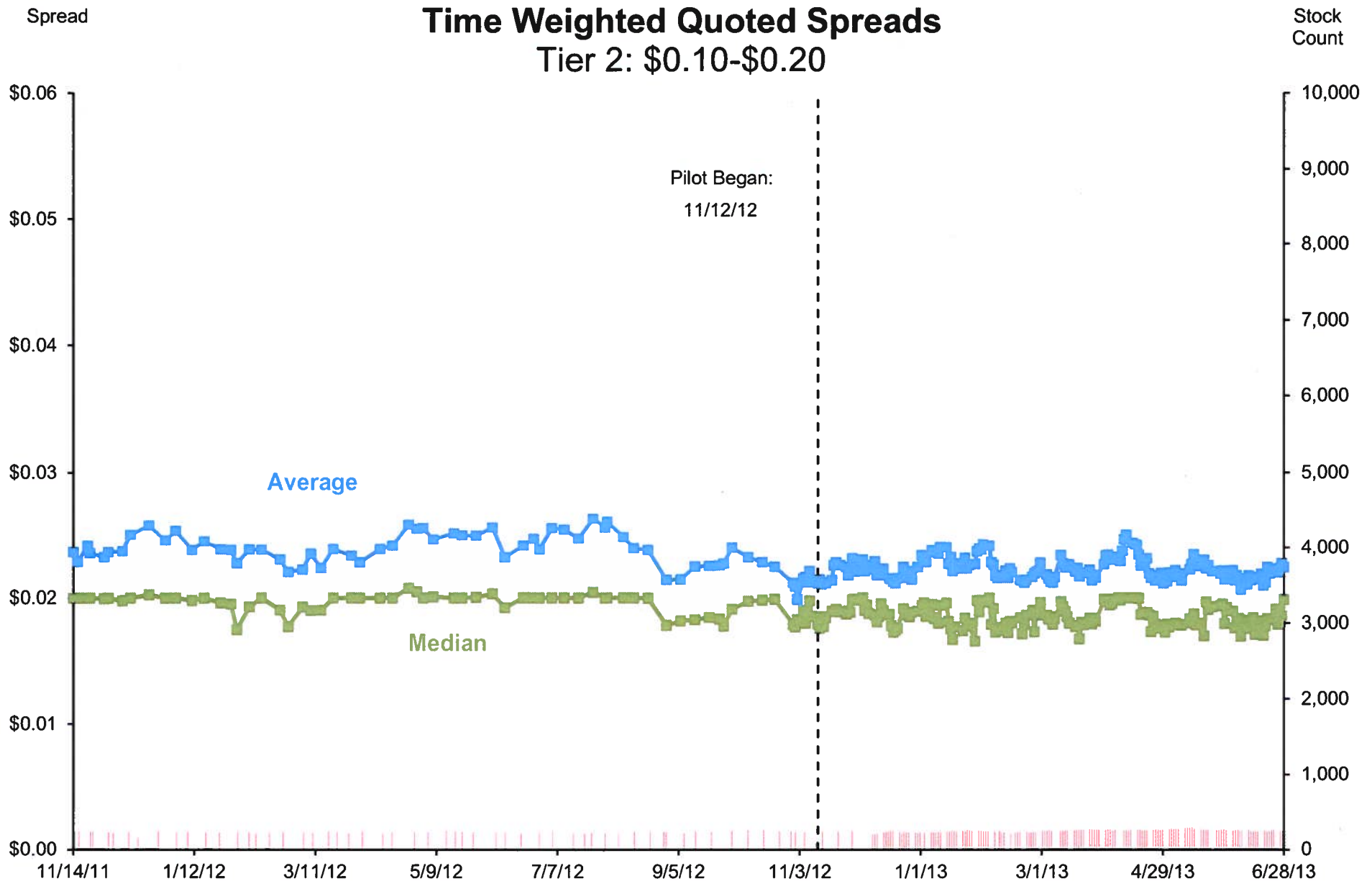






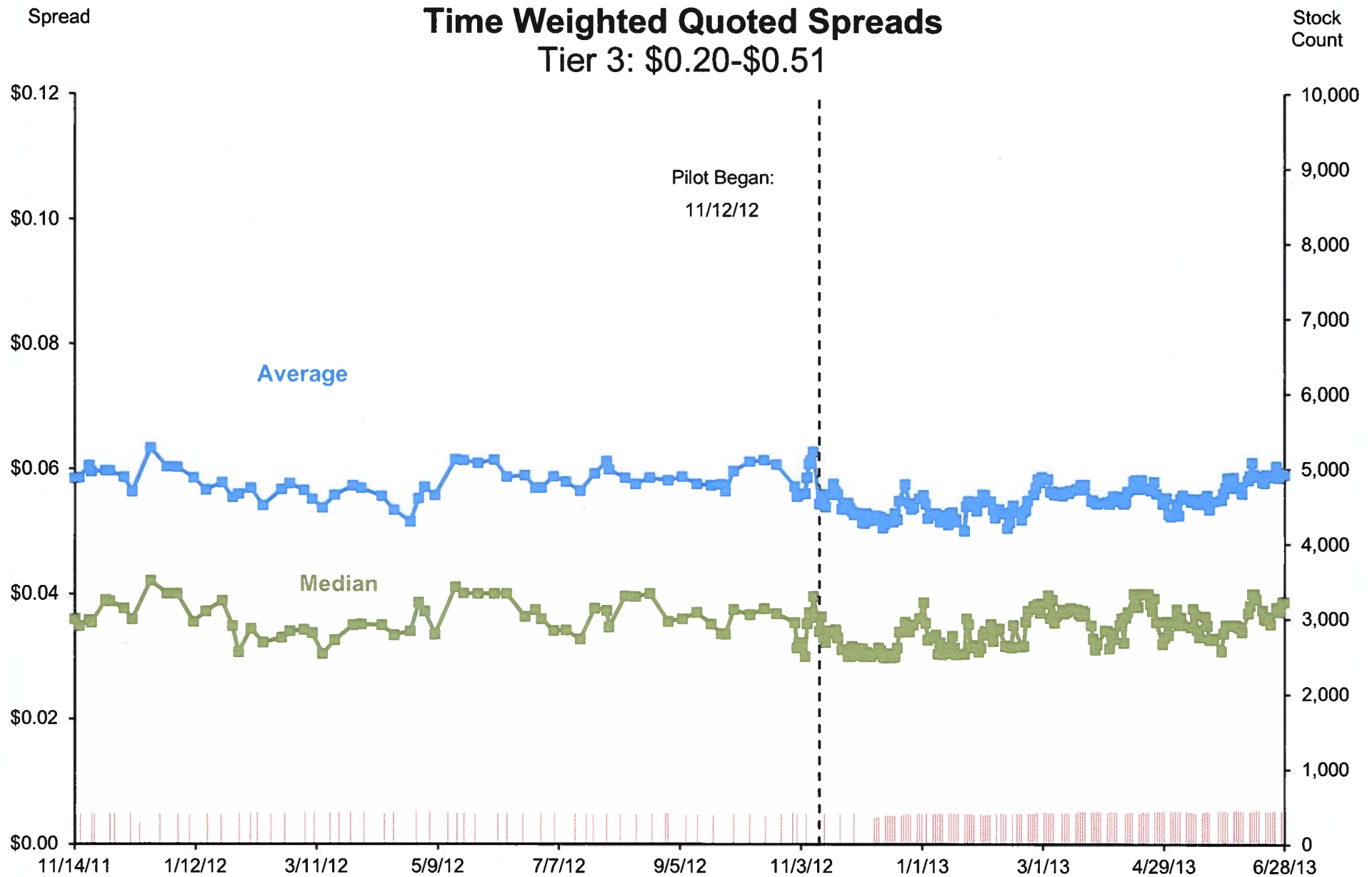
Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Spreads are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 increased the minimum depth from 5,000 to 10,000.



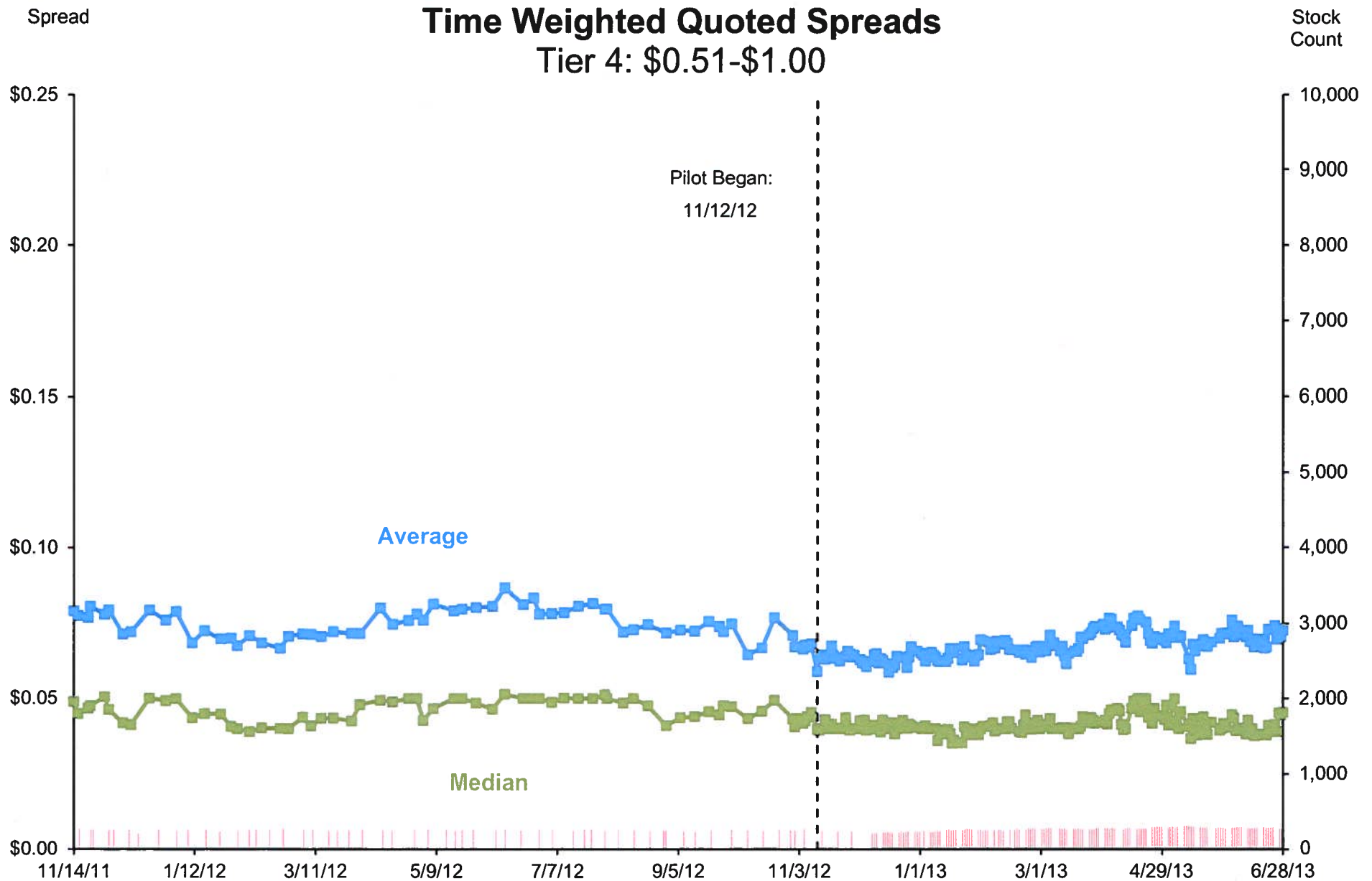
Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Spreads are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements.



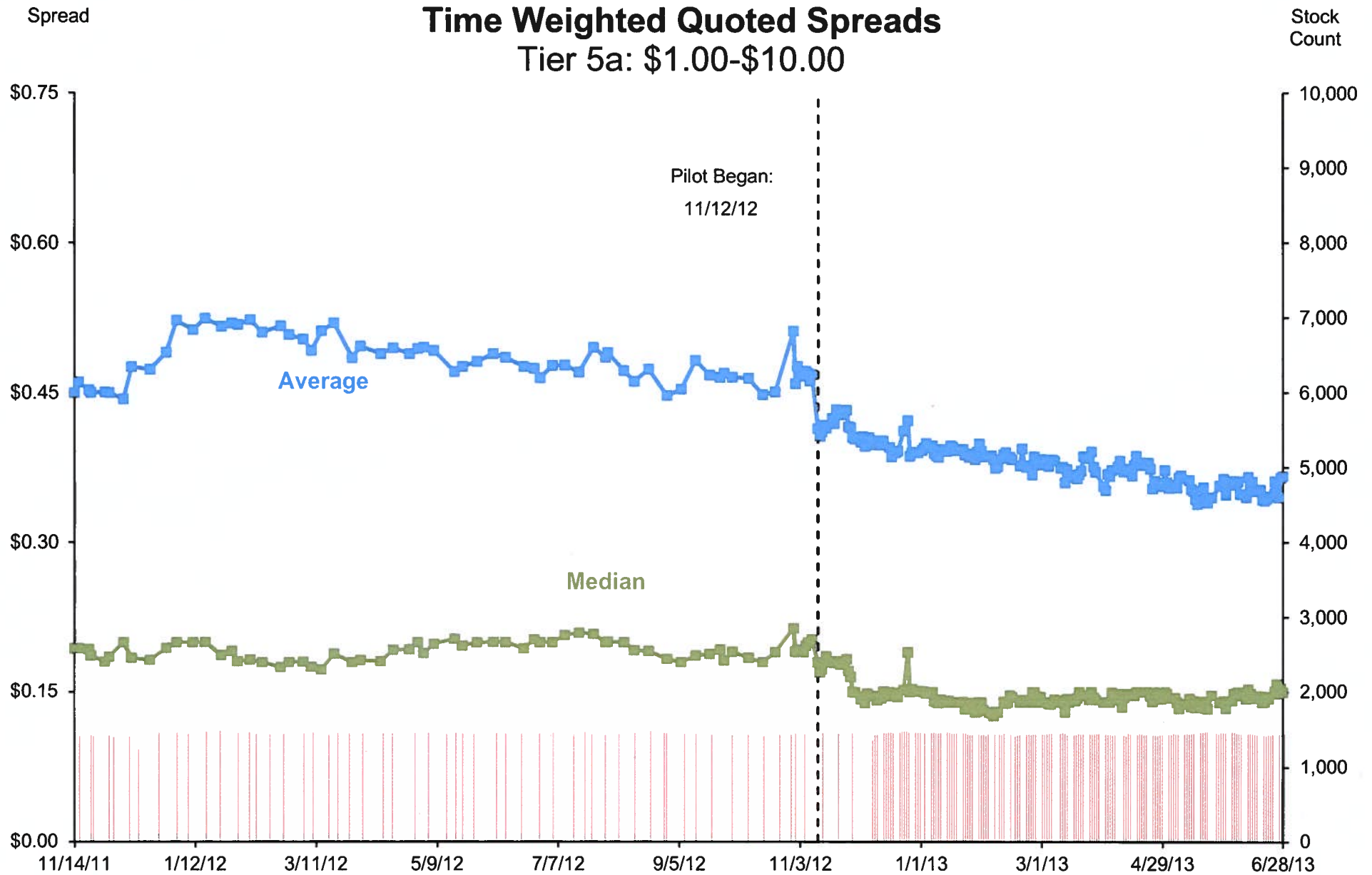
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Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Spreads are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 5,000 to 2,500.



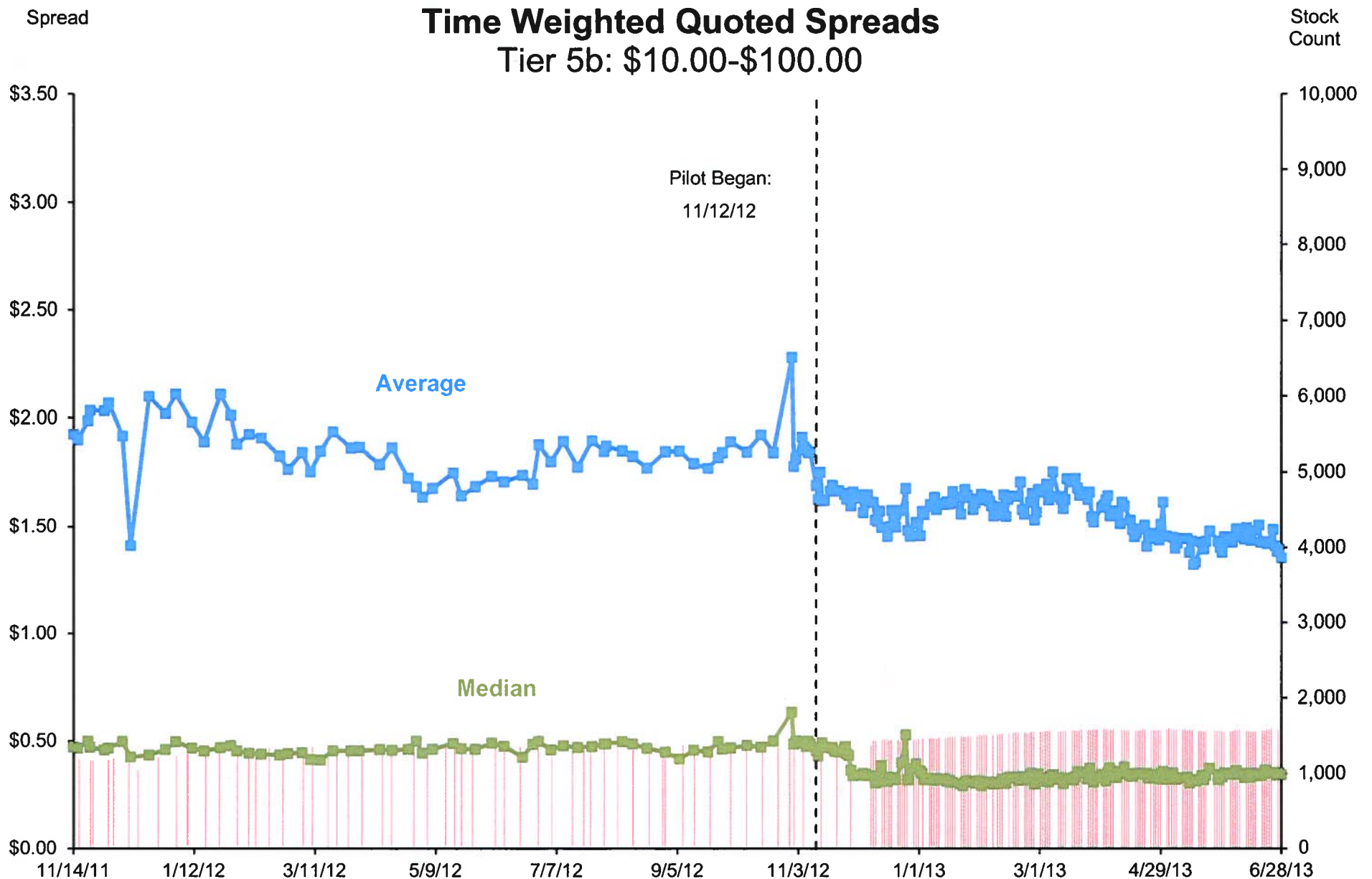
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Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Spreads are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 2,500 to 1,000.



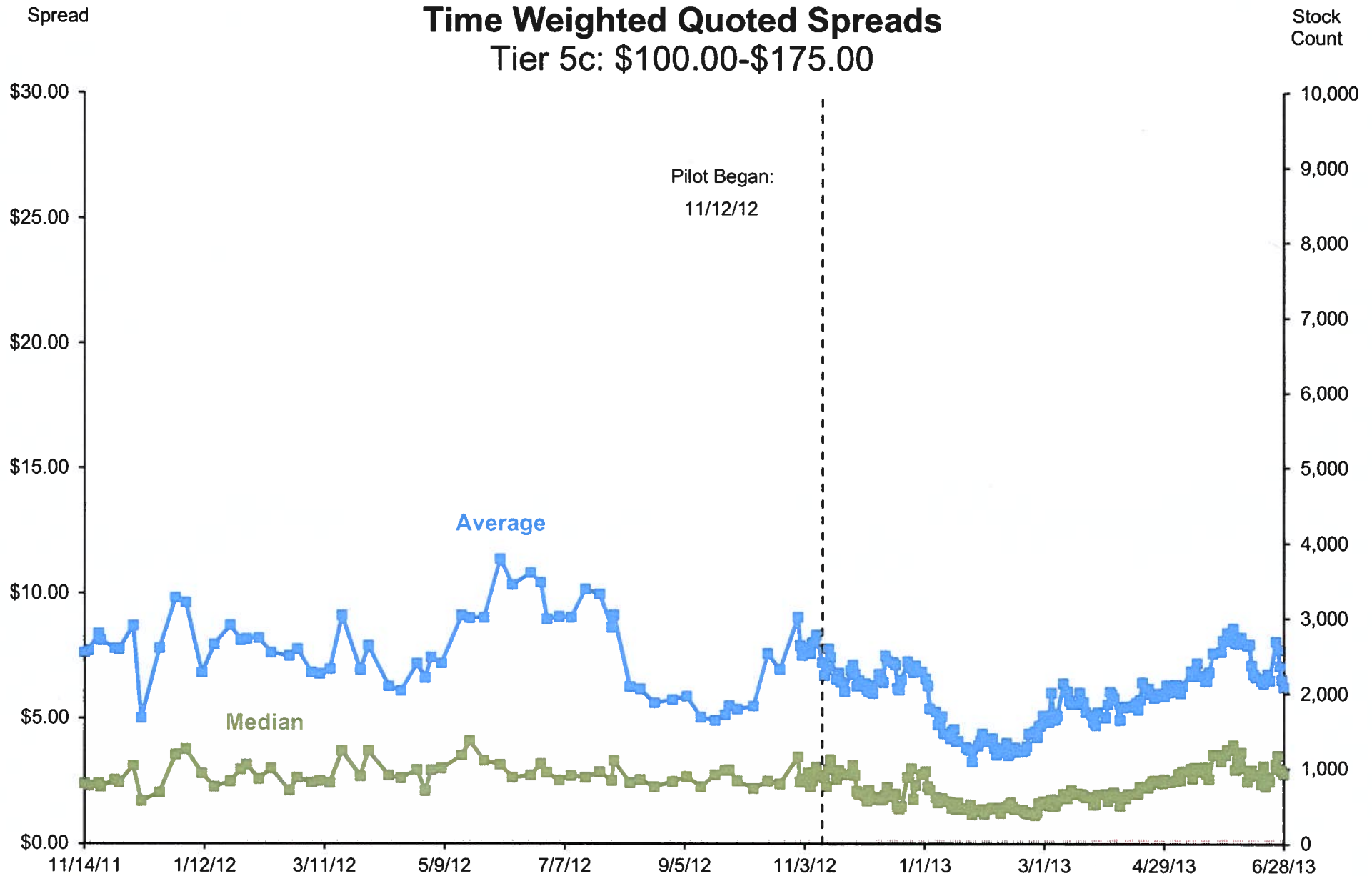
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Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Spreads are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 500 to 100.



Source: OTC Link

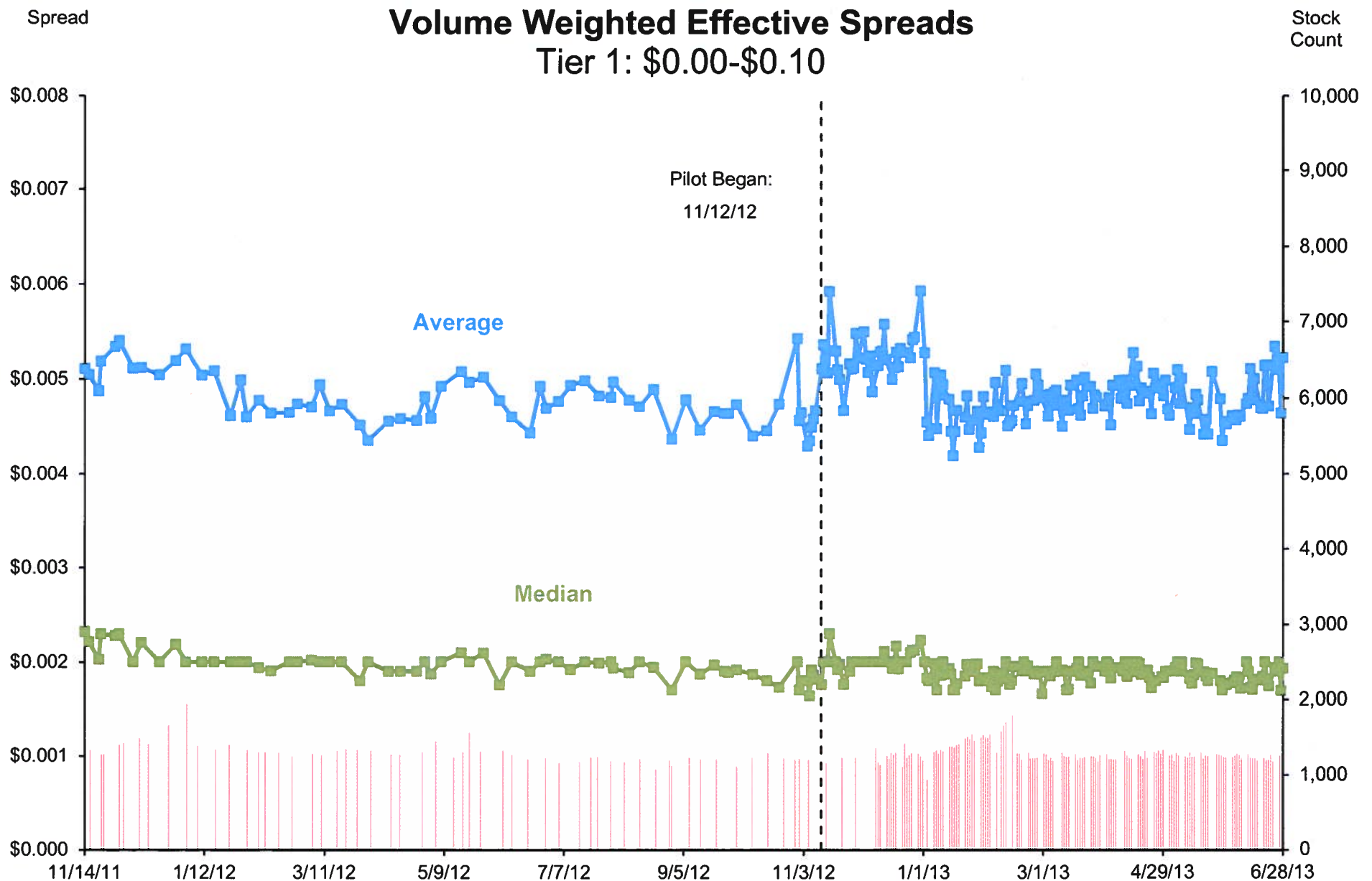
Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Spreads are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 200 to 100.



Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Spreads are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements.

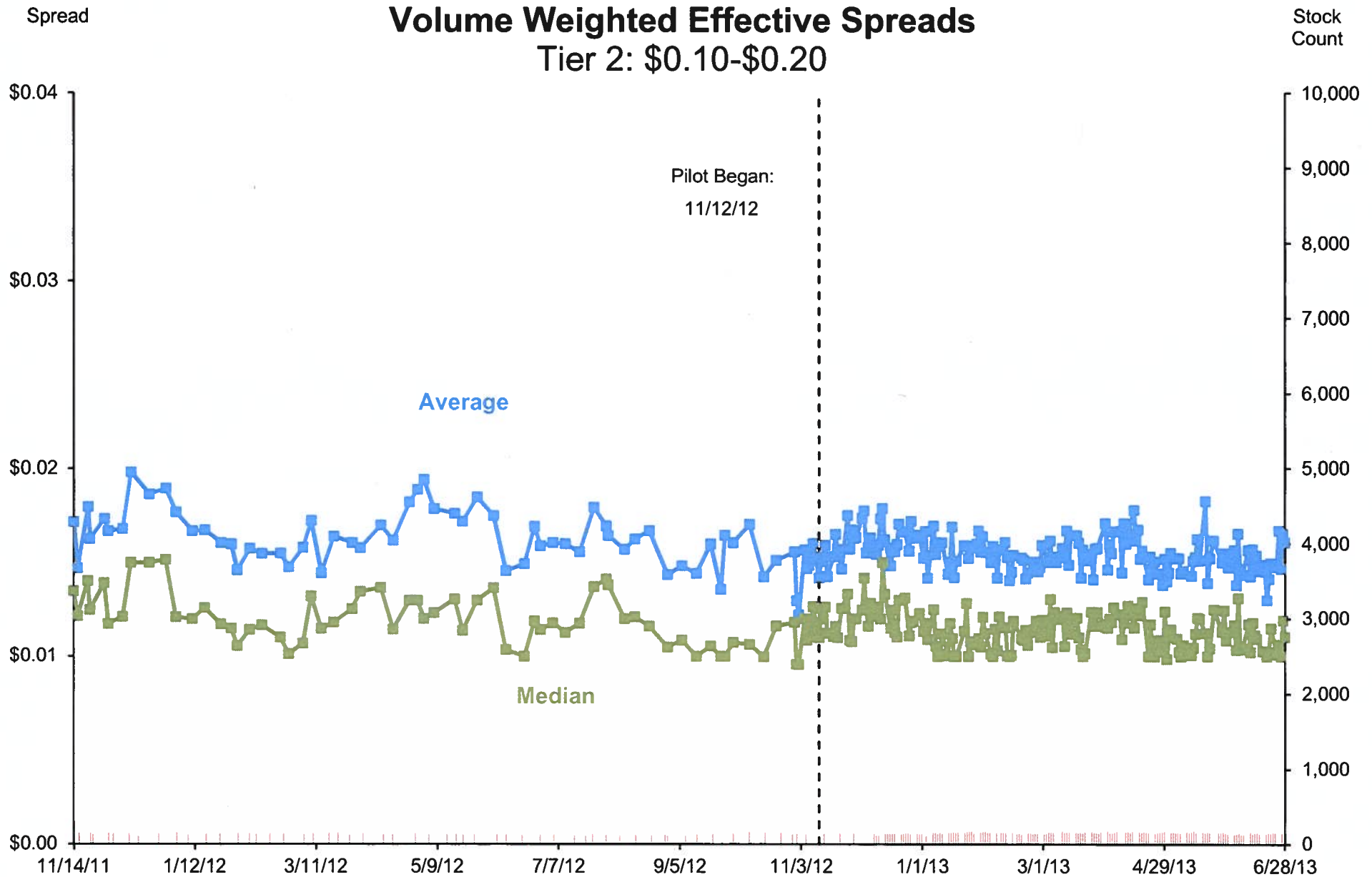




Source: OTC Link

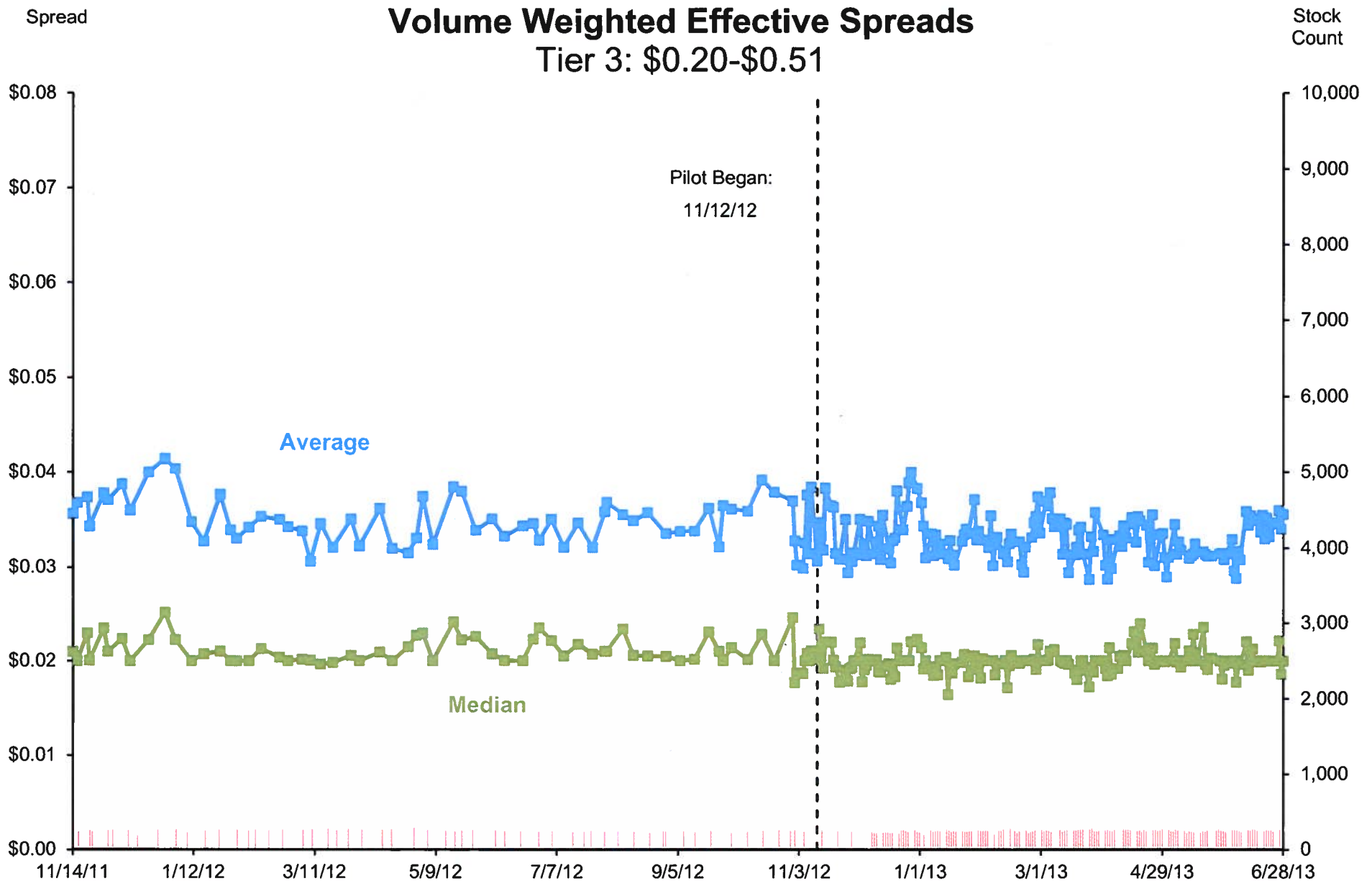
Note: Prevailing quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. If offer is less than or equal to \$0.20, the trade is removed from calculation if the trade price is more than \$0.10 over the offer or \$0.10 less than the bid. Spreads are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 increased the minimum depth from 5,000 to 10,000.





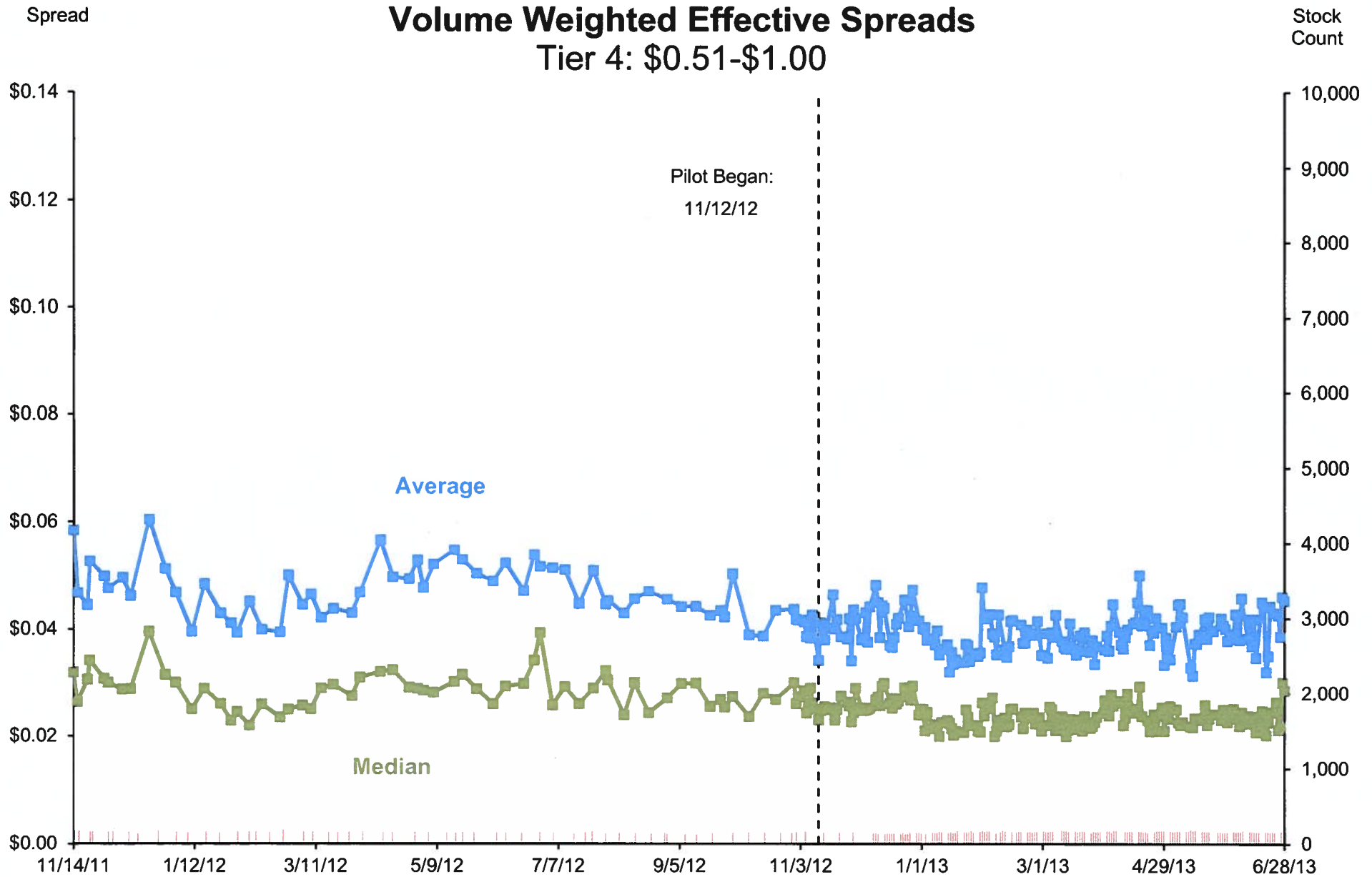
Source: OTC Link

Note: Prevailing quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. If offer is less than or equal to \$0.20, the trade is removed from calculation if the trade price is more than \$0.10 over the offer or \$0.10 less than the bid. Spreads are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements.



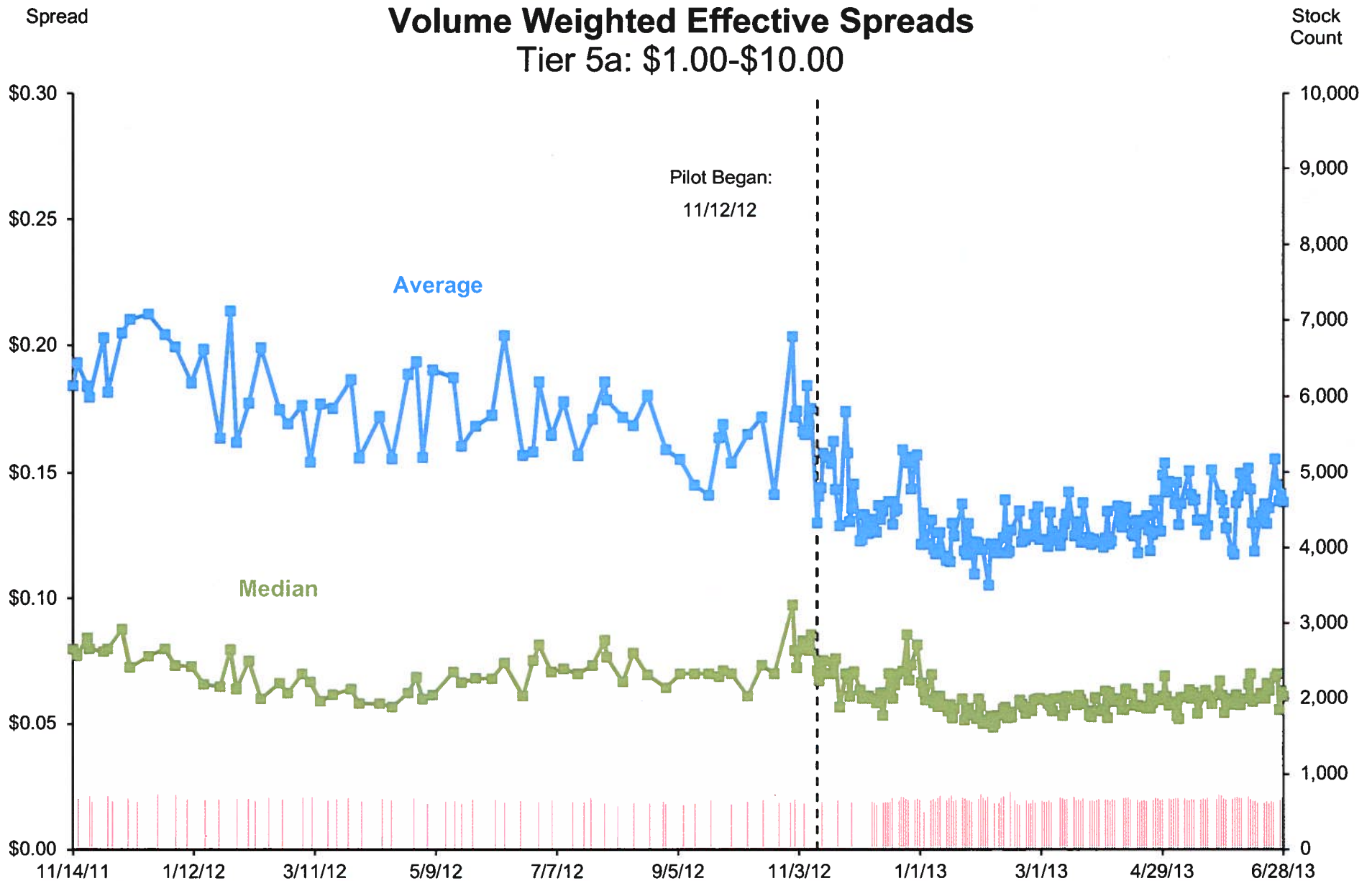
Source: OTC Link

Note: Prevailing quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Trades are removed if they are priced over 150 percent of the prevailing offer or less than 50 percent of the prevailing bid. Spreads are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 5,000 to 2,500.



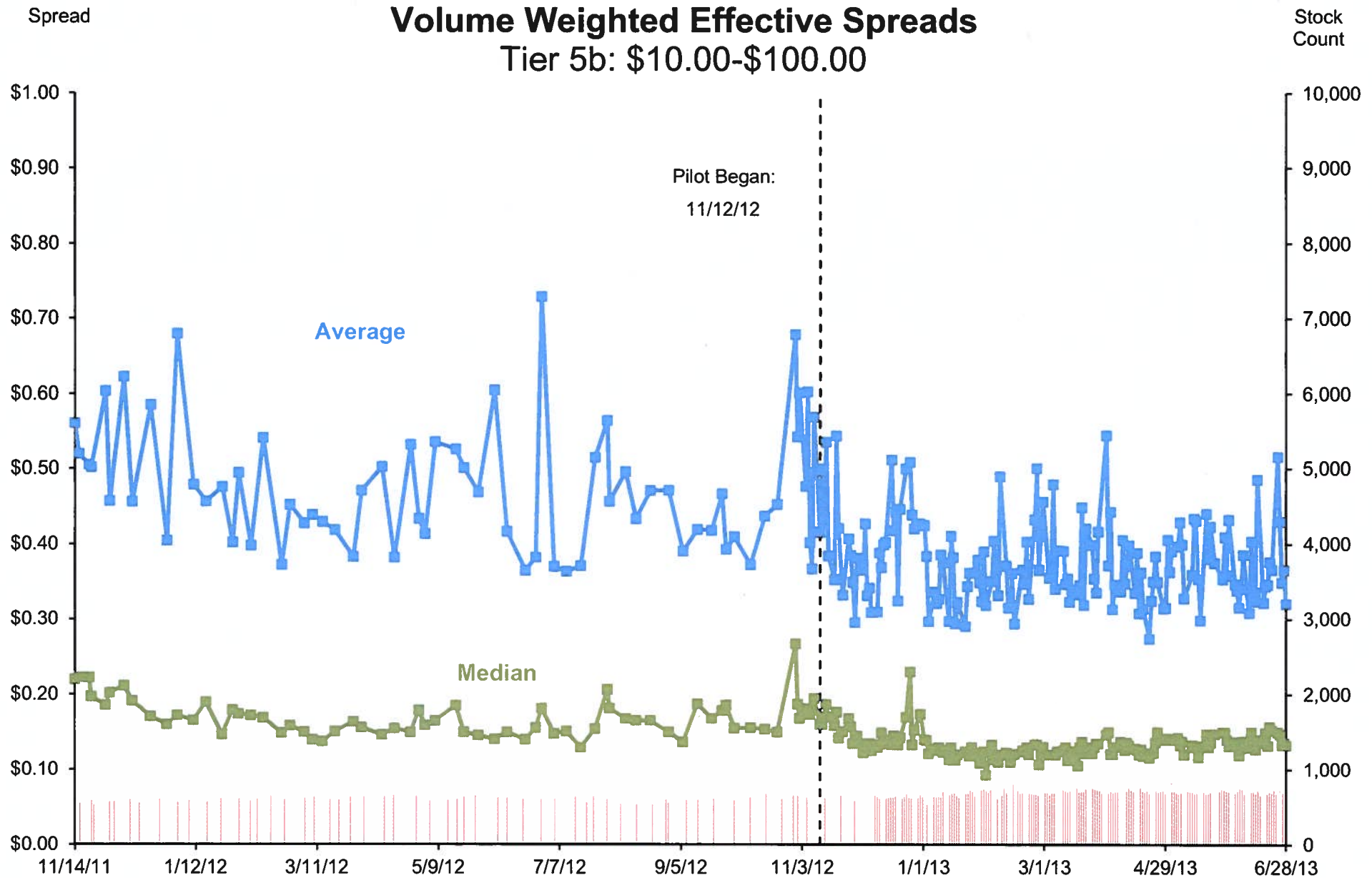
Source: OTC Link

Note: Prevailing quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Trades are removed if they are priced over 150 percent of the prevailing offer or less than 50 percent of the prevailing bid. Spreads are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 2,500 to 1,000.



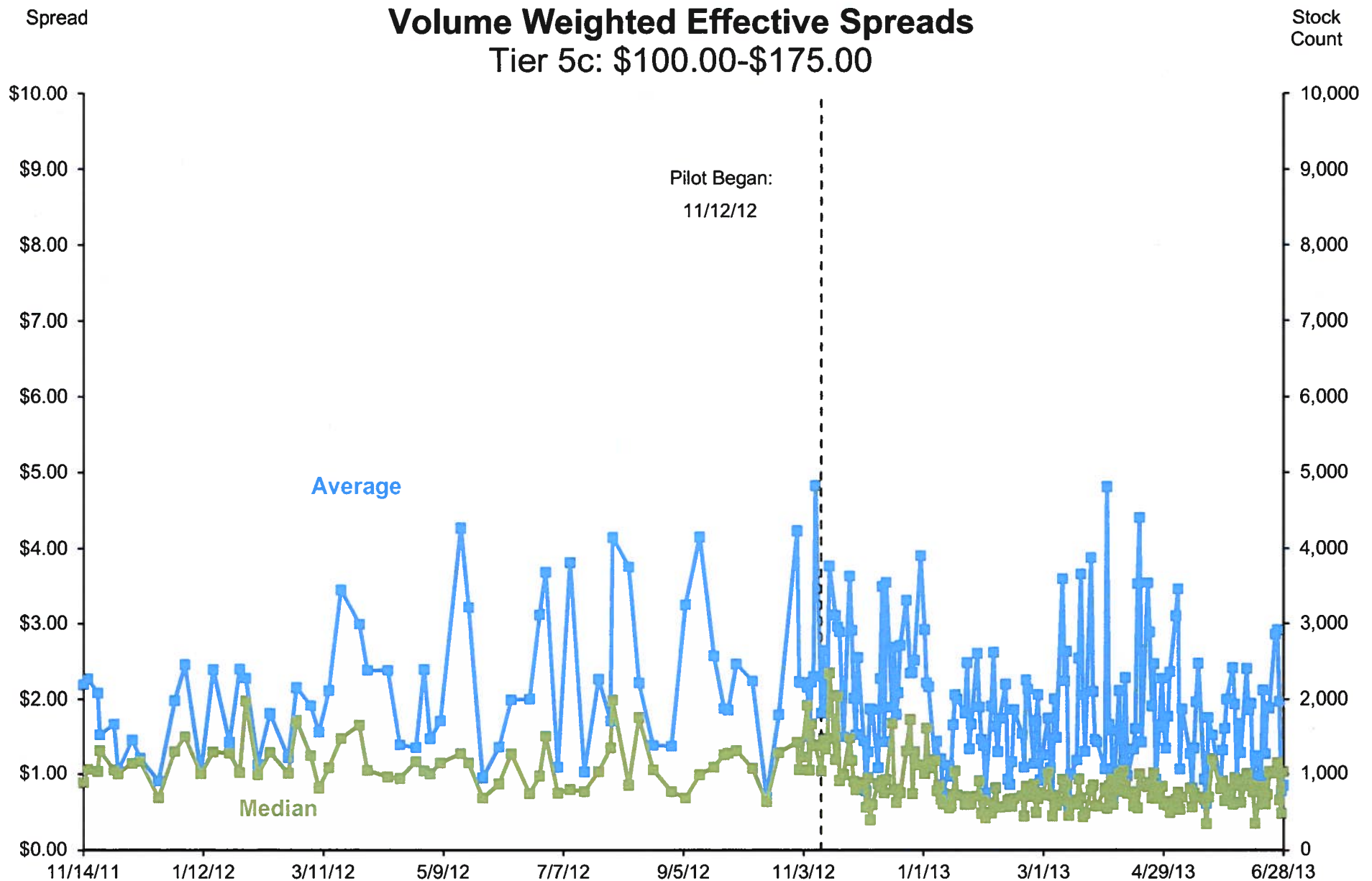
Source: OTC Link

Note: Prevailing quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Trades are removed if they are priced over 150 percent of the prevailing offer or less than 50 percent of the prevailing bid. Spreads are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 500 to 100.



Source: OTC Link

Note: Prevailing quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Trades are removed if they are priced over 150 percent of the prevailing offer or less than 50 percent of the prevailing bid. Spreads are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 200 to 100.

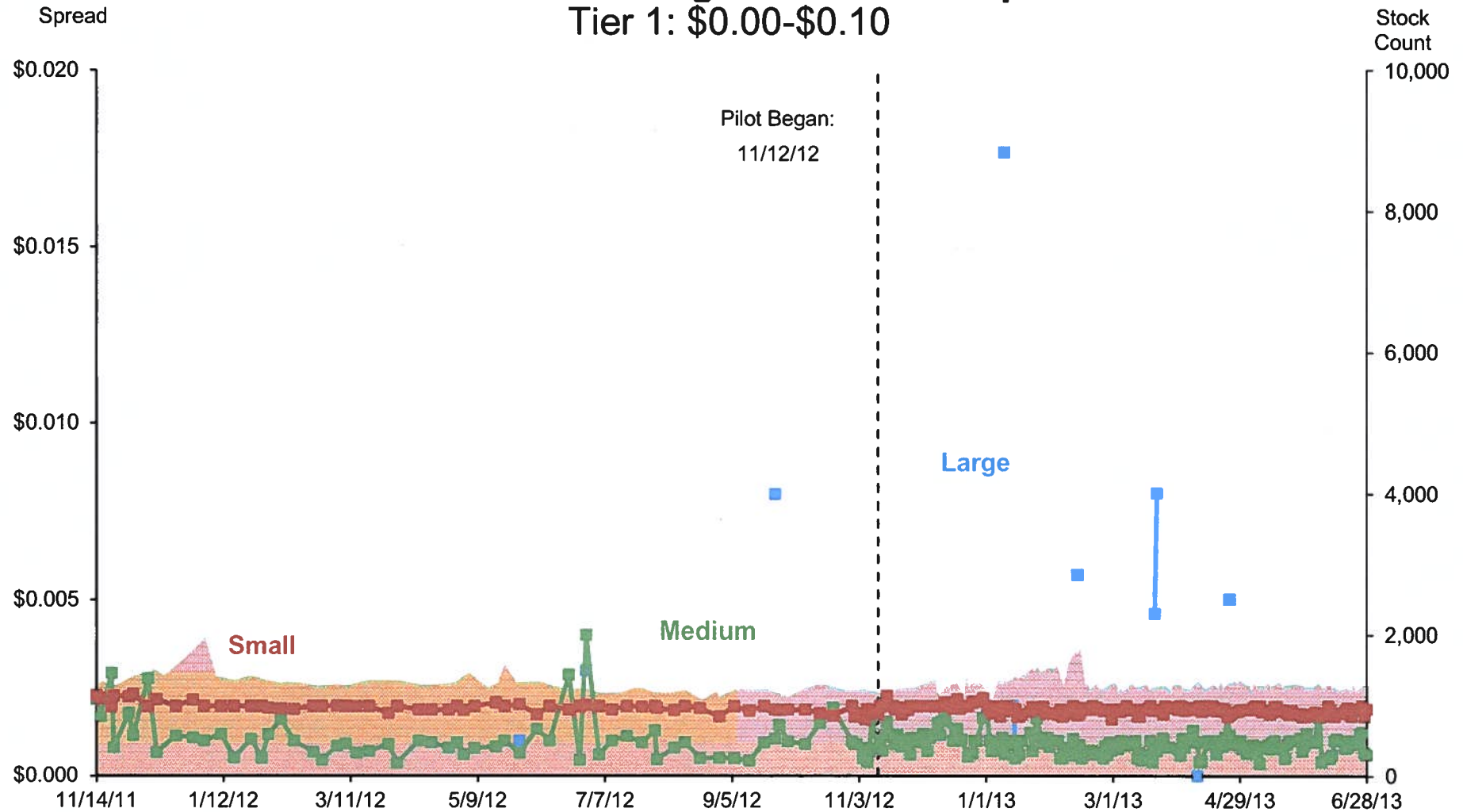


Source: OTC Link

Note: Prevailing quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Trades are removed if they are priced over 150 percent of the prevailing offer or less than 50 percent of the prevailing bid. Spreads are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements.



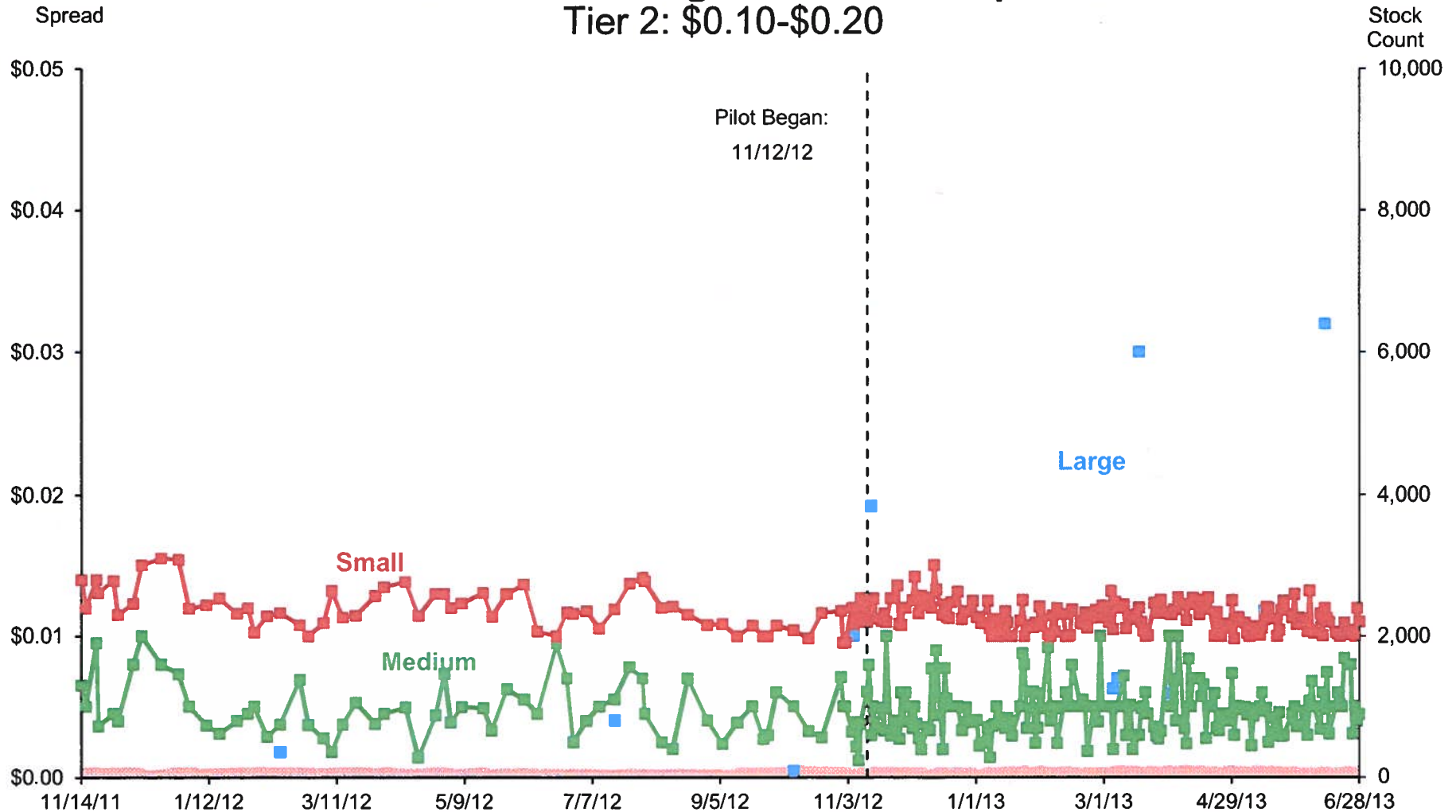
## Median Volume Weighted Effective Spreads Tier 1: \$0.00-\$0.10



Source: OTC Link

Note: Prevailing quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. If offer is less than or equal to \$0.20, the trade is removed from calculation if the trade price is more than \$0.10 over the offer or \$0.10 less than the bid. Spreads are excluded if valid quotes during the day span more than one tier. Small, Medium, and Large indicate dollar volume of trades on each day of less than \$10,000, \$10,000 - 200,000, and over \$200,000, respectively. For stocks in this tier, FINRA Rule 6433 increased the minimum depth from 5,000 to 10,000. Shaded values represent the number of equities for which a valid effective spread was calculated.

## Median Volume Weighted Effective Spreads Tier 2: \$0.10-\$0.20



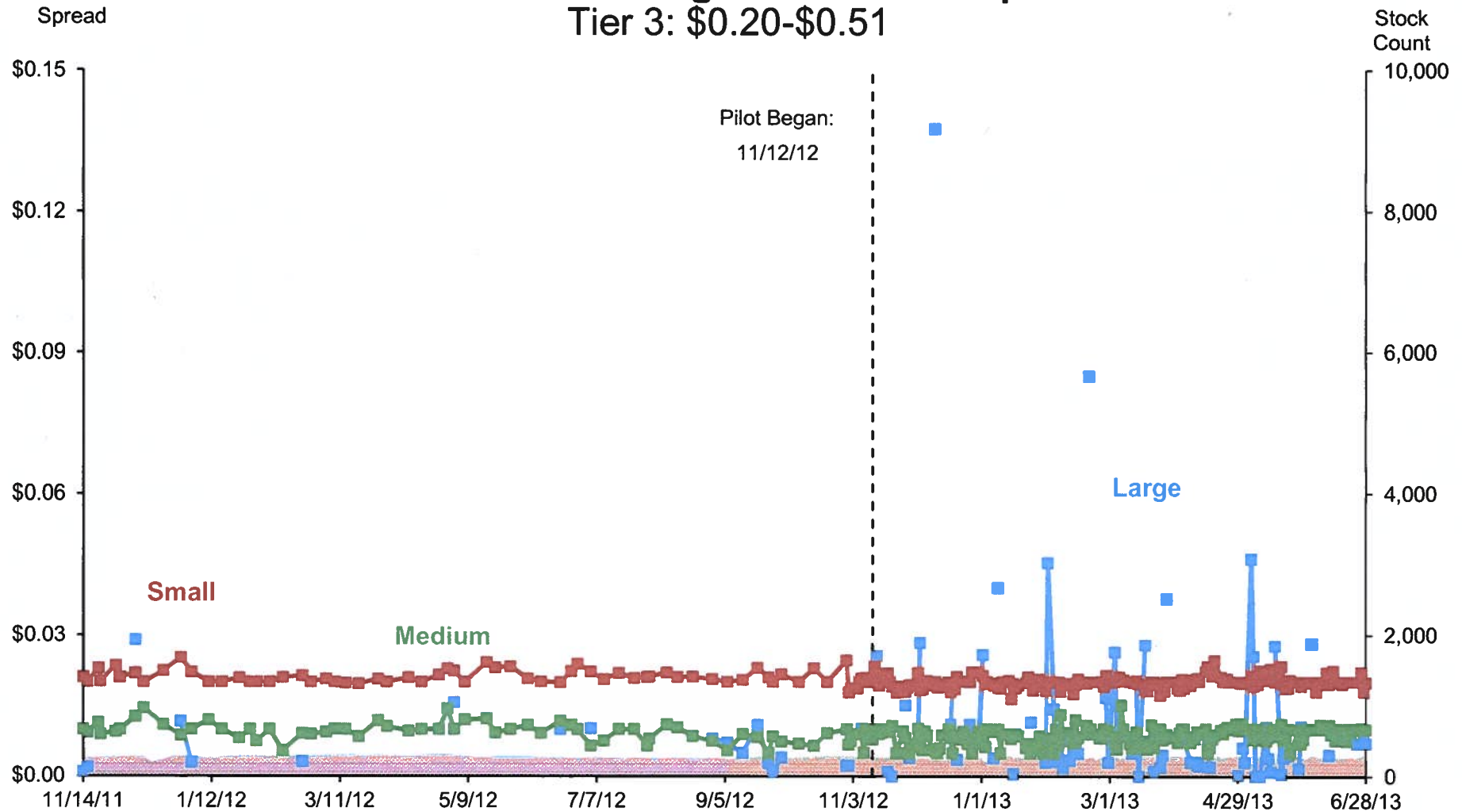
Source: OTC Link

Note: Prevailing quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. If offer is less than or equal to \$0.20, the trade is removed from calculation if the trade price is more than \$0.10 over the offer or \$0.10 less than the bid. Spreads are excluded if valid quotes during the day span more than one tier. Small, Medium, and Large indicate dollar volume of trades on each day of less than \$10,000, \$10,000 - 200,000, and over \$200,000, respectively. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements. Shaded values represent the number of equities for which a valid effective spread was calculated.



## Median Volume Weighted Effective Spreads

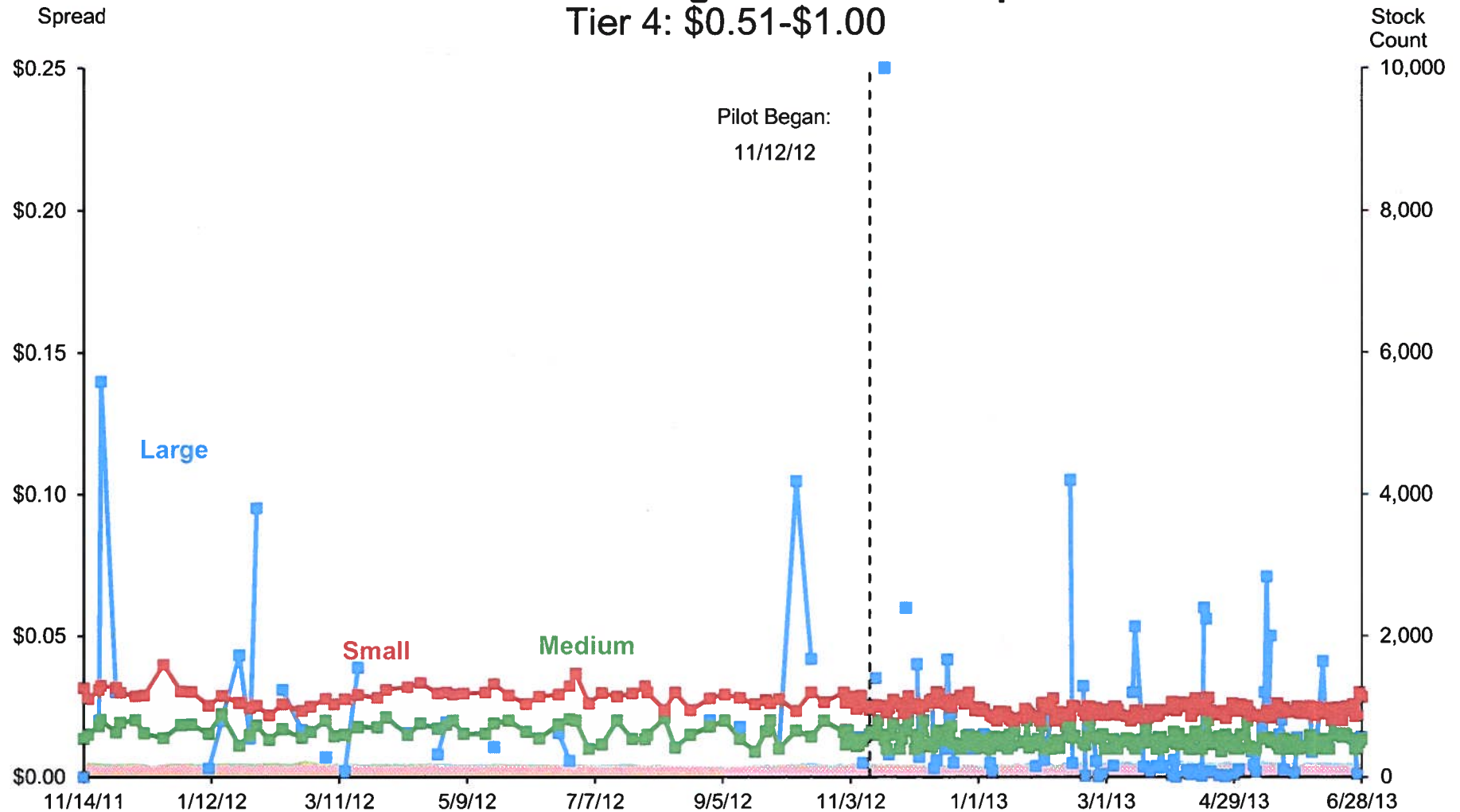
### Tier 3: \$0.20-\$0.51



Source: OTC Link

Note: Prevailing quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Trades are removed if they are priced over 150 percent of the prevailing offer or less than 50 percent of the prevailing bid. Spreads are excluded if valid quotes during the day span more than one tier. Small, Medium, and Large indicate dollar volume of trades on each day of less than \$10,000, \$10,000 - 200,000, and over \$200,000, respectively. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 5,000 to 2,500. Shaded values represent the number of equities for which a valid effective spread was calculated.

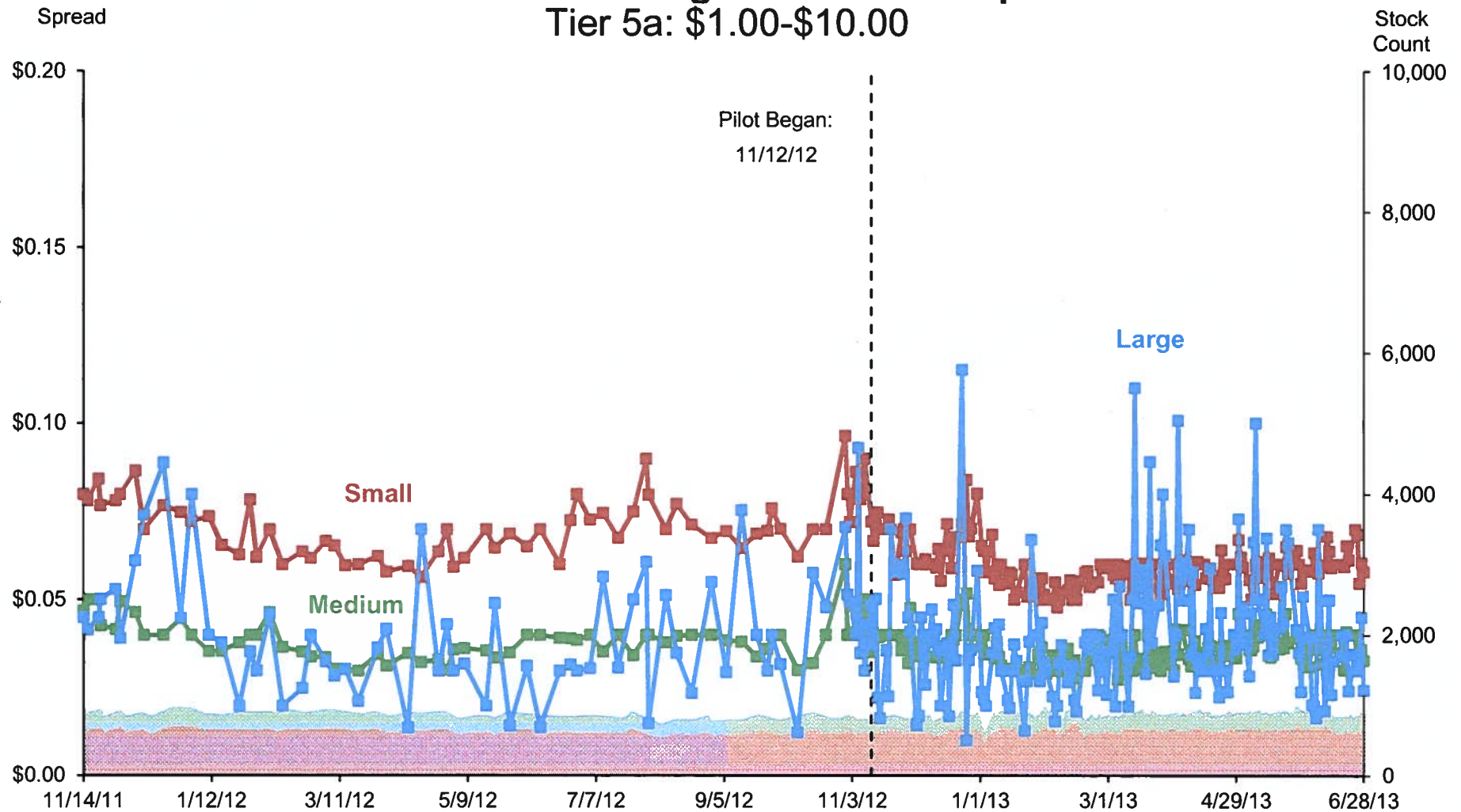
## Median Volume Weighted Effective Spreads Tier 4: \$0.51-\$1.00



Source: OTC Link

Note: Prevailing quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Trades are removed if they are priced over 150 percent of the prevailing offer or less than 50 percent of the prevailing bid. Spreads are excluded if valid quotes during the day span more than one tier. Small, Medium, and Large indicate dollar volume of trades on each day of less than \$10,000, \$10,000 - 200,000, and over \$200,000, respectively. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 2,500 to 1,000. Shaded values represent the number of equities for which a valid effective spread was calculated.

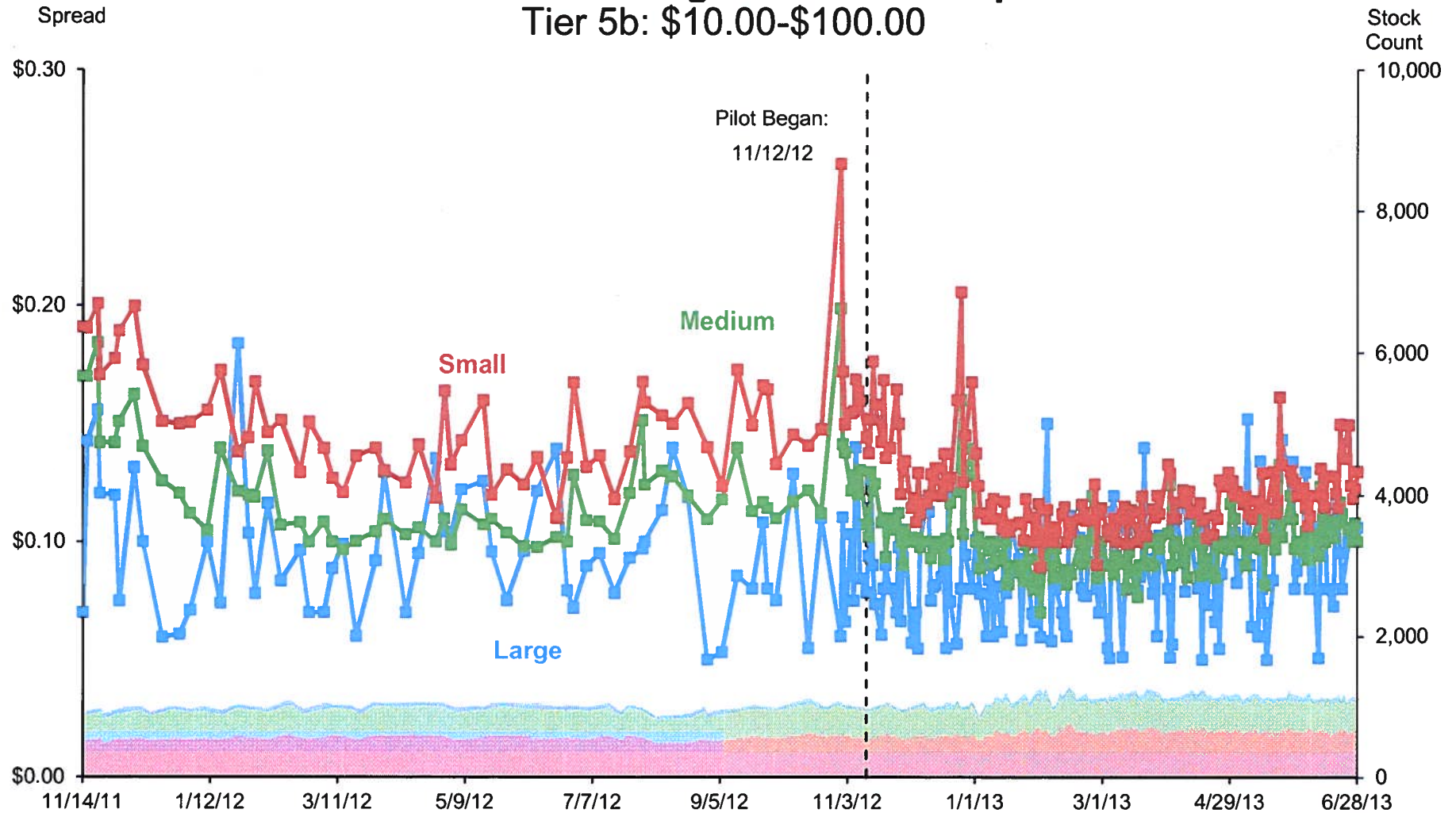
## Median Volume Weighted Effective Spreads Tier 5a: \$1.00-\$10.00



Source: OTC Link

Note: Prevailing quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Trades are removed if they are priced over 150 percent of the prevailing offer or less than 50 percent of the prevailing bid. Spreads are excluded if valid quotes during the day span more than one tier. Small, Medium, and Large indicate dollar volume of trades on each day of less than \$10,000, \$10,000 - 200,000, and over \$200,000, respectively. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 500 to 100. Shaded values represent the number of equities for which a valid effective spread was calculated.

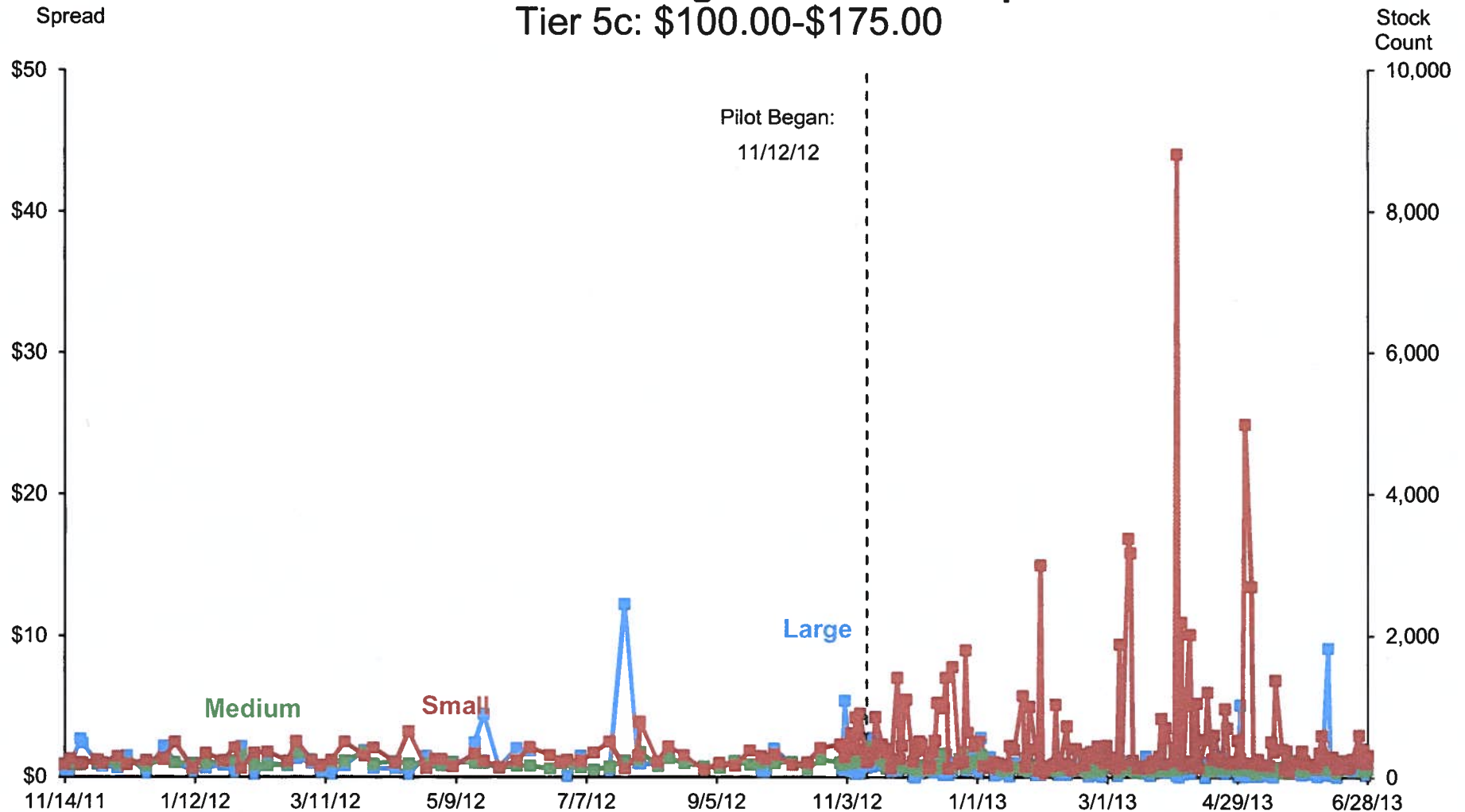
## Median Volume Weighted Effective Spreads Tier 5b: \$10.00-\$100.00



Source: OTC Link

Note: Prevailing quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Trades are removed if they are priced over 150 percent of the prevailing offer or less than 50 percent of the prevailing bid. Spreads are excluded if valid quotes during the day span more than one tier. Small, Medium, and Large indicate dollar volume of trades on each day of less than \$10,000, \$10,000 - 200,000, and over \$200,000, respectively. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 200 to 100. Shaded values represent the number of equities for which a valid effective spread was calculated.

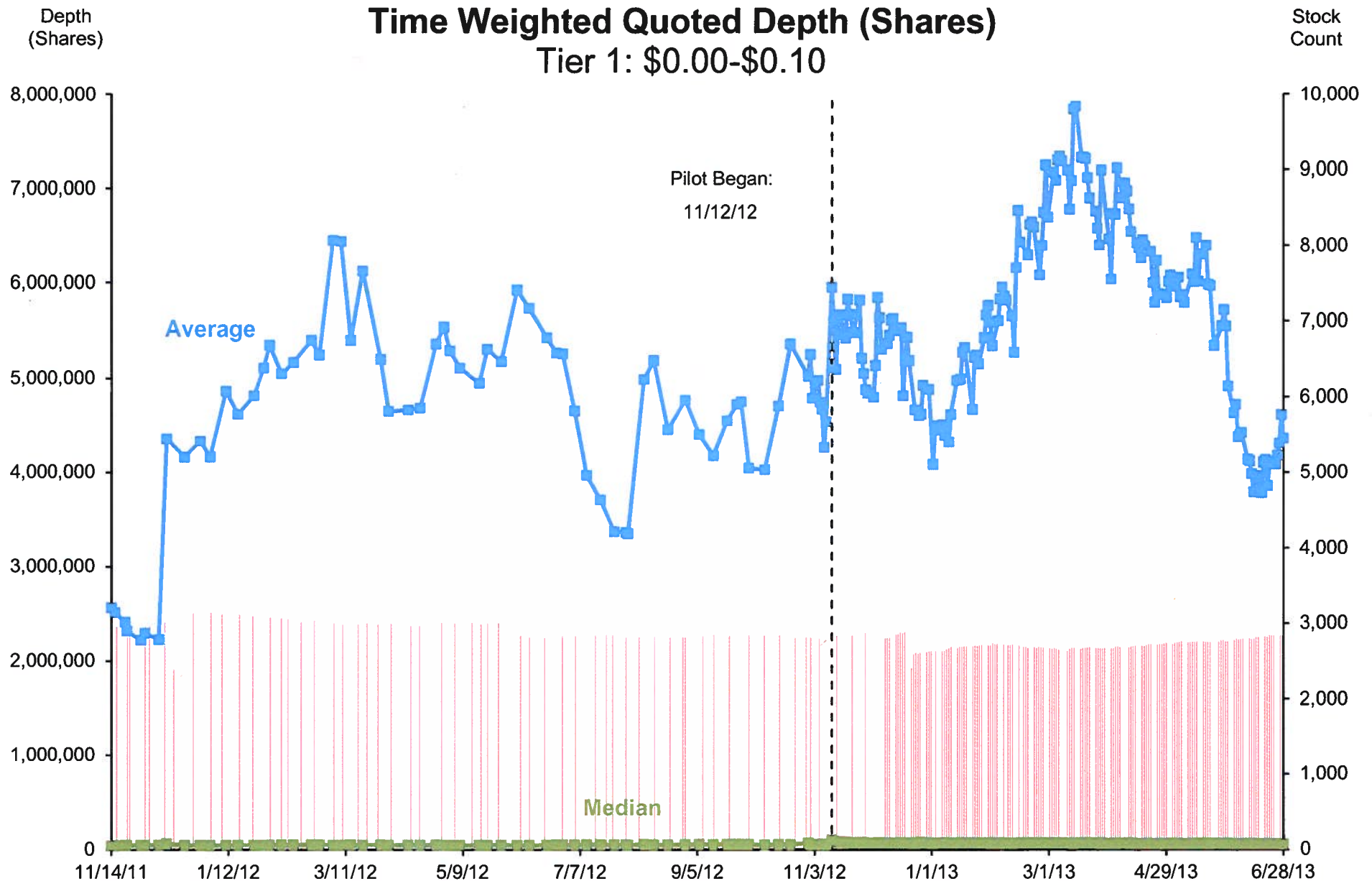
## Median Volume Weighted Effective Spreads Tier 5c: \$100.00-\$175.00



Source: OTC Link

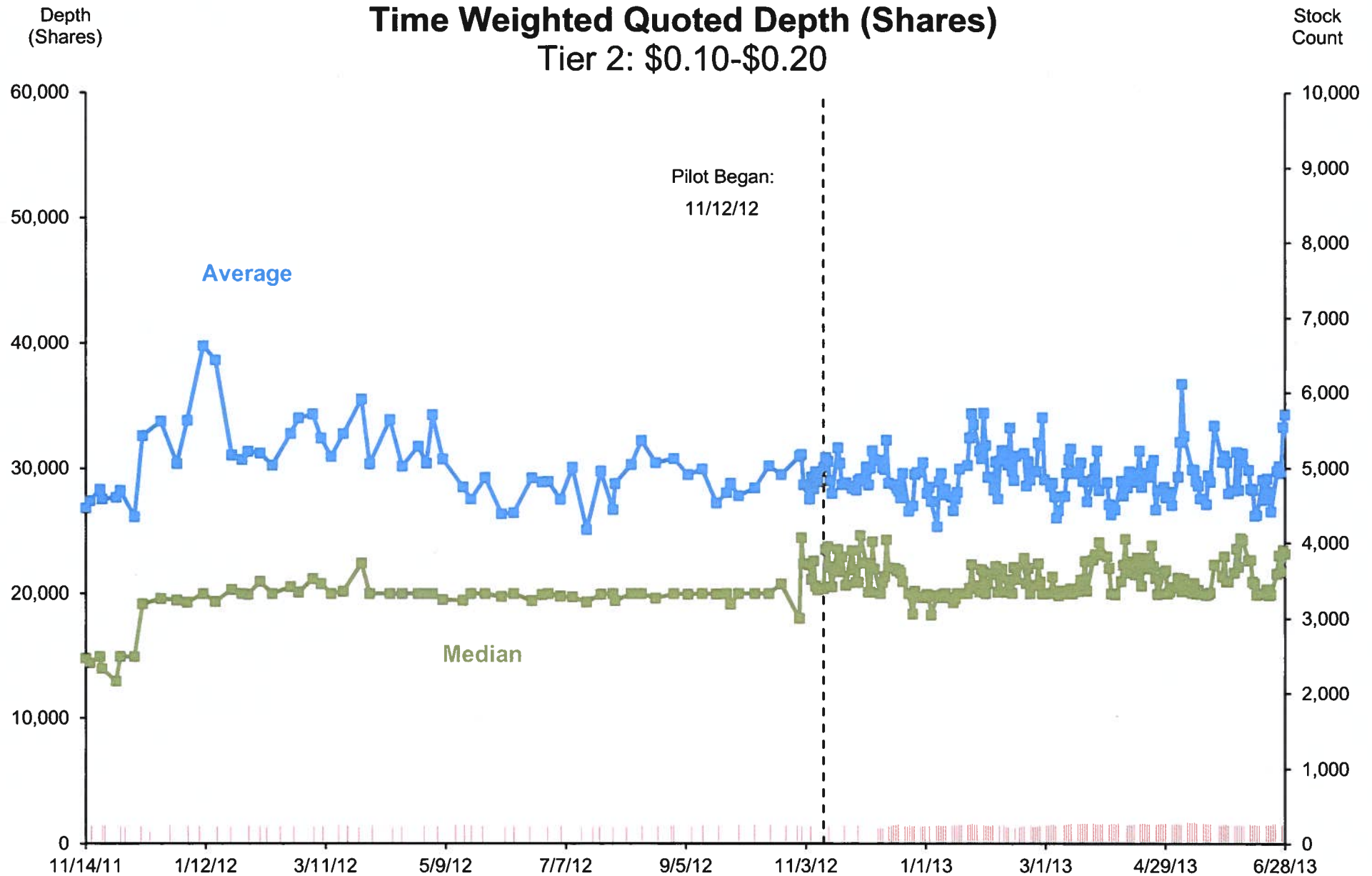
Note: Prevailing quotes are removed if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Trades are removed if they are priced over 150 percent of the prevailing offer or less than 50 percent of the prevailing bid. Spreads are excluded if valid quotes during the day span more than one tier. Small, Medium, and Large indicate dollar volume of trades on each day of less than \$10,000, \$10,000 - 200,000, and over \$200,000, respectively. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements. Shaded values represent the number of equities for which a valid effective spread was calculated.





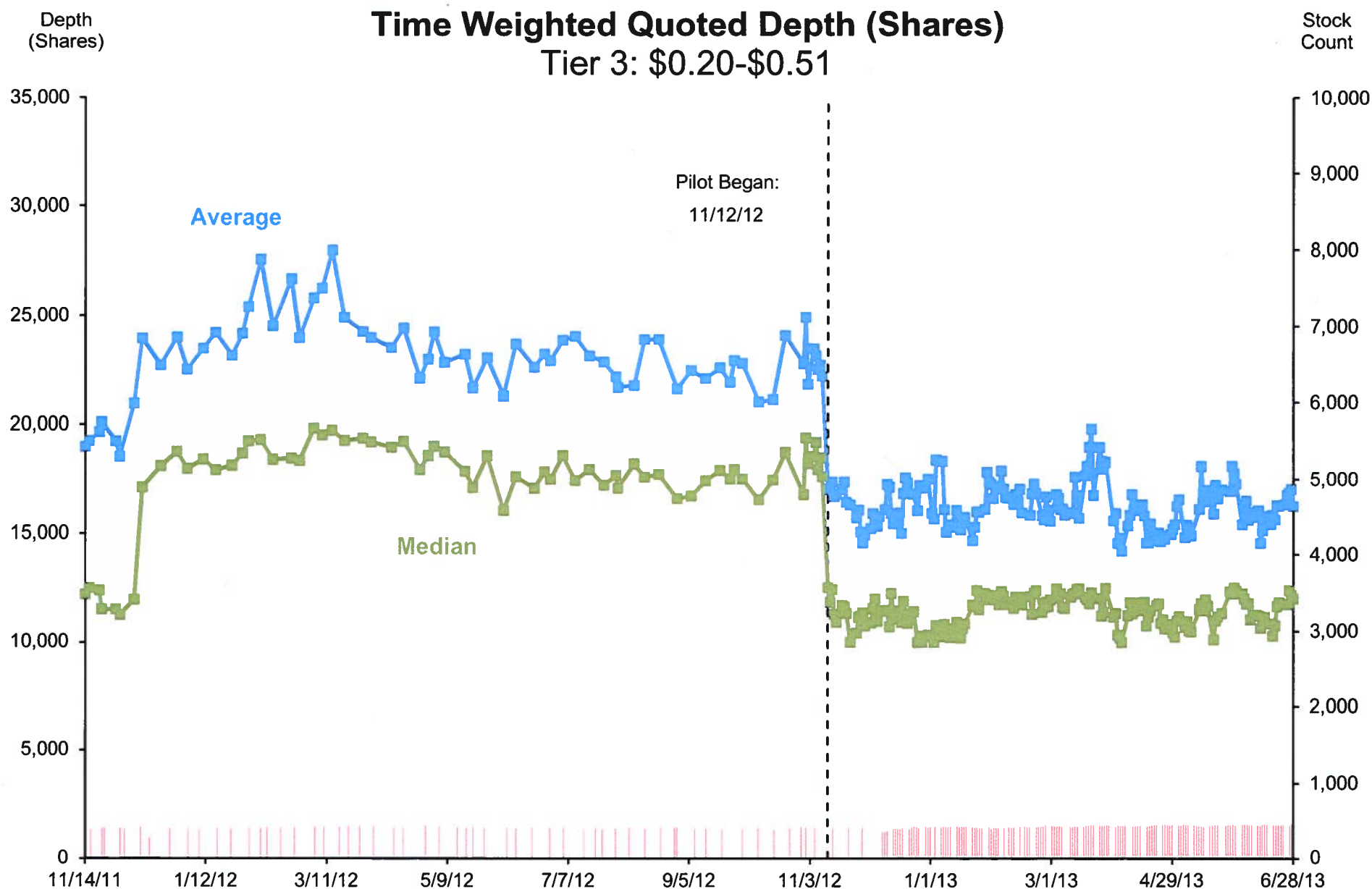
Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Depths are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 increased the minimum depth from 5,000 to 10,000. Quoted depth is calculated as the sum of bid and offer depths.



Source: OTC Link

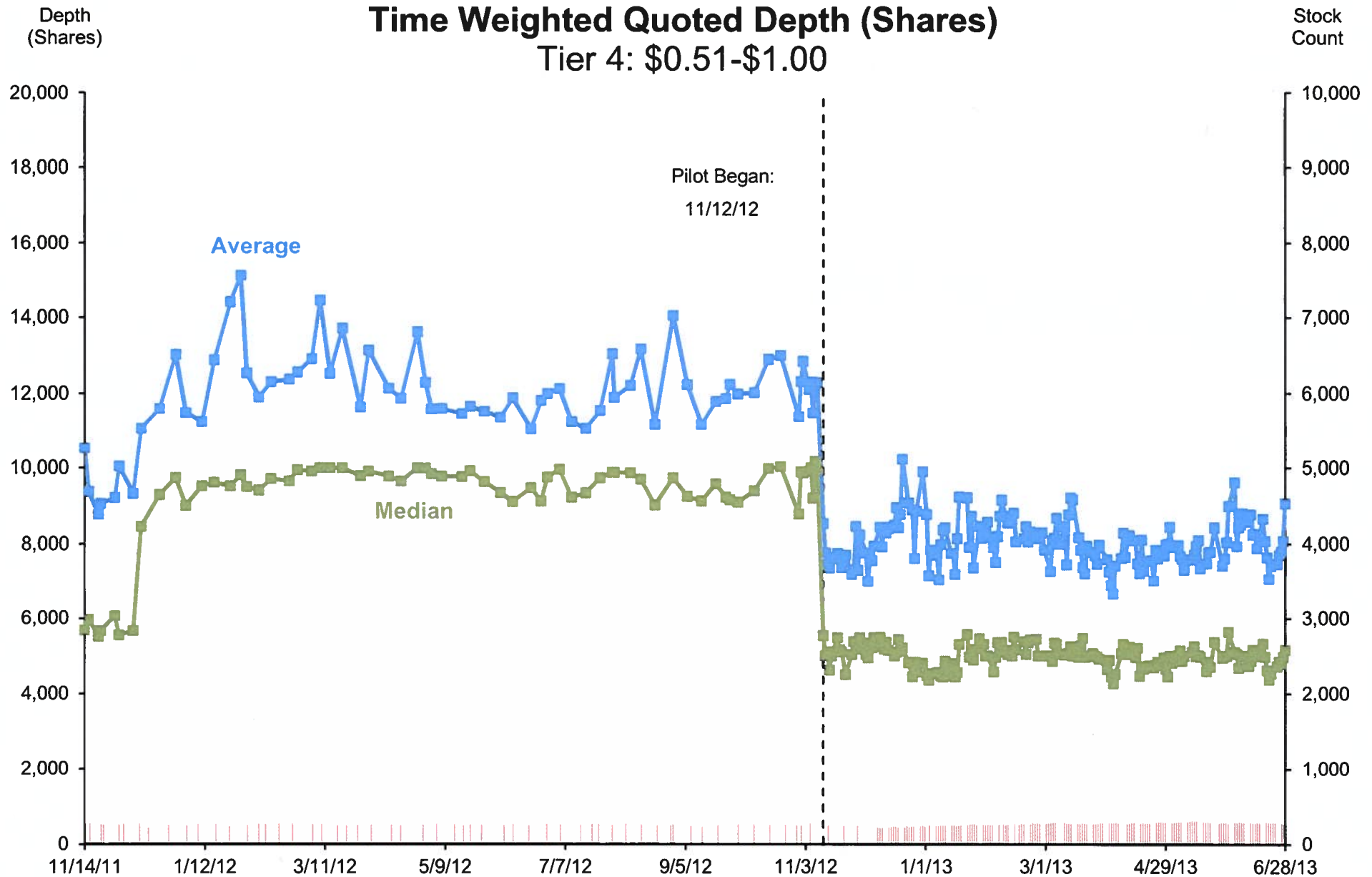
Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Depths are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements. Quoted depth is calculated as the sum of bid and offer depths.



Source: OTC Link

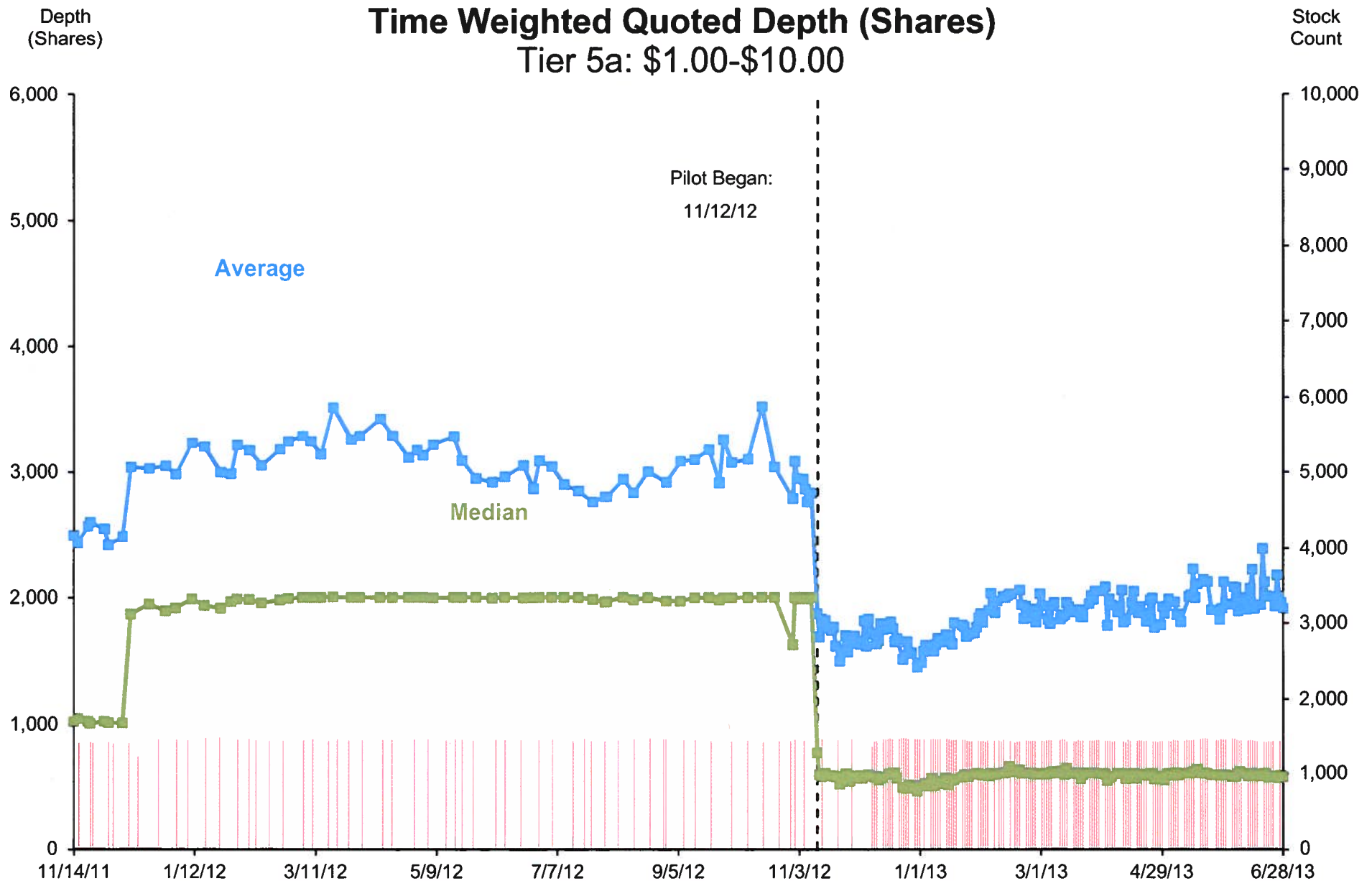
Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Depths are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 5,000 to 2,500. Quoted depth is calculated as the sum of bid and offer depths.





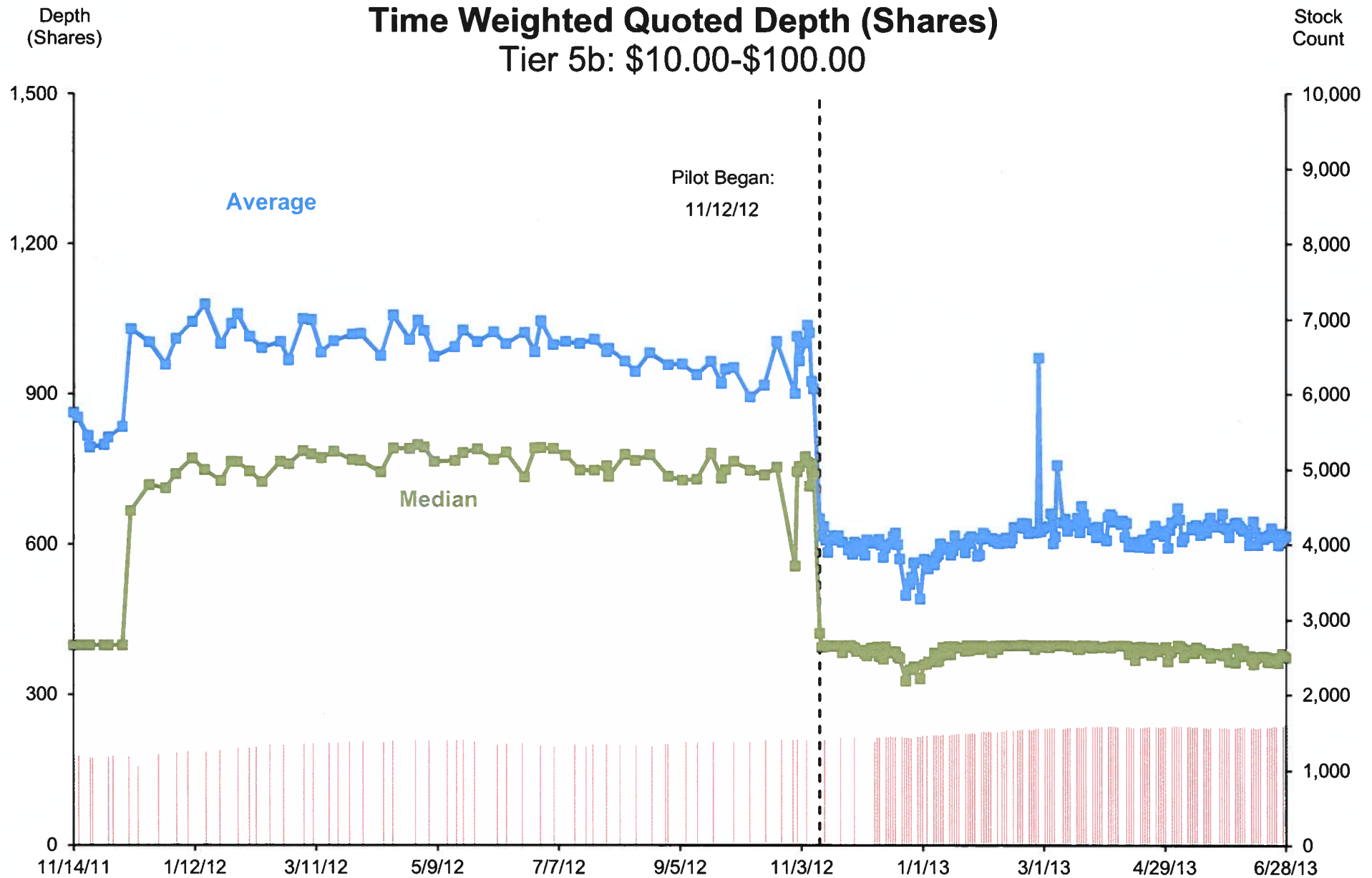
Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Depths are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 2,500 to 1,000. Quoted depth is calculated as the sum of bid and offer depths.



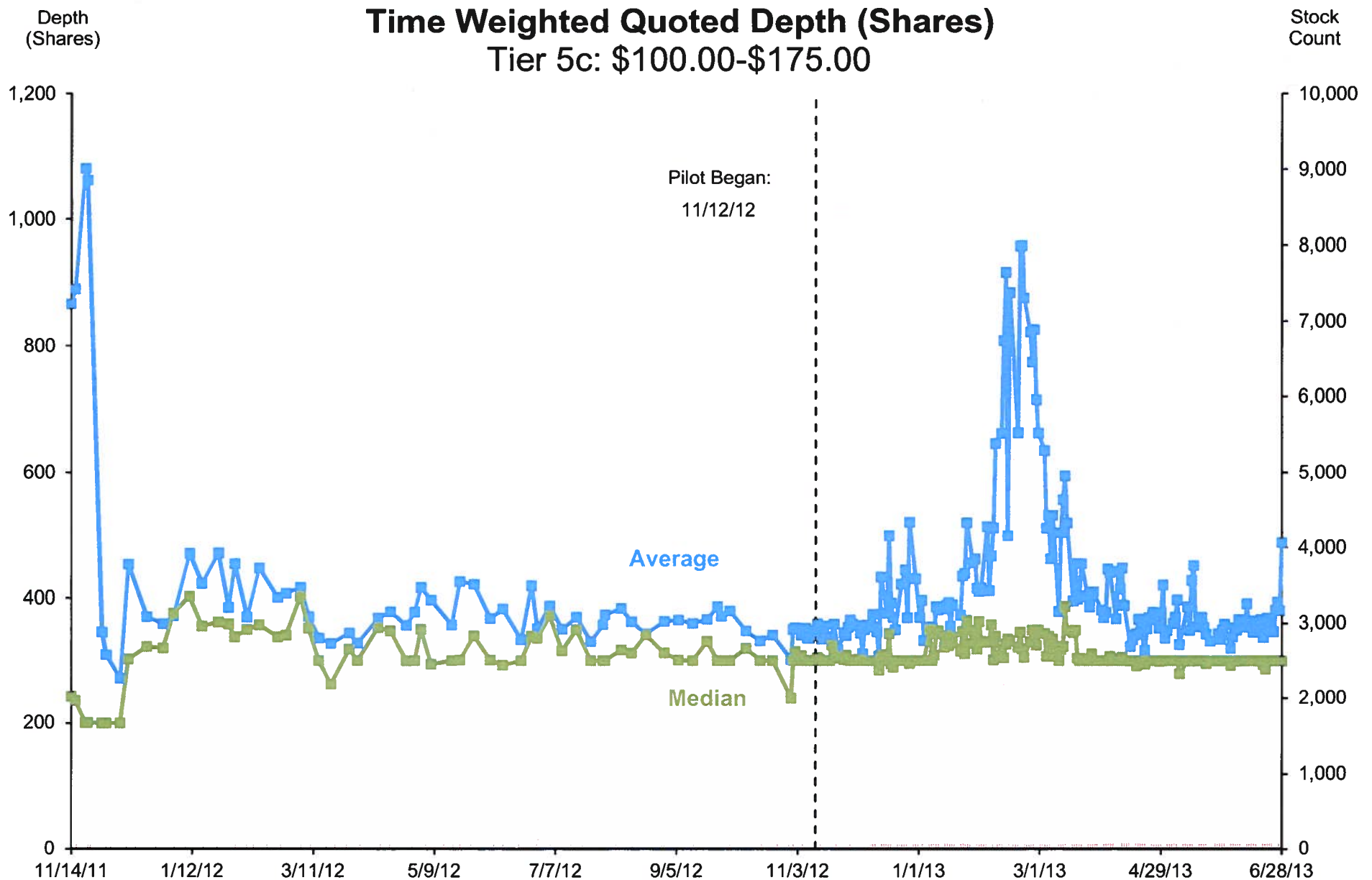
Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Depths are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 500 to 100. Quoted depth is calculated as the sum of bid and offer depths.



Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Depths are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 200 to 100. Quoted depth is calculated as the sum of bid and offer depths.

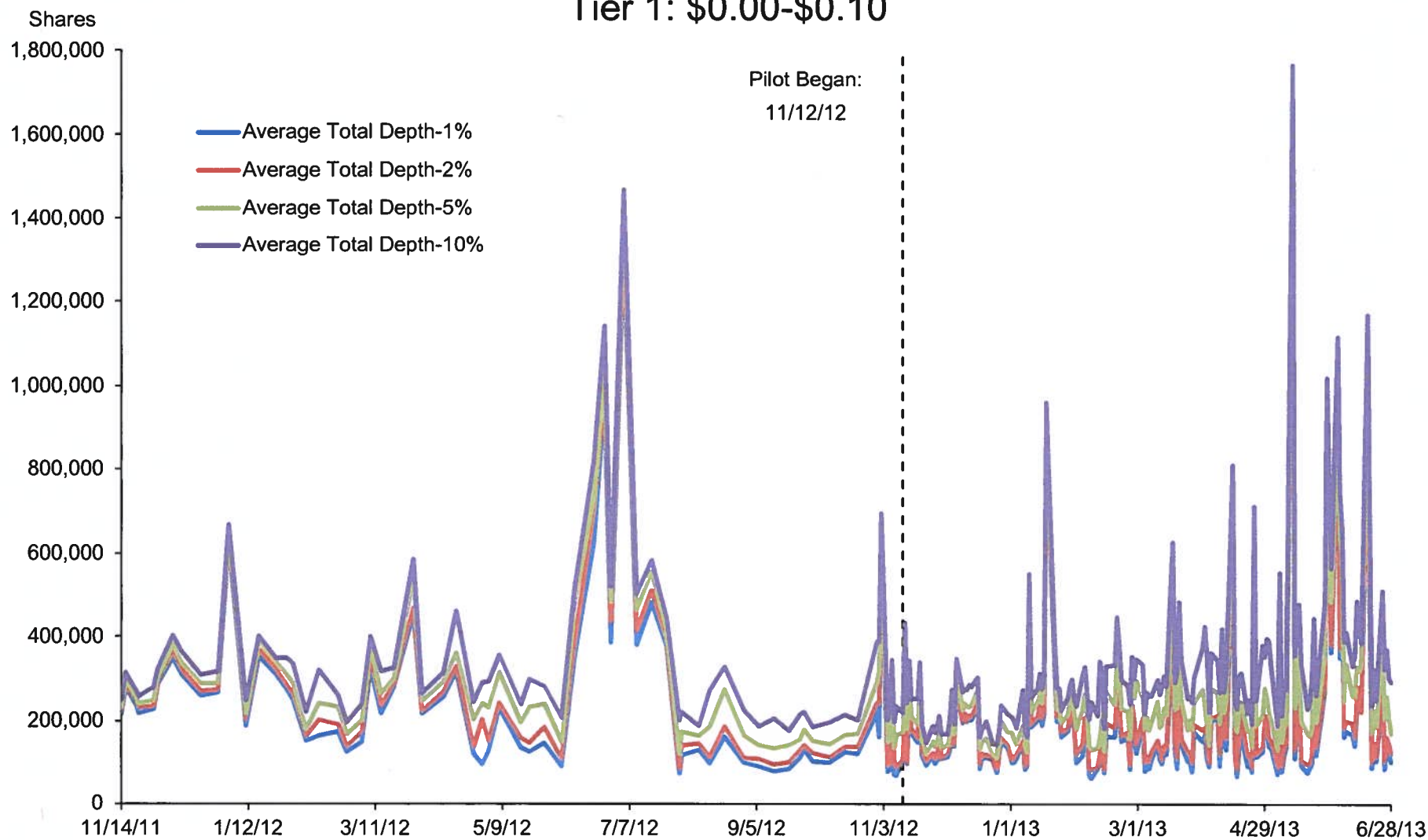


Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Depths are excluded if valid quotes during the day span more than one tier. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements. Quoted depth is calculated as the sum of bid and offer depths.

## Time-Weighted Quoted Depth around the BBO Midpoint (Shares)

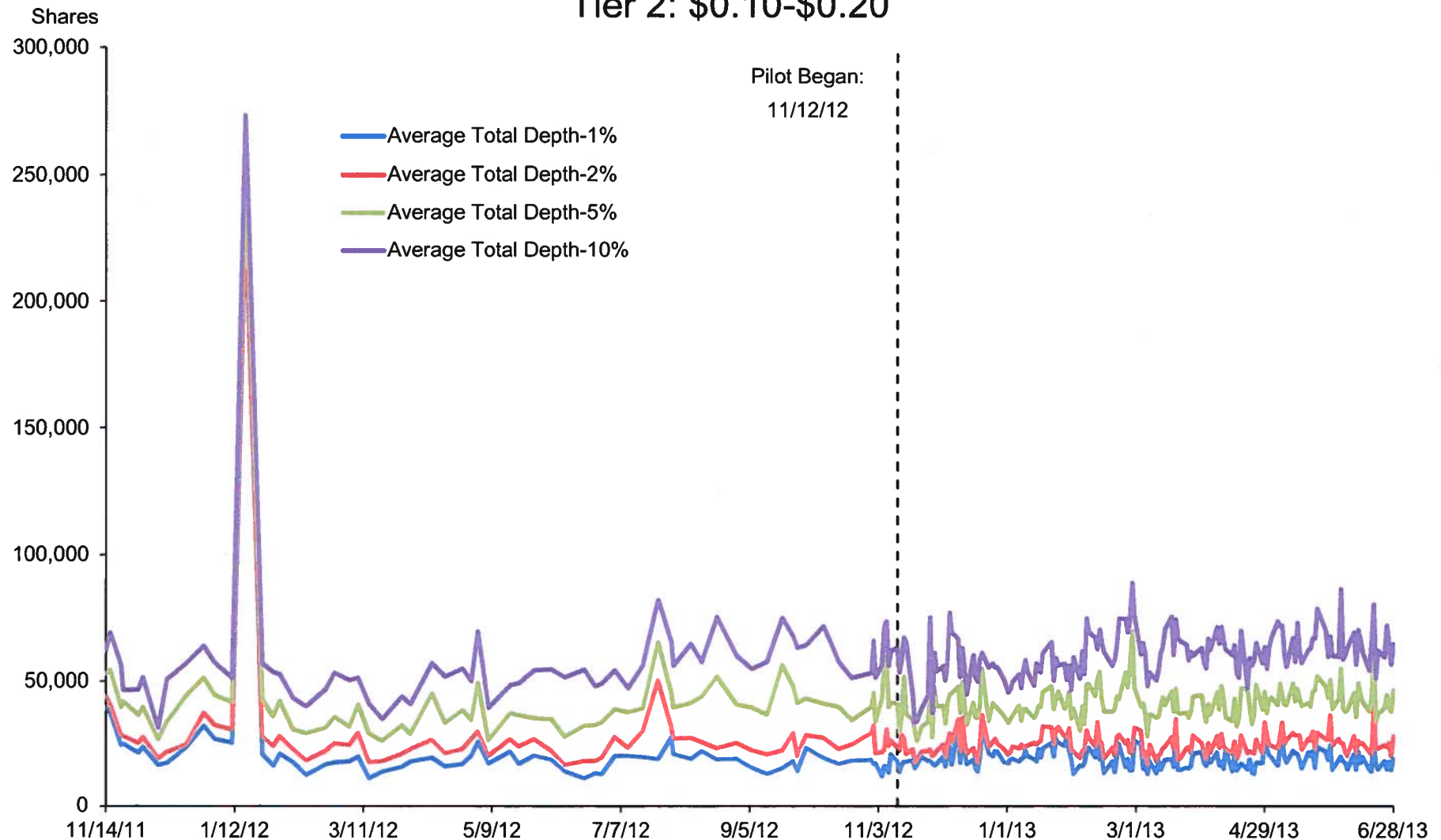
### Tier 1: \$0.00-\$0.10



Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Depths are excluded if valid quotes during the day span more than one tier. All depth within a given percentage, for which the corresponding quote is within 45% of the midpoint, are included. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 5,000 to 2,500. Quoted depth is calculated as the sum of bid and offer depths.

## Time-Weighted Quoted Depth around the BBO Midpoint (Shares) Tier 2: \$0.10-\$0.20



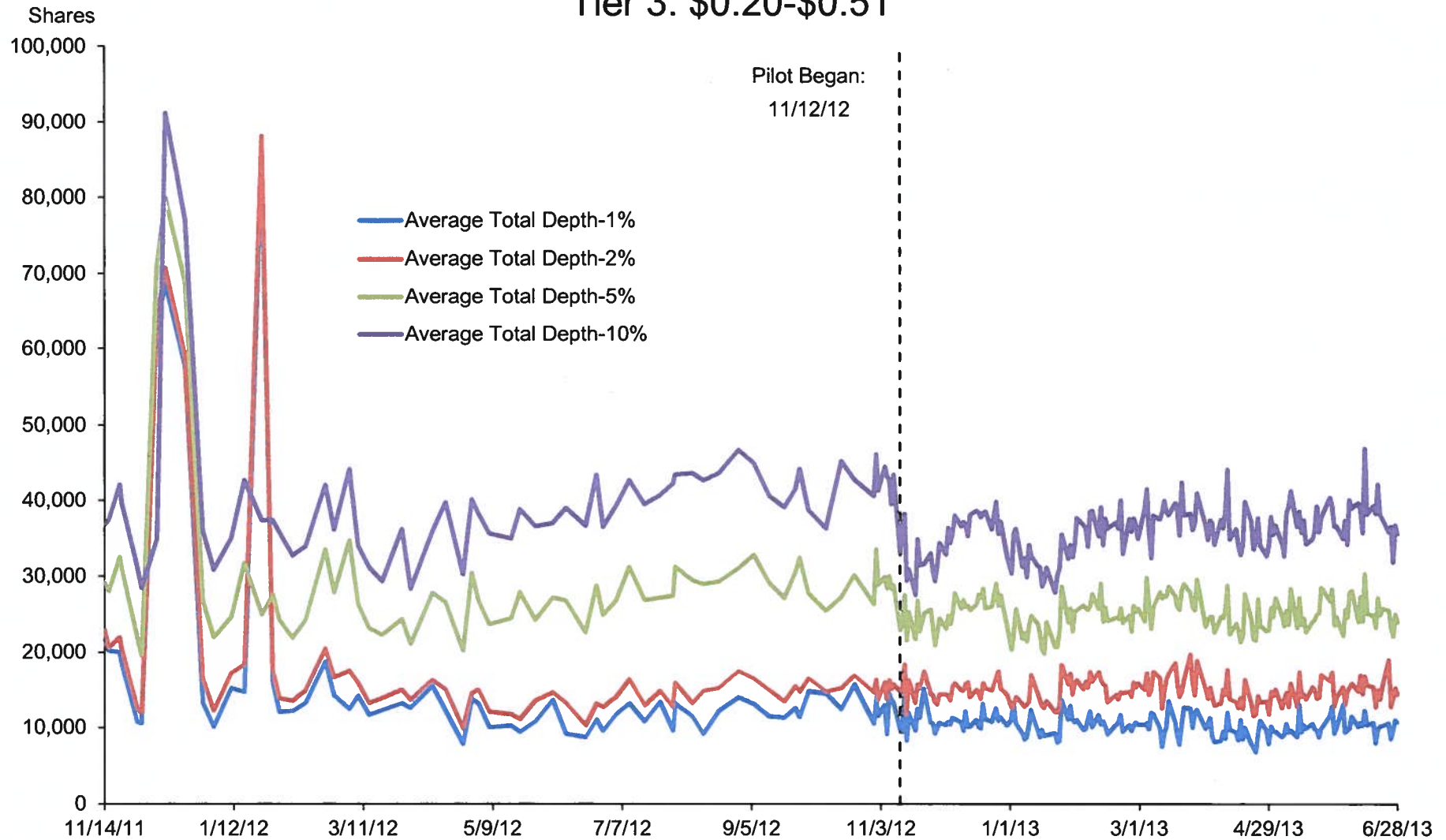
Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Depths are excluded if valid quotes during the day span more than one tier. All depth within a given percentage, for which the corresponding quote is within 45% of the midpoint, are included. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements. Quoted depth is calculated as the sum of bid and offer depths.



# Time-Weighted Quoted Depth around the BBO Midpoint (Shares)

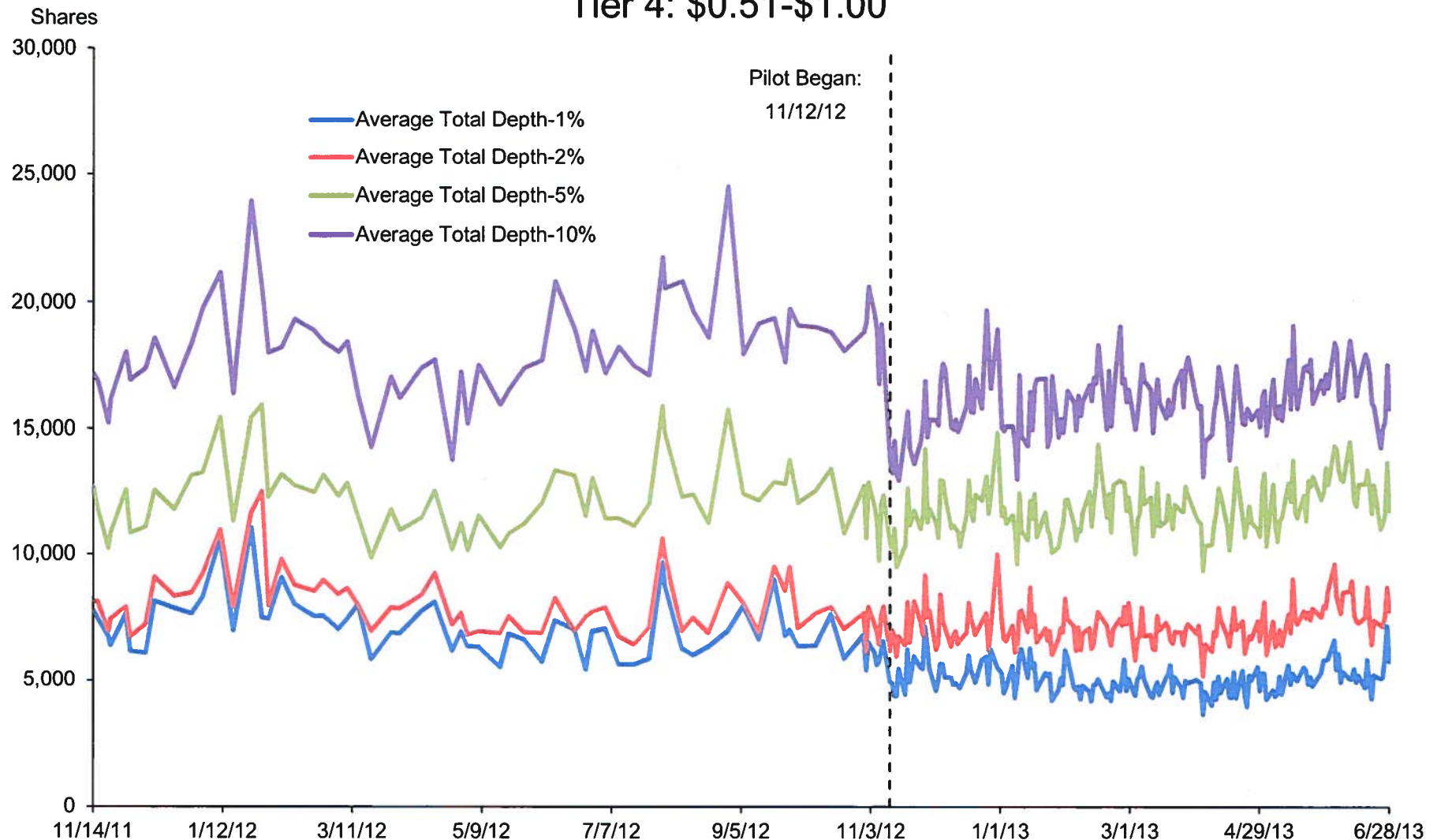
Tier 3: \$0.20-\$0.51



Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Depths are excluded if valid quotes during the day span more than one tier. All depth within a given percentage, for which the corresponding quote is within 45% of the midpoint, are included. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 5,000 to 2,500. Quoted depth is calculated as the sum of bid and offer depths.

# **Time-Weighted Quoted Depth around the BBO Midpoint (Shares)** **Tier 4: \$0.51-\$1.00**



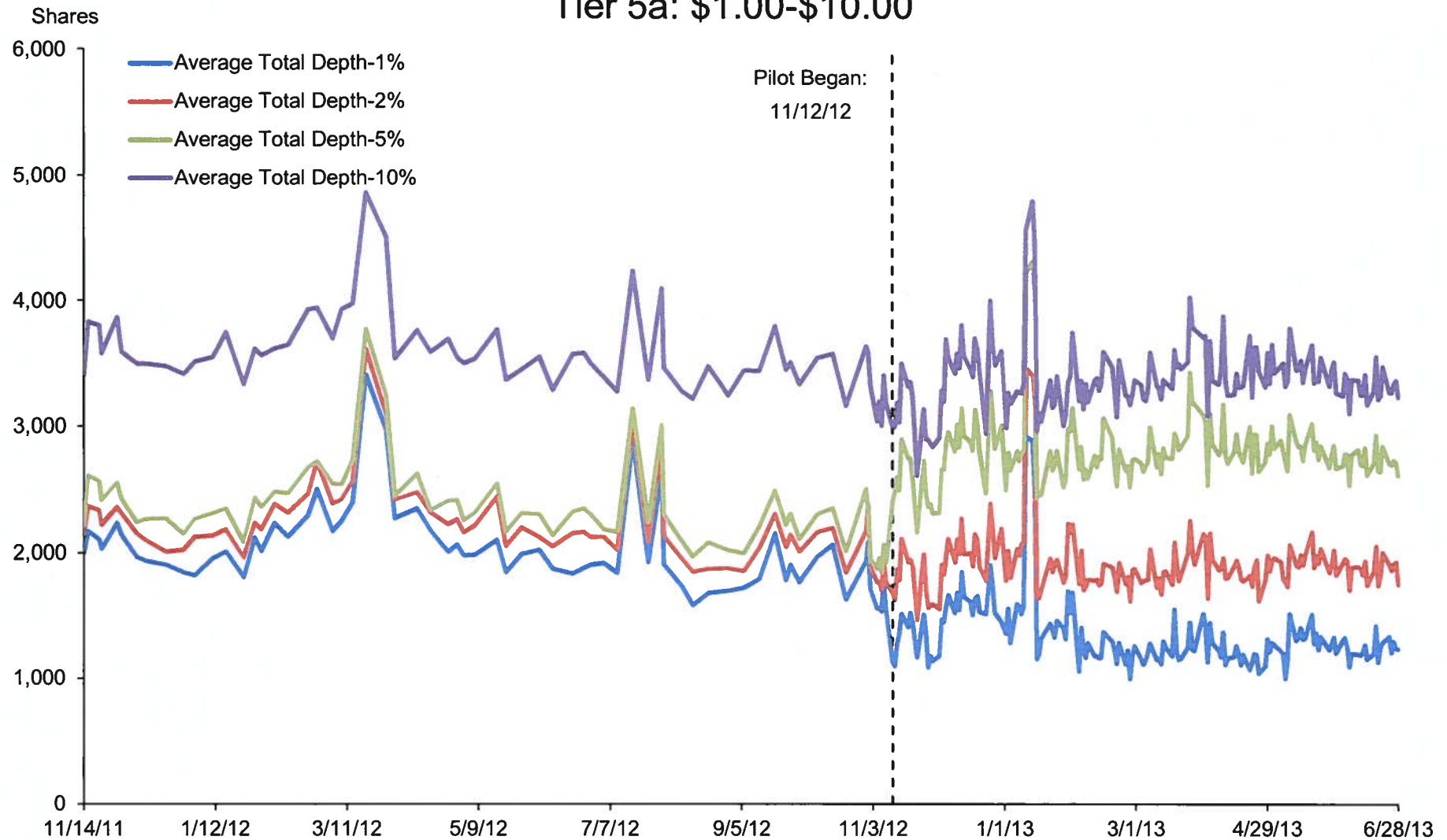
Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Depths are excluded if valid quotes during the day span more than one tier. All depth within a given percentage, for which the corresponding quote is within 45% of the midpoint, are included. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 2,500 to 1,000. Quoted depth is calculated as the sum of bid and offer depths.



# Time-Weighted Quoted Depth around the BBO Midpoint (Shares)

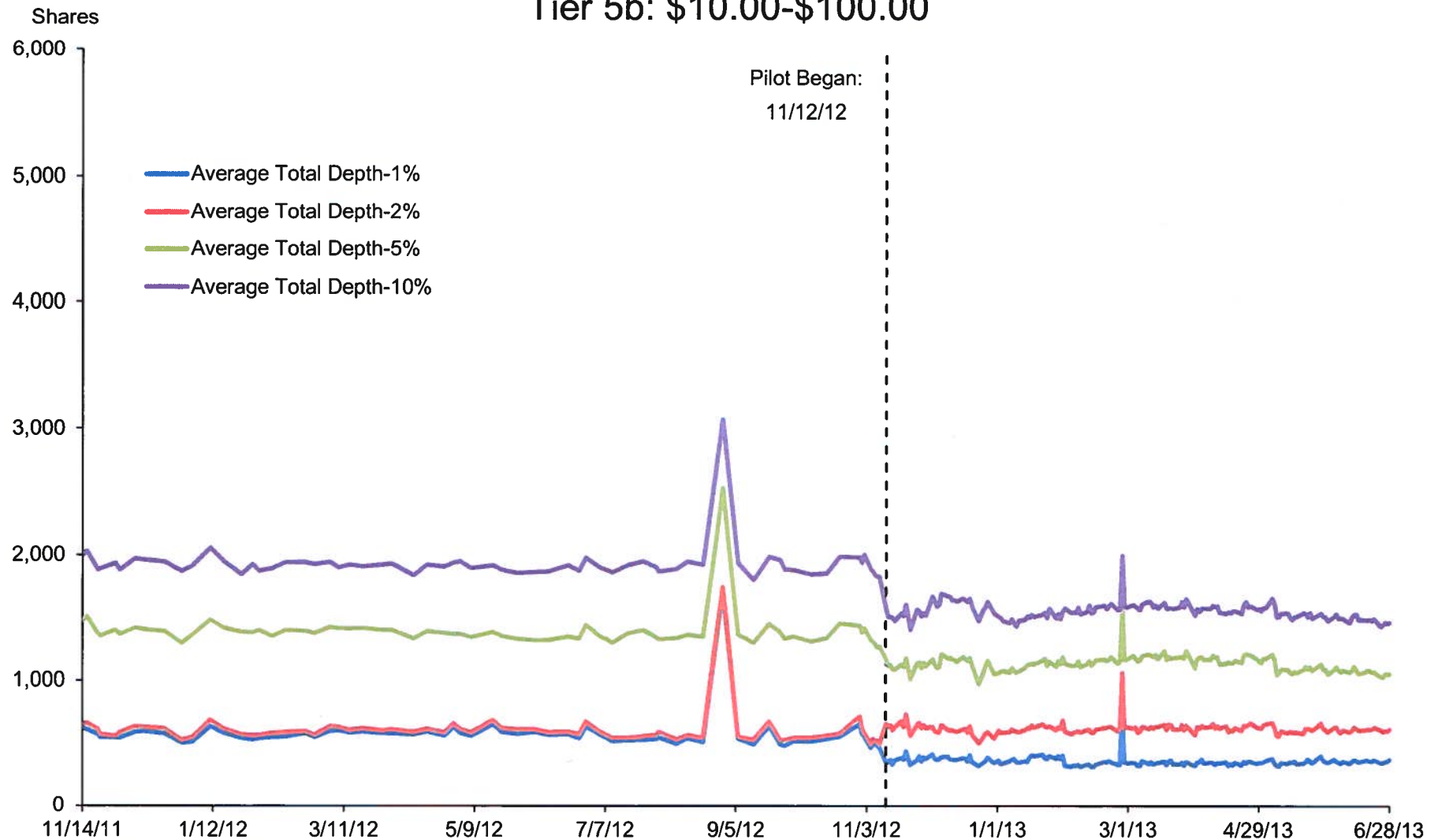
Tier 5a: \$1.00-\$10.00



Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Depths are excluded if valid quotes during the day span more than one tier. All depth within a given percentage, for which the corresponding quote is within 45% of the midpoint, are included. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 500 to 100. Quoted depth is calculated as the sum of bid and offer depths.

## Time-Weighted Quoted Depth around the BBO Midpoint (Shares) Tier 5b: \$10.00-\$100.00

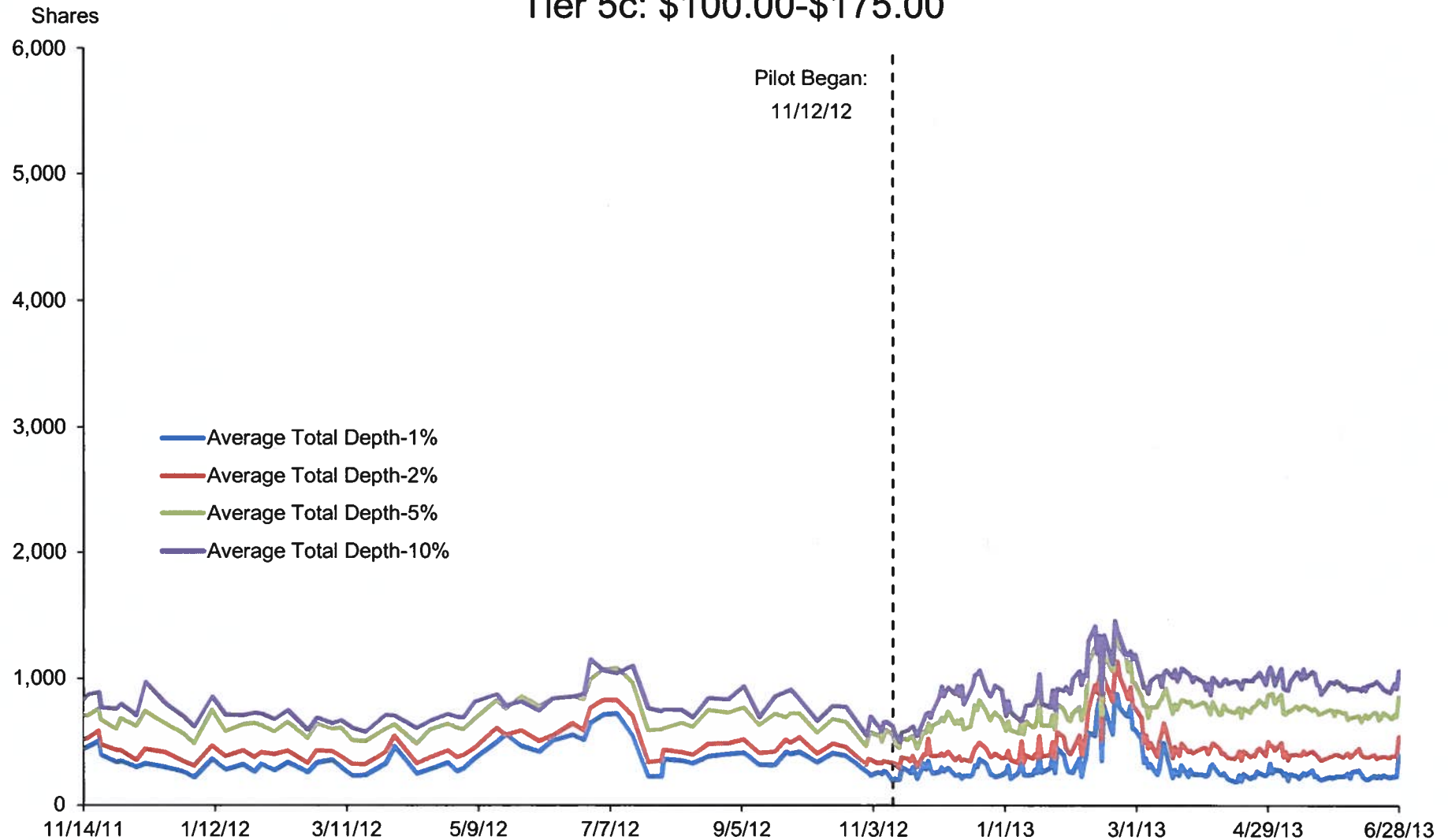


Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Depths are excluded if valid quotes during the day span more than one tier. All depth within a given percentage, for which the corresponding quote is within 45% of the midpoint, are included. For stocks in this tier, FINRA Rule 6433 decreased the minimum depth from 200 to 100. Quoted depth is calculated as the sum of bid and offer depths.

## Time-Weighted Quoted Depth around the BBO Midpoint (Shares)

### Tier 5c: \$100.00-\$175.00

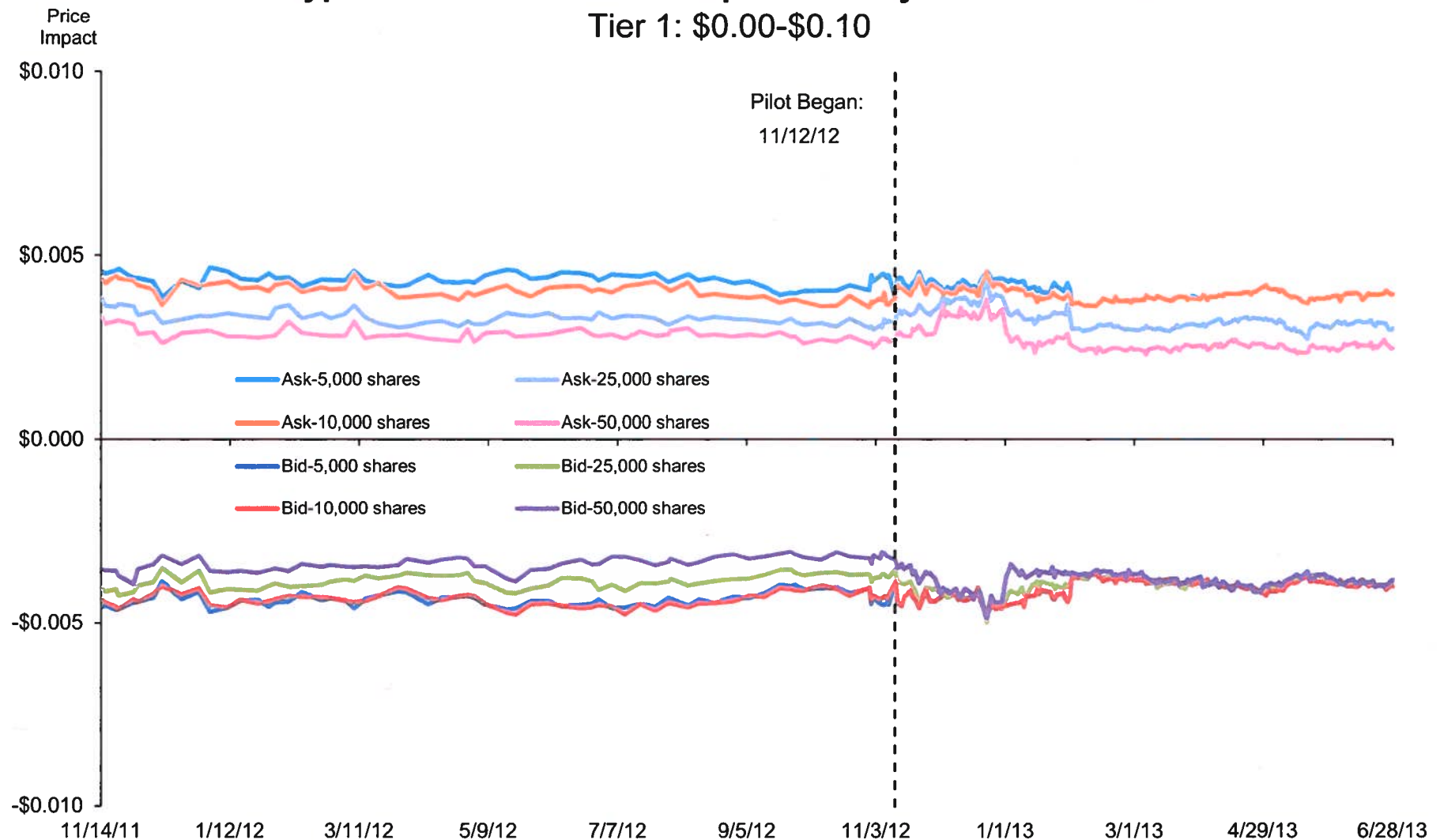


Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, or if the quoted spread divided by the offer price is over 90 percent. Depths are excluded if valid quotes during the day span more than one tier. All depth within a given percentage, for which the corresponding quote is within 45% of the midpoint, are included. For stocks in this tier, FINRA Rule 6433 maintained the previous minimum depth requirements. Quoted depth is calculated as the sum of bid and offer depths.

## Hypothetical Trade Price Impact for Buy and Sell Orders

Tier 1: \$0.00-\$0.10

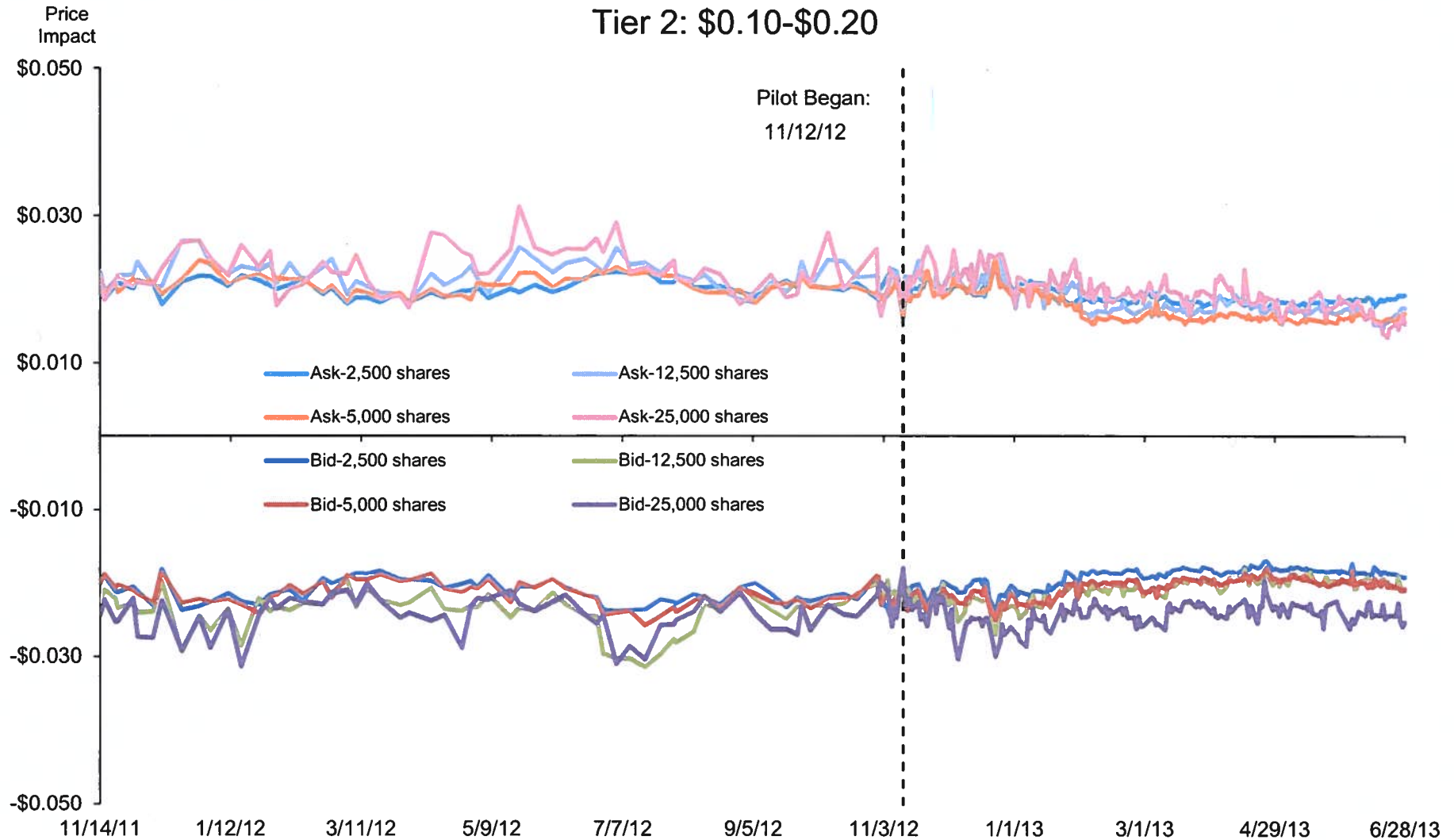


Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, if the quoted spread divided by the offer price is over 90 percent, or if the market maker quote is more than 45% away from the midpoint. Impact calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. For stocks in this tier, FINRA Rule 6433 increased the minimum depth from 5,000 to 10,000.

# Hypothetical Trade Price Impact for Buy and Sell Orders

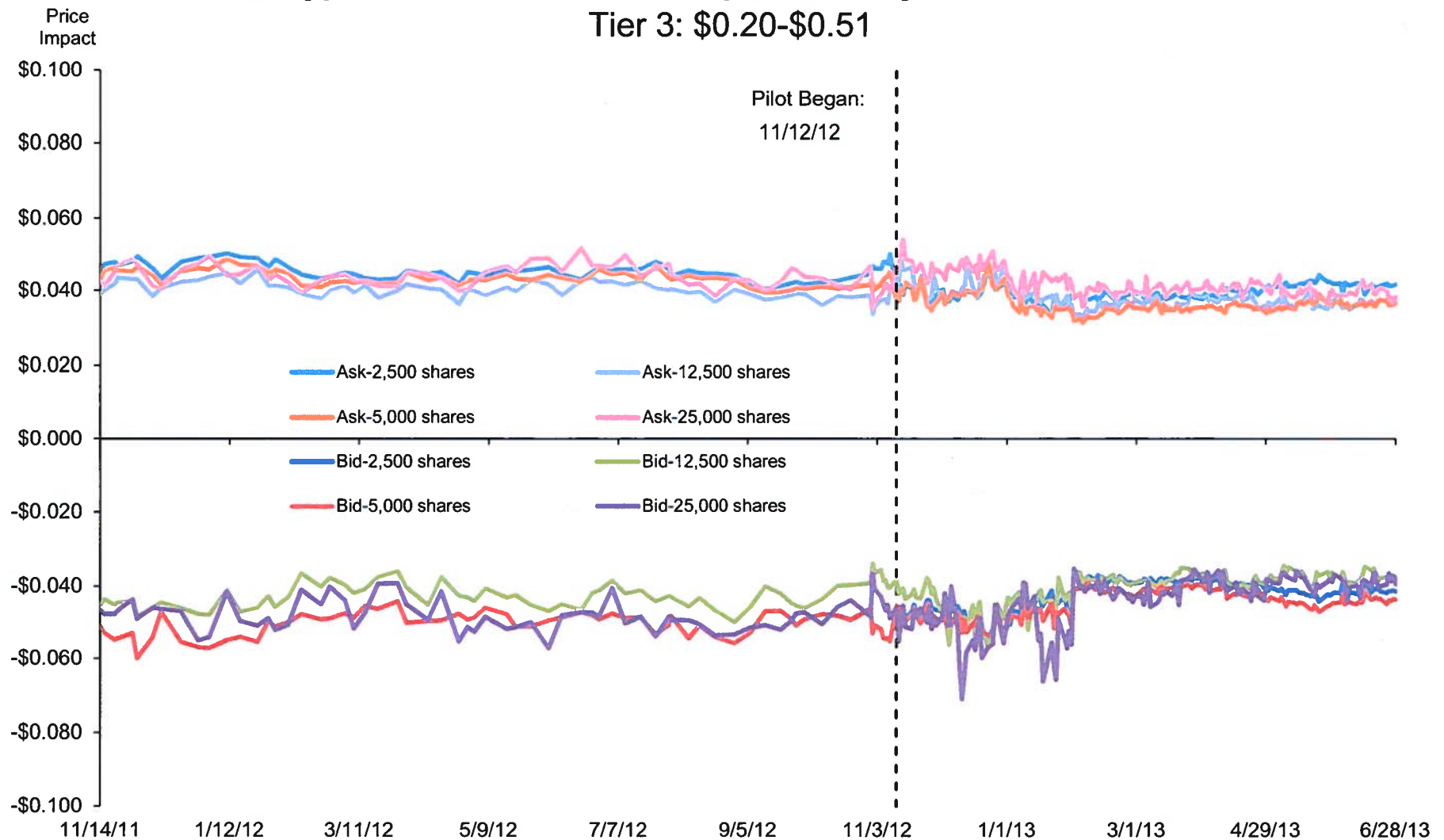
Tier 2: \$0.10-\$0.20



Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, if the quoted spread divided by the offer price is over 90 percent, or if the market maker quote is more than 45% away from the midpoint. Impact calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. FINRA Rule 6433 maintained the previous minimum depth requirements.

## Hypothetical Trade Price Impact for Buy and Sell Orders Tier 3: \$0.20-\$0.51

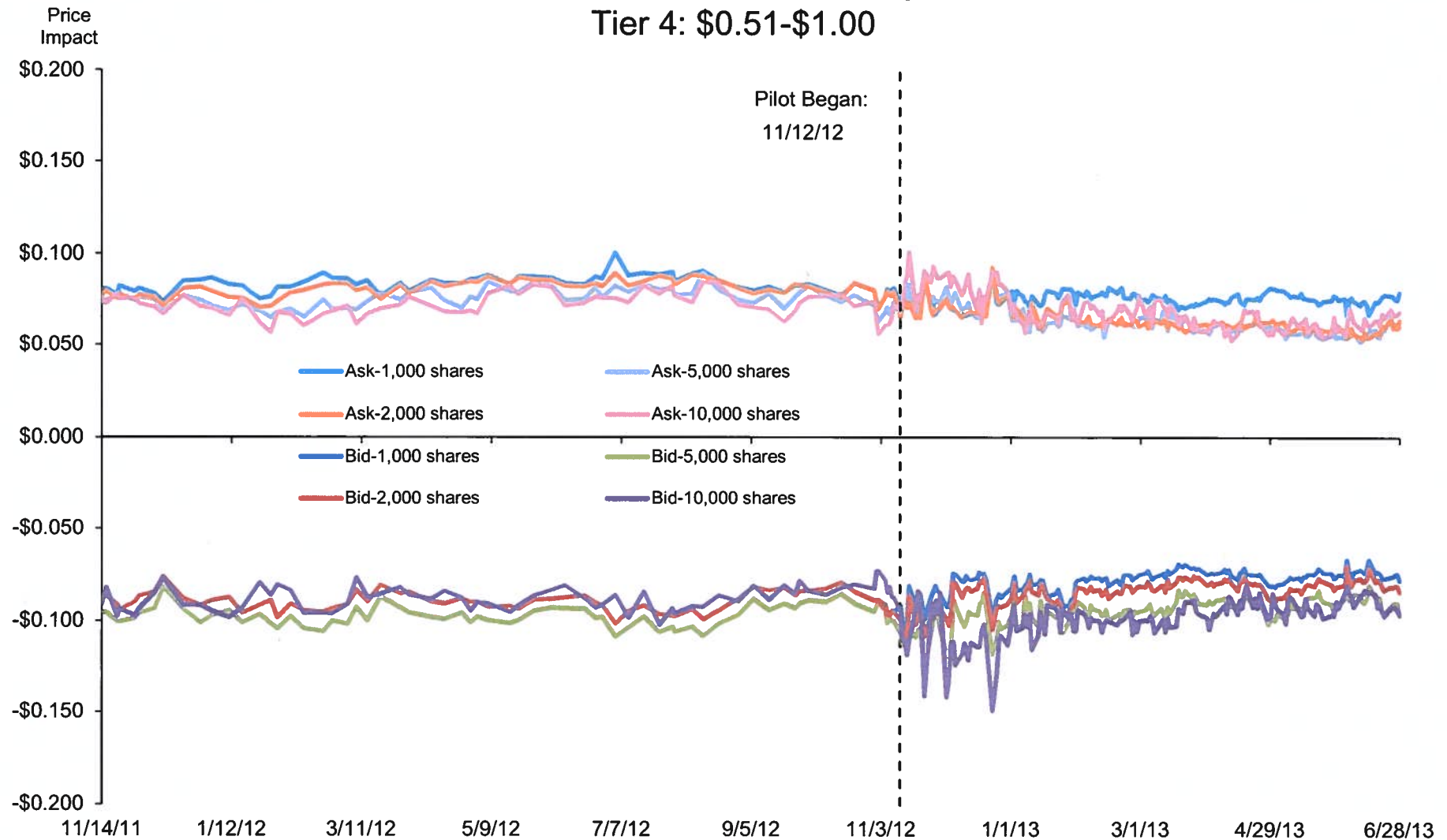


Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, if the quoted spread divided by the offer price is over 90 percent, or if the market maker quote is more than 45% away from the midpoint. Impact calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. FINRA Rule 6433 decreased the minimum depth from 5,000 to 2,500.



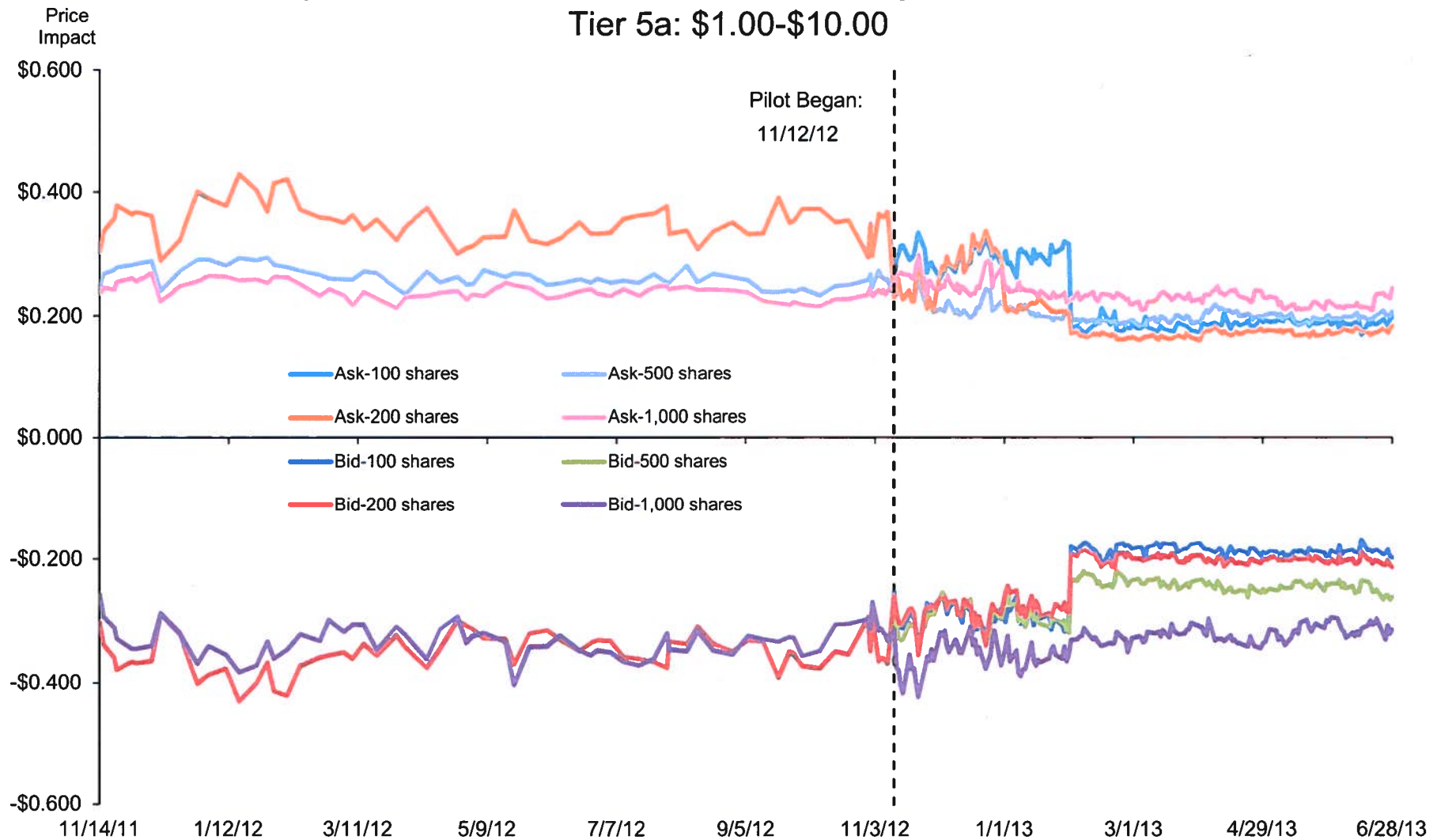
## Hypothetical Trade Price Impact for Buy and Sell Orders Tier 4: \$0.51-\$1.00



Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, if the quoted spread divided by the offer price is over 90 percent, or if the market maker quote is more than 45% away from the midpoint. Impact calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. FINRA Rule 6433 decreased the minimum depth from 2,500 to 1,000.

## Hypothetical Trade Price Impact for Buy and Sell Orders Tier 5a: \$1.00-\$10.00

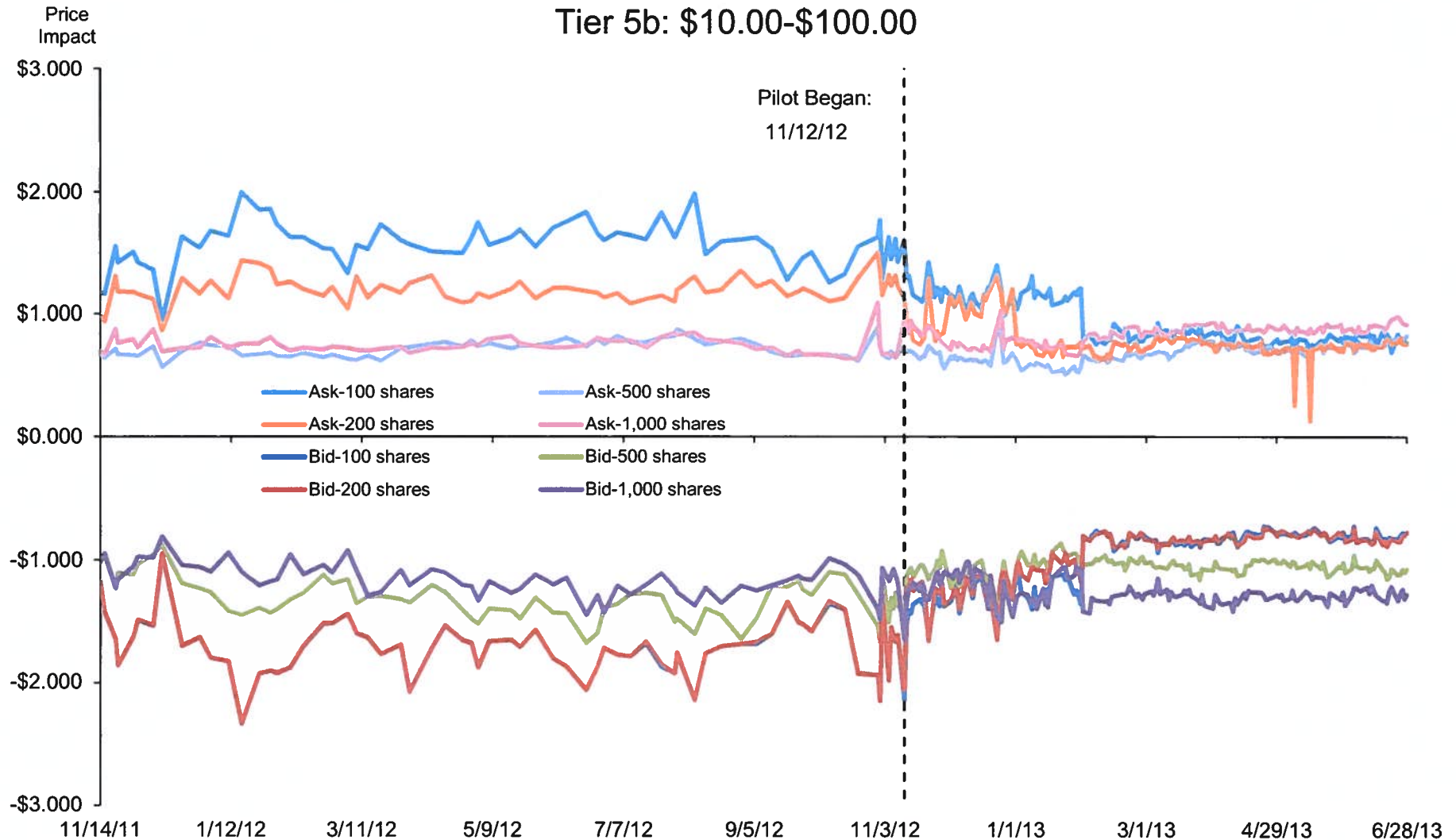


Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, if the quoted spread divided by the offer price is over 90 percent, or if the market maker quote is more than 45% away from the midpoint. Impact calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. FINRA Rule 6433 decreased the minimum depth from 500 to 100.



## Hypothetical Trade Price Impact for Buy and Sell Orders Tier 5b: \$10.00-\$100.00

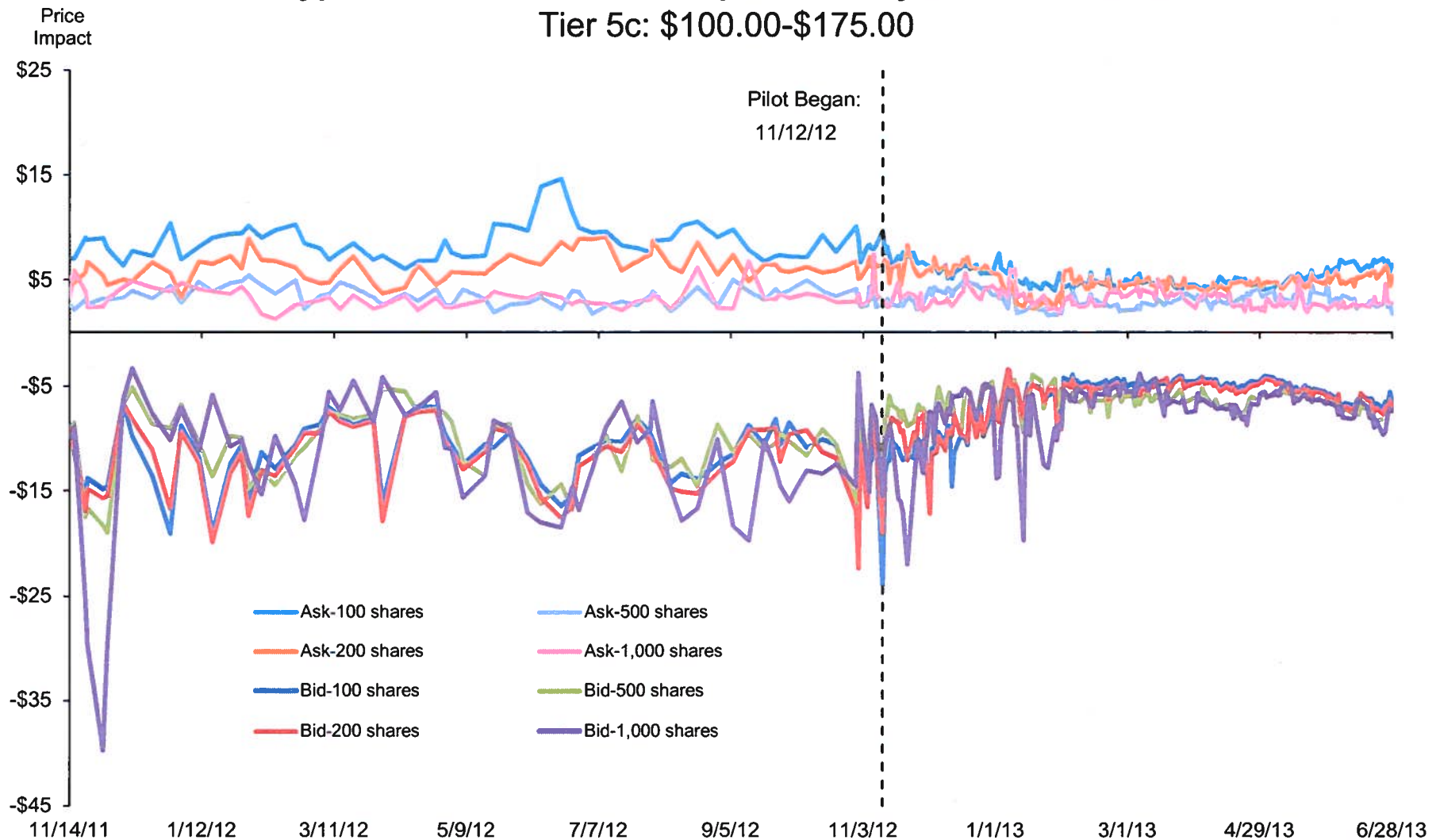


Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, if the quoted spread divided by the offer price is over 90 percent, or if the market maker quote is more than 45% away from the midpoint. Impact calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. FINRA Rule 6433 decreased the minimum depth from 200 to 100.

## Hypothetical Trade Price Impact for Buy and Sell Orders

Tier 5c: \$100.00-\$175.00

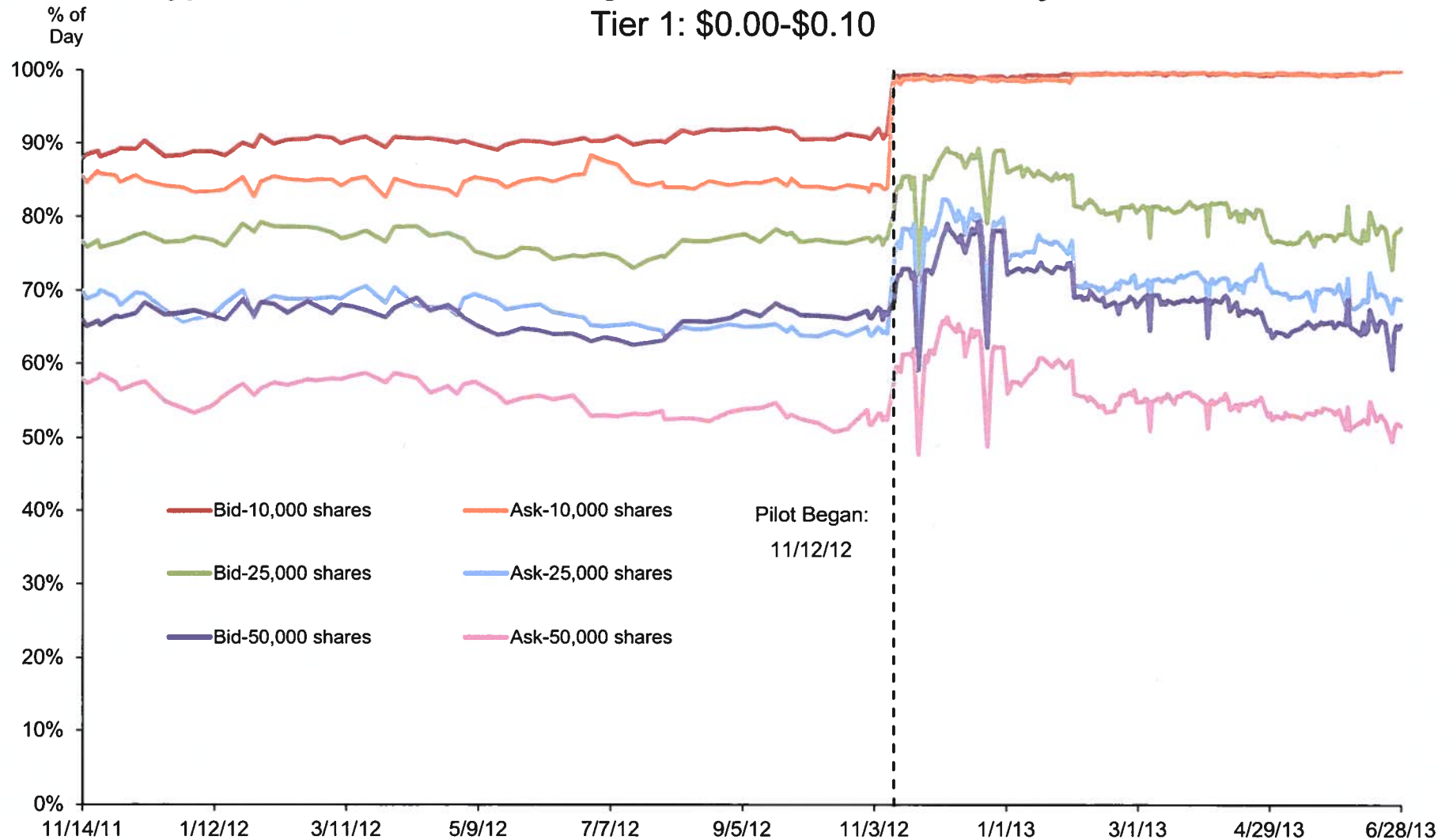


Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, if the quoted spread divided by the offer price is over 90 percent, or if the market maker quote is more than 45% away from the midpoint. Impact calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. FINRA Rule 6433 maintained the previous minimum depth requirements.

## Hypothetical Trade Percentage of Time Executed for Buy and Sell Orders

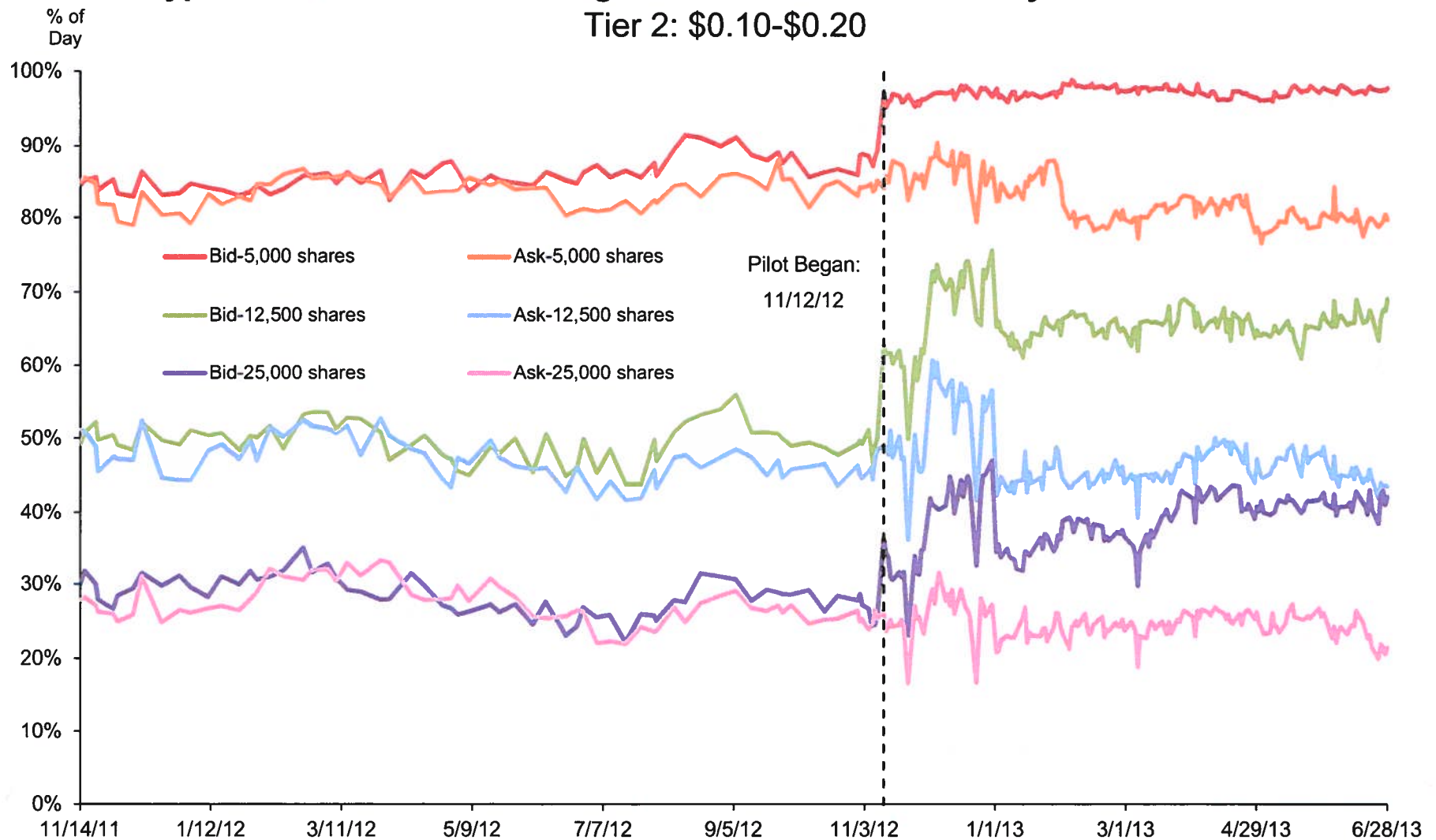
Tier 1: \$0.00-\$0.10



Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, if the quoted spread divided by the offer price is over 90 percent, or if the market maker quote is more than 45% away from the midpoint. Percentage calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. For stocks in this tier, FINRA Rule 6433 increased the minimum depth from 5,000 to 10,000.

## Hypothetical Trade Percentage of Time Executed for Buy and Sell Orders Tier 2: \$0.10-\$0.20

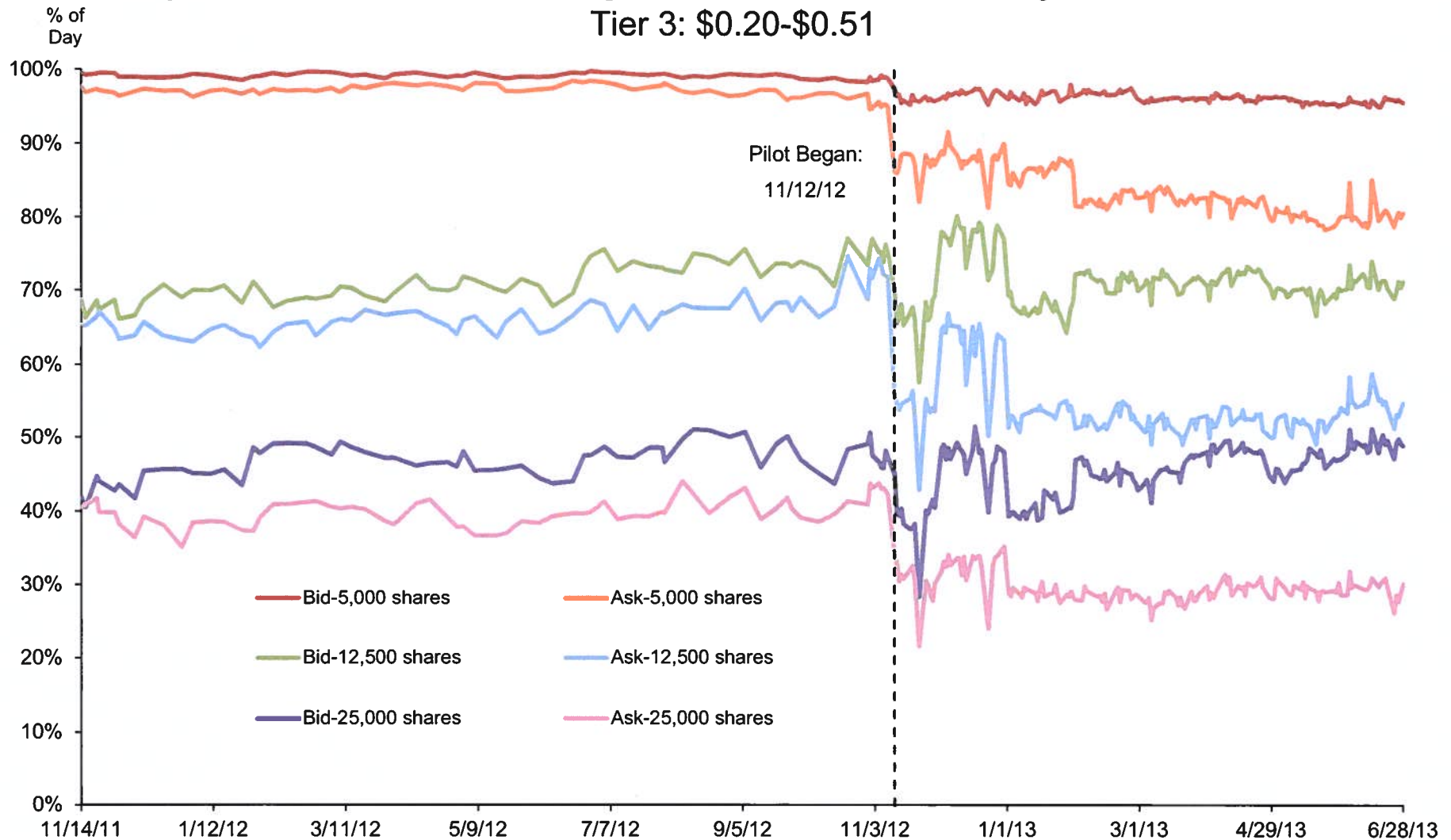


Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, if the quoted spread divided by the offer price is over 90 percent, or if the market maker quote is more than 45% away from the midpoint. Percentage calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. FINRA Rule 6433 maintained the previous minimum depth requirements.

## Hypothetical Trade Percentage of Time Executed for Buy and Sell Orders

Tier 3: \$0.20-\$0.51



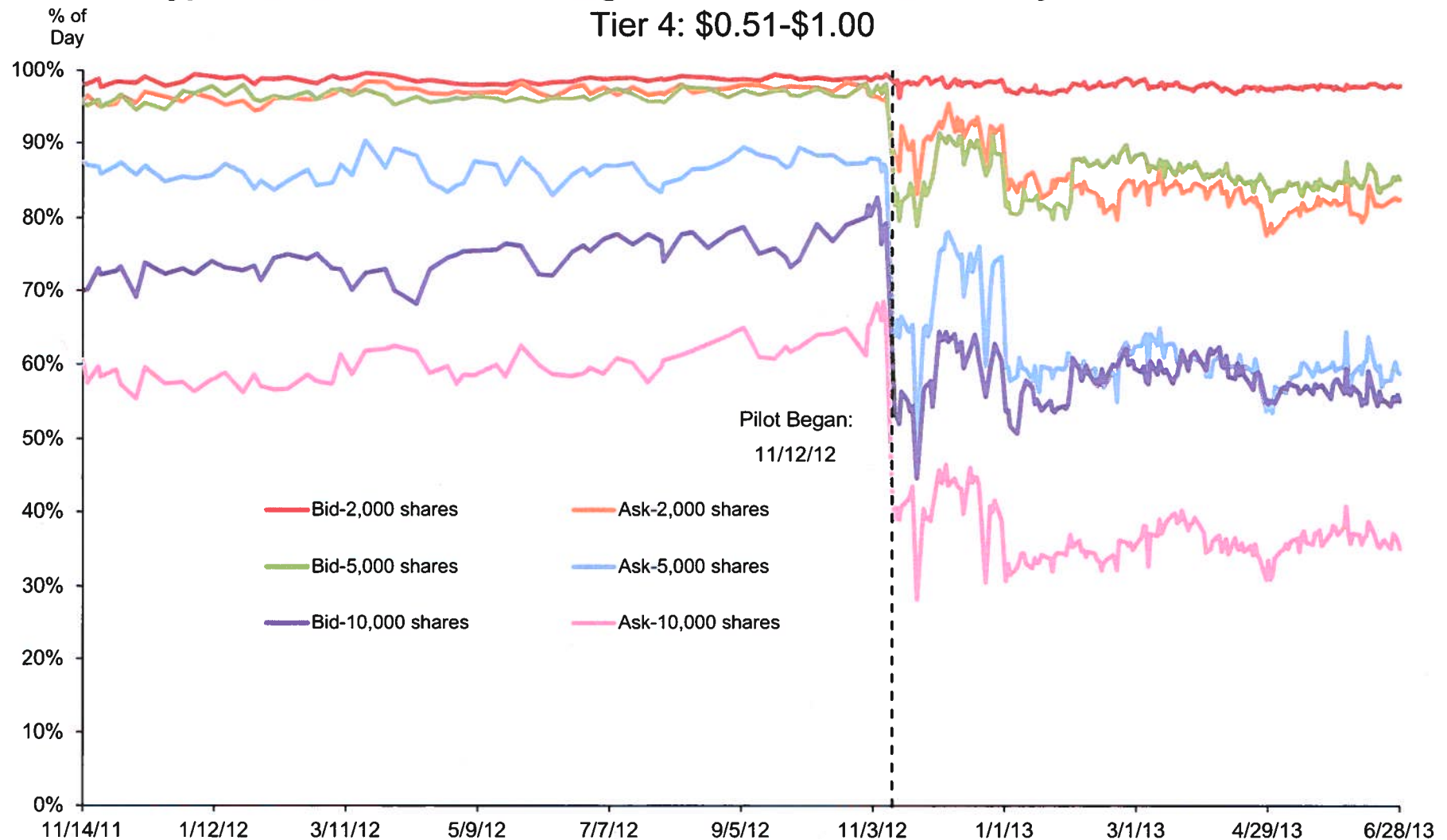
Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, if the quoted spread divided by the offer price is over 90 percent, or if the market maker quote is more than 45% away from the midpoint. Percentage calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. FINRA Rule 6433 decreased the minimum depth from 5,000 to 2,500.



## Hypothetical Trade Percentage of Time Executed for Buy and Sell Orders

Tier 4: \$0.51-\$1.00

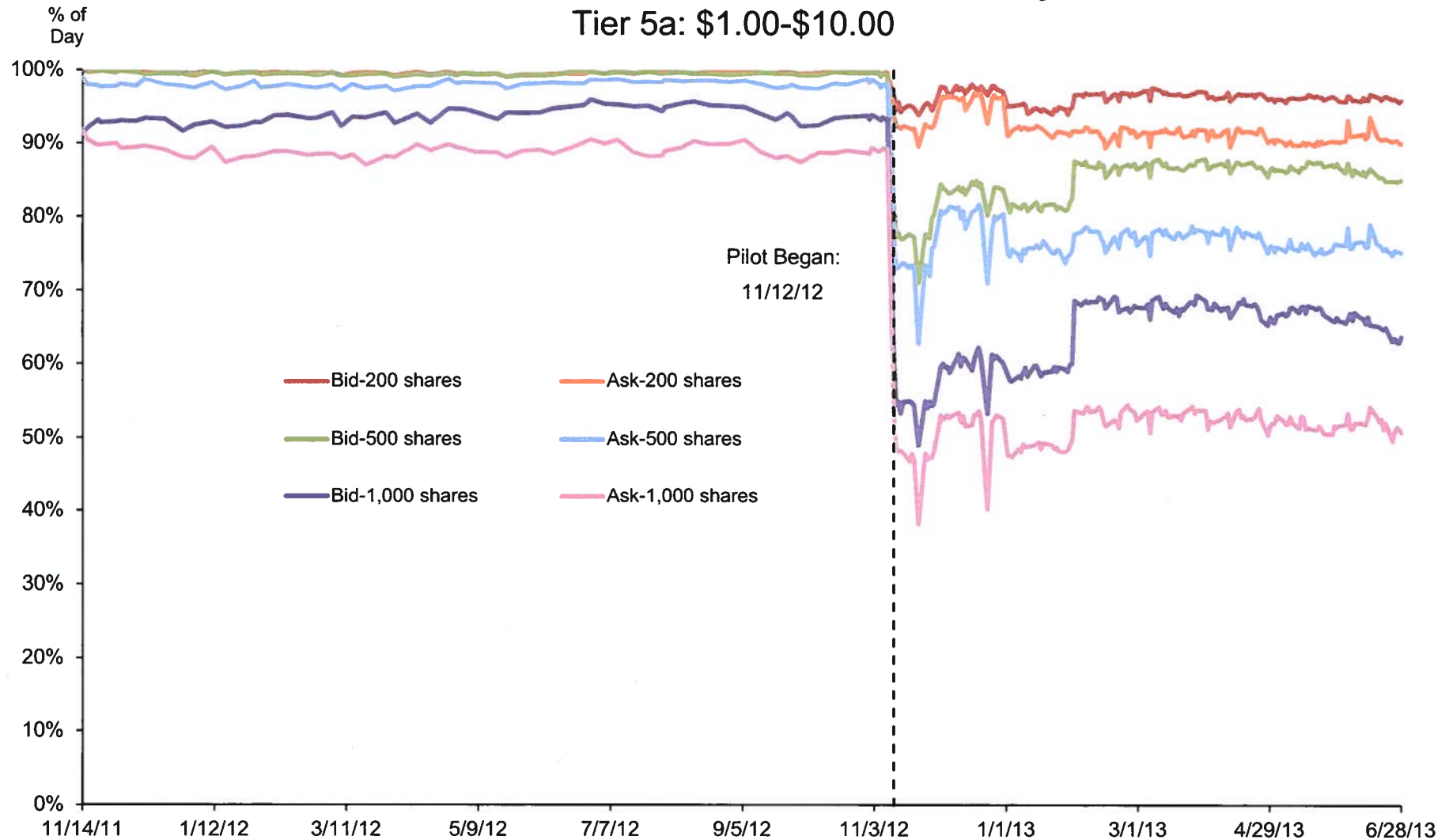


Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, if the quoted spread divided by the offer price is over 90 percent, or if the market maker quote is more than 45% away from the midpoint. Percentage calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. FINRA Rule 6433 decreased the minimum depth from 2,500 to 1,000.

## Hypothetical Trade Percentage of Time Executed for Buy and Sell Orders

Tier 5a: \$1.00-\$10.00

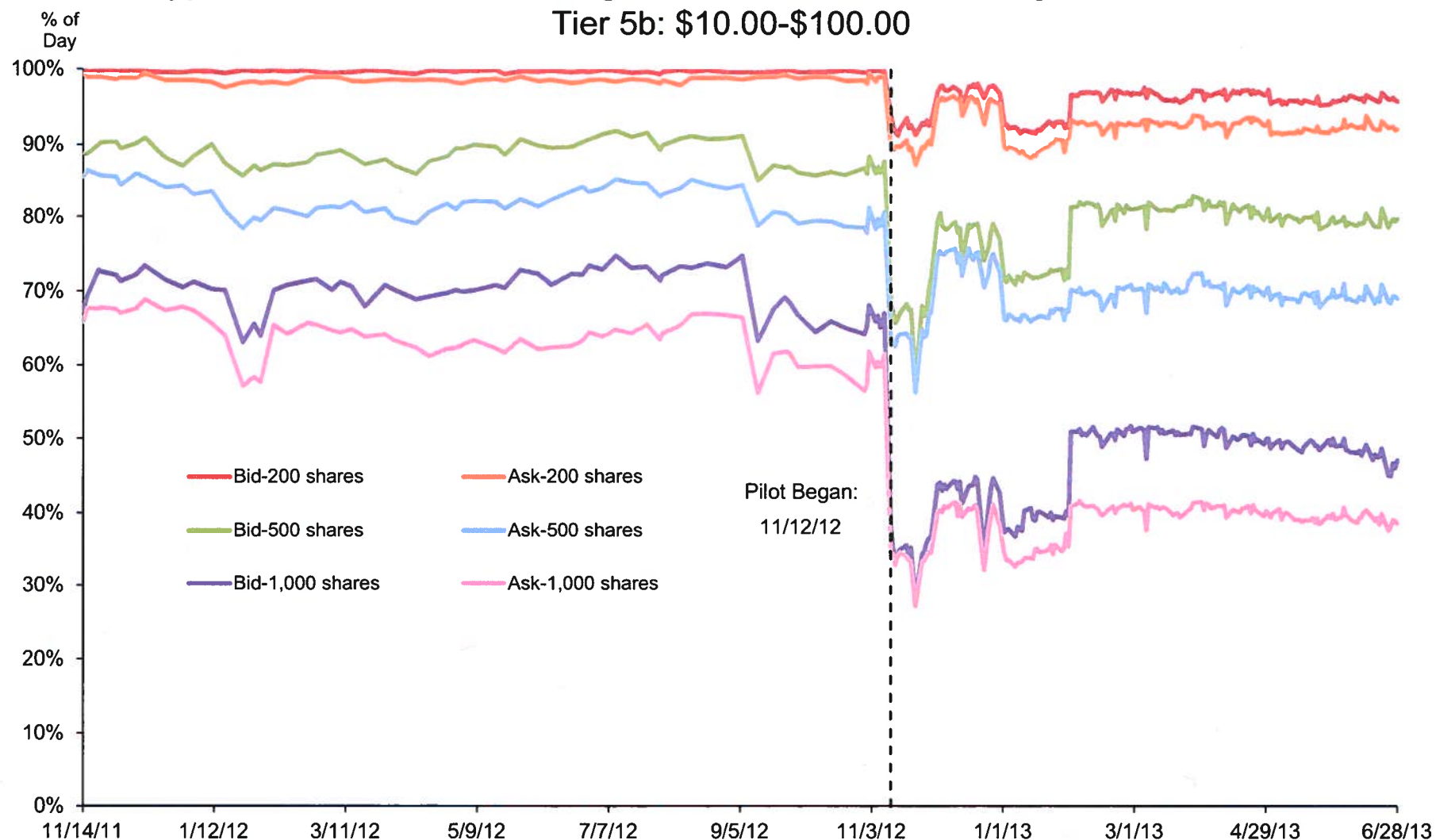


Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, if the quoted spread divided by the offer price is over 90 percent, or if the market maker quote is more than 45% away from the midpoint. Percentage calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. FINRA Rule 6433 decreased the minimum depth from 500 to 100.

## Hypothetical Trade Percentage of Time Executed for Buy and Sell Orders

Tier 5b: \$10.00-\$100.00



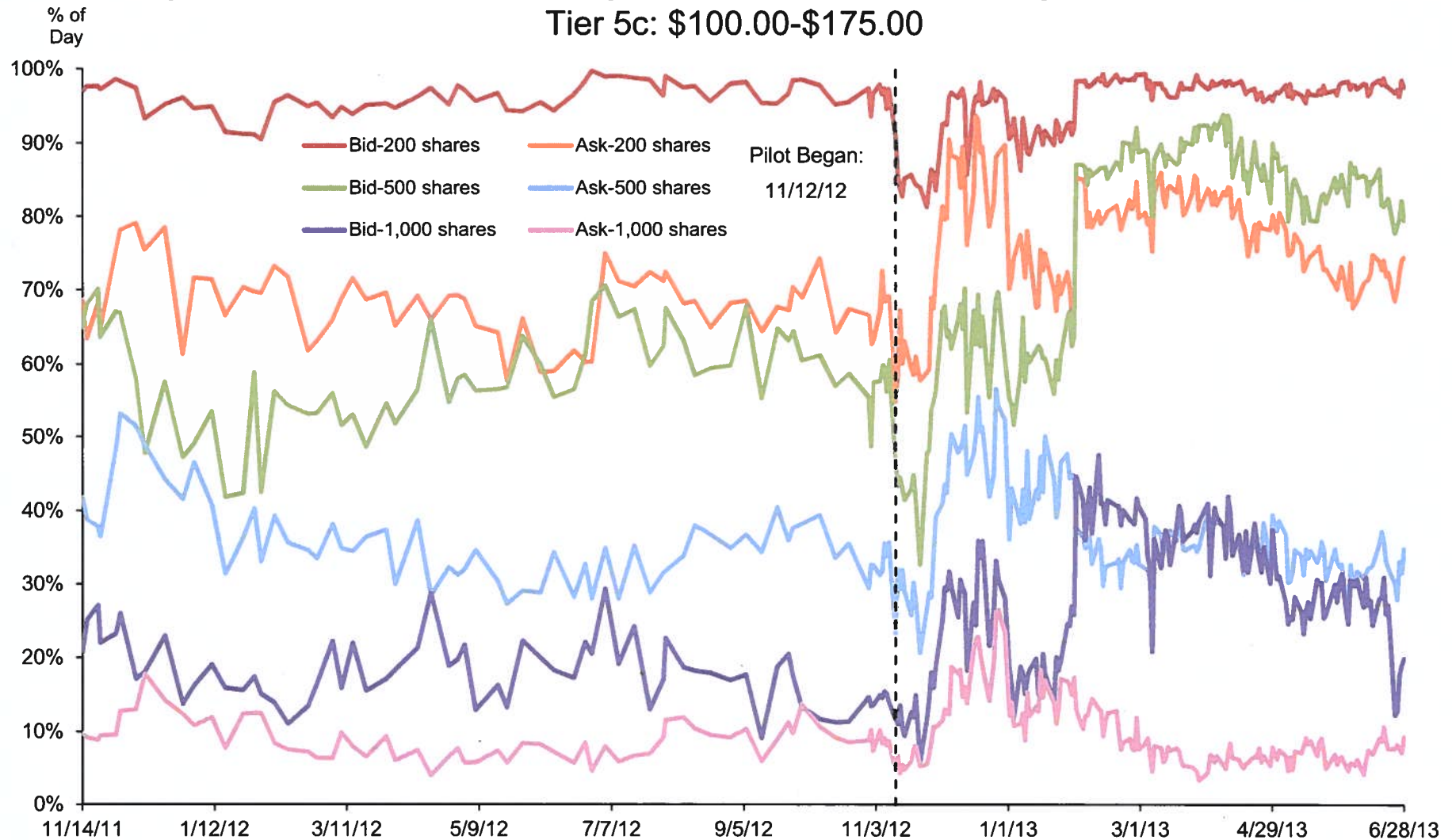
Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, if the quoted spread divided by the offer price is over 90 percent, or if the market maker quote is more than 45% away from the midpoint. Percentage calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. FINRA Rule 6433 decreased the minimum depth from 200 to 100.



# Hypothetical Trade Percentage of Time Executed for Buy and Sell Orders

Tier 5c: \$100.00-\$175.00



Source: OTC Link

Note: Quotes are removed from calculation if the market is crossed, if the quoted bid or offer is zero, if the quoted spread divided by the offer price is over 90 percent, or if the market maker quote is more than 45% away from the midpoint. Percentage calculated for various set sizes of hypothetical buy and sell orders, constituting fixed multiples of the minimum required depth size for the corresponding tier. FINRA Rule 6433 maintained the previous minimum depth requirements.

**MEMORANDUM**

**TO: File**

**FROM: The Division of Economic and Risk Analysis<sup>1</sup>**

**DATE: July 28, 2017**

**RE: FINRA's Pilot Program Amending Minimum Quotation Size Requirements for OTC Equity Securities (SR-FINRA-2011-058)**

**Summary**

On June 15, 2012, the Securities and Exchange Commission ("the Commission") approved a pilot program that amended FINRA Rule 6433, which governs the minimum quotation size requirements for over-the-counter ("OTC") equity securities. The pilot reduced the minimum quotation size requirements for most price tiers, although for some tiers the minimum quotation size requirement increased or remained the same. The pilot began on November 12, 2012, and it is currently scheduled to end on December 8, 2017.

In the approval order for the pilot, the Commission noted that FINRA committed to provide the Commission with the data necessary to assess the impact of the revised tier sizes on the OTC equity market. In particular, the Commission noted that this data would afford the Commission an opportunity to assess the impact of the revised tier sizes on liquidity of OTC equity securities.

In this memo, using the data provided by FINRA, we assess the impact of the pilot on liquidity as measured by quoted and effective spreads.<sup>2</sup> For stocks in price tiers where the minimum quotation size requirement decreased, we find that both quoted and effective spreads decreased between the pre-pilot period and the pilot period. Furthermore, our analysis suggests that these decreases in spreads may reflect causal effects of the pilot.

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<sup>1</sup> This is a memo by the Staff of the Division of Economic and Risk Analysis of the U.S. Securities and Exchange Commission. The U.S. Securities and Exchange Commission, as a matter of policy, disclaims responsibility for any private publication or statement of any of its employees. The views expressed in this paper are those of the author and do not necessarily reflect the views of the Commission, or its staff, or of the authors' colleagues.

<sup>2</sup> Lower (higher) spreads indicate higher (lower) level of liquidity.

For stocks in the price tier where the minimum quotation size requirement increased, we find that both quoted and effective spreads increased between the pre-pilot period and the pilot period. However, we do not find sufficient evidence that these increases in spreads were caused by the pilot.

For price tiers where the minimum quotation size requirement remained the same, we find that between the pre-pilot period and the pilot period, quoted and effective spreads decreased for stocks in one tier but did not change for stocks in another tier. We also find that for the former group of stocks, the decreases in spreads may have been caused by factors unrelated to the pilot.

Our findings are similar to the findings of a FINRA-commissioned study conducted by Cornerstone Research (“the FINRA/Cornerstone Study”).<sup>3</sup> In particular, our findings are consistent with FINRA’s assessment that the pilot had a neutral to positive impact on liquidity (i.e., had no effect on spreads or reduced spreads in the context of our study) for the majority of OTC equity securities and price tiers. At the same time, like the FINRA/Cornerstone Study, we find inconclusive evidence regarding the effects of the pilot on liquidity for the price tier where the minimum quotation size requirement increased.

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<sup>3</sup> FINRA Assessment of Rule 6433 and Cornerstone Research, “OTC Tier Size Analysis,” September 13, 2013 (the “FINRA/Cornerstone Study”), available at <http://www.sec.gov/comments/sr-finra-2011-058/finra2011058-15.pdf>.

## I. Background

FINRA Rule 6433 sets forth a minimum quotation size that may be displayed on any inter-dealer quotation system for over-the-counter (OTC) equity securities. The minimum quotation size in Rule 6433 also determines the minimum size at or above which market makers are required to display OTC customer limit orders. The minimum quotation size varies as a function of the stock price, according to a schedule known as the “tier structure”.

On October 14, 2011, the Commission published notice of FINRA’s proposed rule change<sup>4</sup> (“Notice”) that would modify the tier structure in Rule 6433 by decreasing the number of tiers from nine to six and reducing the minimum quotation sizes for most tiers. In the Notice, FINRA stated that lower minimum quotation sizes would facilitate the display of customer limit orders, which would in turn increase quote competition, reduce bid-ask spreads, and improve liquidity.

The Commission solicited comments from the public on FINRA’s original proposal, on the Commission’s order instituting proceedings to determine whether to approve or disapprove the proposed rule change, and on FINRA’s subsequent amendments to the original proposal.<sup>5</sup> On June 15, 2012, the Commission approved the rule change as a one-year pilot program,<sup>6</sup> and its implementation started on November 12, 2012. The pilot was subsequently extended and is currently scheduled to end on December 8, 2017.<sup>7</sup>

Table 1 compares the minimum quotation size requirements under the pre-pilot rule and under the pilot rule for each price range. The minimum quotation size increased for prices below \$0.10 (Tier 1), remained the same for prices between \$0.10 and \$0.20 (Tier 2), decreased for prices between \$0.20 and \$100.00 (Tiers 3, 4, 5a, and 5b), remained the same for prices between \$100.00 and \$175.00 (Tier 5c), decreased for prices between \$175.00 and \$2,500.00 (Tiers 6a, 6b, 6c, and 6d), and remained the same for prices higher than \$2,500.00 (Tier 6e).

<sup>4</sup> Federal Register, Release No. 34-65568, “Self-Regulatory Organizations; Financial Industry Regulatory Authority, Inc.; Notice of Filing of Proposed Rule Change To Amend FINRA Rule 6433 (Minimum Quotation Size Requirements for OTC Equity Securities),” October 14, 2011, available at <http://www.sec.gov/rules/sro/finra/2011/34-65568.pdf>.

<sup>5</sup> In addition to the original Federal Register release cited in note 4, see subsequent Release No. 34-66168 (Order Instituting Proceedings to Determine Whether to Disapprove, January 17, 2012); and Release No. 34-66819 (Notice of Filing of Amendment 1 to Proposed Rule Change, April 17, 2012).

<sup>6</sup> Federal Register, Release No. 34-67208, “Notice of Filing of Amendment No. 2 and Order Granting Accelerated Approval of a Proposed Rule Change, as Modified by Amendment Nos. 1 and 2, to Amend FINRA Rule 6433 (Minimum Quotation Size Requirements for OTC Equity Securities),” June 15, 2012 (“Approval Order”), available at <http://www.sec.gov/rules/sro/finra/2012/34-67208.pdf>.

<sup>7</sup> The latest extension to the pilot (to December 8, 2017) was published in the Federal Register as Release No. 34-80727, “Self-Regulatory Organizations; Financial Industry Regulatory Authority, Inc.; Notice of Filing and Immediate Effectiveness of a Proposed Rule Change to Extend the Tier Size Pilot of FINRA Rule 6433 (Minimum Quotation Size Requirements for OTC Equity Securities),” May 18, 2017, available at <http://www.sec.gov/rules/sro/finra/2017/34-80727.pdf>.

In the approval order for the pilot, the Commission noted that, in its filing describing Amendment No. 2 to the proposed pilot,<sup>8</sup> FINRA committed to provide the Commission with the data necessary to assess the impact of the revised tier sizes on the OTC equity market.<sup>9</sup> In particular, the Commission noted that this data would afford the Commission an opportunity to assess the impact of the revised tier sizes on liquidity of OTC equity securities.<sup>10</sup>

In this memo, using the data provided by FINRA, we present a statistical analysis that assesses the impact of the pilot on liquidity as measured by quoted and effective spreads.<sup>11</sup> We conduct the analysis for OTC stocks in different price tiers: tiers where the minimum quotation size requirement decreased, tiers where the minimum quotation size requirement increased, and tiers where the minimum quotation size requirement remained the same. Where relevant, we compare our methodology and empirical findings to those in the FINRA/Cornerstone Study.<sup>12</sup>

## II. Data and Methodology

We use the data provided to the Commission by FINRA in accordance with the Amendment No. 2 Filing: aggregated daily market data by symbol for OTC equity securities subject to the pilot.<sup>13</sup> Our analysis covers the 37 months between November 2011 and November 2014. The period between November 2011 and October 2012 corresponds to the “pre-pilot period” for our analysis. For each month in this period, FINRA provided data for five randomly selected trading days (for a total of 60 days for the pre-pilot period). The period between November 2012 and November 2014 corresponds to the “pilot period” for our analysis. For this period, FINRA provided data for all trading days after the start of the pilot on November 12, 2012.<sup>14</sup> Overall, our data covers a total of 15,986 stocks and 576 trading days.

<sup>8</sup> See FINRA Letter to U.S. Securities and Exchange Commission, re: File No. SR-FINRA-2011-058 (June 4, 2012), Attachment: Amendment No. 2, Proposed Rule Change by Financial Industry Regulatory Authority, SR-FINRA- 2011-058 (the “Amendment No. 2 Filing”), at 6. A copy of the Amendment No. 2 Filing is located in the Commission’s public file for SR-FINRA-2011-058 at <http://www.sec.gov/comments/sr-finra-2011-058/finra2011058-14.pdf>.

<sup>9</sup> See Approval Order, *supra* note 6, at 25. FINRA specified the categories of data that it would provide to the Commission on a monthly basis, starting no later than 90 days after the start of the pilot, including price and volume information, execution data, and liquidity metrics and the time frame within which FINRA would submit the data. See Amendment No. 2 Filing, *supra* note 8, at 6-7.

<sup>10</sup> See Approval Order, *supra* note 6, at 41.

<sup>11</sup> It is beyond the scope of this memo to study the specific mechanisms through which the revised minimum quotation sizes may have affected liquidity.

<sup>12</sup> See FINRA/Cornerstone Study, *supra* note 3.

<sup>13</sup> If an OTC equity security was not quoted on an inter-dealer quotation system during the pilot period, it was not subject to the pilot. See FINRA/Cornerstone Study, *supra* note 3, at 4.

<sup>14</sup> In terms of trading days, the data for the pre-pilot period ranges from November 14, 2011 to October 31, 2012, while the data for the pilot period ranges from November 12, 2012 to November 28, 2014.



To assess the impact of the pilot on liquidity, we use two daily measures of liquidity as our outcome variables: time-weighted quoted spread and volume-weighted effective spread. In the dataset provided by FINRA, these variables are defined as follows. The time-weighted quoted spread is defined as the intraday average difference between the best bid and offer (“BBO”) prices for a stock, where each BBO quote observed during trading hours is weighted by the amount of time that the quote is active. The volume-weighted effective spread is defined as the intraday average difference between the trade price and the midpoint of the BBO at the time of the trade for a stock (in absolute value and multiplied by 2), where each trade observed during trading hours is weighted by the share volume of the trade.<sup>15</sup>

The time-weighted quoted spread and the volume-weighted effective spread variables provided by FINRA are measured in dollars. However, for the purposes of our analysis, we redefine these variables in terms of basis points relative to the stock’s average price on a given day. Specifically, for each stock-day observation, we divide the time-weighted quoted spread and the volume-weighted effective spread *in dollars* by the volume-weighted average price (“VWAP”)<sup>16</sup>, and then multiply each of these ratios by 10,000. This yields the time-weighted quoted spread and the volume-weighted effective spread *in basis points*, which are the measures of liquidity that we use in our empirical analysis. For brevity, in the rest of this memo, we often refer to these measures of liquidity simply as “quoted spread” and “effective spread”.

The quoted spread and the effective spread represent standard measures of liquidity, with lower (higher) spreads indicating higher (lower) level of liquidity. Furthermore, defining these variables in basis points relative to the VWAP makes it easier to compare spreads across stocks with different prices, as well as to compare spreads of the same stock over time (when the price of the stock is changing).

We seek to explain changes in quoted and effective spreads with the *Pilot* variable. This is an indicator variable equal to 1 for stock-day observations in the pilot period and equal to 0 for stock-day observations in the pre-pilot period.

Because the changes in the minimum quotation size requirements due to the pilot varied by price tier, our goal is to assess the effects of the pilot on spreads separately within each tier. Therefore, we need to assign each stock-day observation to one of the price tiers shown in Table 1. To do this, we consider three types of prices for a given stock in a given day: the price of the first trade of the trading day, the price of the last trade of the trading day, and the VWAP during the trading day.<sup>17</sup> If each of the three

<sup>15</sup> The dataset provided by FINRA included several variants of the time-weighted quoted spread and the volume-weighted quoted spread variables. First, FINRA provided spread variables for each of the two quoting and trading platforms for OTC securities: OTC Link and the OTC Bulletin Board. Second, for each platform, FINRA provided spread variables based on either raw BBO data or “filtered” BBO data (where certain “non-meaningful” BBOs, including crossed BBOs, were eliminated from the calculation). In our analysis, we use the “filtered” spreads from OTC Link (which had significantly more quoting and trading activity than the OTC Bulletin Board during the period that we analyze). The FINRA/Cornerstone Study also used “filtered” spreads from OTC Link for its analysis.

<sup>16</sup> For a given stock-day observation, the VWAP is defined as the ratio of the daily dollar volume to the daily share volume.

<sup>17</sup> FINRA’s rule 6433 defines price tiers based on the bid and offer prices. Because we do not have data on the bid and offer prices, we use the actual transaction prices as an approximation. As a consequence of

prices falls within the price range of a single tier, we assign the stock-day observation to that tier. In contrast, if at least two of the three prices fall within the price ranges of different tiers, this indicates to us that the stock changed tiers within the same day, and we exclude the stock-day observation from our analysis.<sup>18</sup>

For each tier, we estimate the following regression equation:

$$Y_{st} = \beta * Pilot_{st} + \mu_s + \theta_s t + \varepsilon_{st} \quad (1)$$

$Y_{st}$  is the quoted or effective spread for stock  $s$  on day  $t$ .  $Pilot_{st}$  is our independent variable for stock  $s$  on day  $t$ . The parameters  $\mu_s$  and  $\theta_s t$  denote stock fixed effects and stock-specific linear time trends respectively.

The inclusion of stock fixed effects in our regressions allows us to compare spreads in the pilot and the pre-pilot periods *within stocks*. This is important because the composition of stocks in any given price tier could have changed between the pre-pilot period and the pilot period (e.g., due to changes in stock prices), which could potentially confound the analysis. By comparing spreads within stocks, we effectively control for such changes in the composition of stocks. We include stock-specific linear time trends in our regressions to control for stock-specific changes in spreads that might be unrelated to the pilot.

Our main parameter of interest is  $\beta$ , the coefficient on the *Pilot* indicator variable. For a given tier,  $\beta$  measures the average within-stock change in spreads between the pre-pilot period and the pilot period, where this average is computed across all stocks that have at least one observation in that tier in each of the two periods. Stocks that do not have any observations for a particular tier in either the pre-pilot period or the pilot period are excluded from the regression analysis for that tier, because they do not provide within-tier and within-stock variation in spreads that can be used to identify the effect of the pilot for that tier.<sup>19</sup>

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this approximation, we cannot assign to a tier stock-day observations with zero trading volume. These observations are therefore excluded from our analysis.

<sup>18</sup> 56,030 stock-day observations (2.55% of all stock-day observations) are excluded from the analysis because at least two of the three prices fall within the price ranges of different tiers. Such exclusion allows for cleaner interpretation of the within-tier results. The FINRA/Cornerstone Study also excluded stock-day observations where the bid and/or offer prices crossed the border between multiple tiers within the same day.

As a robustness test, we redid the analysis using an alternative methodology that avoids this loss of observations. Specifically, we assigned each stock-day observation to a price tier based only on the stock's VWAP during the trading day (while ignoring the prices of the stock's first and last trades of the trading day). The results were very similar to those reported in the memo.

<sup>19</sup> We also exclude from our analysis trading days in which the market closed early, because these days could have lower levels of trading activity. This results in the exclusion of 16,495 stock-day observations (across all price tiers combined).

Table 2 shows summary statistics for our dependent variables by tier. For each dependent variable and each tier, the table shows the number of stocks and stock-day observations used in the regression analysis, the mean value of the dependent variable across all stock-day observations in the tier, and the average within-stock standard deviation of the dependent variable in that tier. The average within-stock standard deviations capture typical fluctuations in quoted or effective spreads over time for stocks in a given tier. These standard deviations will provide a useful benchmark when we assess the economic magnitude of our regression coefficients in the next section.<sup>20</sup>

For example, Table 2 shows that when we estimate the regression for time-weighted quoted spreads in Tier 3, the regression uses data for 1,114 stocks and has 107,878 stock-day observations. Table 2 also shows that for stock-day observations in Tier 3, the time-weighted quoted spread variable has the mean of 1,678 basis points and the within-stock standard deviation of 1,116 basis points. Other summary statistics in Table 2 can be interpreted accordingly.<sup>21</sup>

We confine our analysis (and the description of summary statistics in Table 2) to Tiers 1 to 5c. This is because for Tiers 6a to 6e only a small number of stocks have at least one observation in both the pre-pilot and the pilot periods. Regression analysis based on such a small number of stocks would not be very reliable.<sup>22</sup>

Before proceeding to discuss our regression results, we briefly summarize the differences between our methodology and the methodology used in the FINRA/Cornerstone Study.

The FINRA/Cornerstone Study utilized a series of “t-tests” that compared quoted or effective spreads before and after the start of the pilot. Although these tests were performed separately for each price tier, they did not control for changes in the composition of stocks in any given tier. Furthermore, the t-tests did not control for stock-specific time trends in spreads that might have been unrelated to the pilot. As discussed above, our regression methodology allows us to control for these confounding factors.

<sup>20</sup> The average within-stock standard deviation of the dependent variable is computed as follows. First, we compute the time-series standard deviation of the dependent variable for each individual stock in a given tier. Then we compute the weighted average of these individual standard deviations, weighting each stock by its number of observations in that tier.

<sup>21</sup> The mean spreads reported in Table 2 are large, which is consistent with the academic literature on OTC stocks. For example, Eraker and Ready (2015) report the average quoted spread of 1,316 basis points for a sample of OTC stocks with market capitalization of at least \$1 million, the share price of at least \$0.01 and the monthly dollar volume of at least \$2,000 in 2000-2008. See Bjorn Eraker and Mark Ready, “Do Investors Overpay for Stocks with Lottery-Like Payoffs? An Examination of the Returns of OTC Stocks”, *Journal of Financial Economics* 115 (2015) 486-504. In addition, we computed the mean values of quoted and effective spreads (by tier) as measured in dollars (not shown), and found them to be of the same order of magnitude as those reported in the FINRA/Cornerstone Study.

<sup>22</sup> The number of stocks that we could use in the regression analysis for Tiers 6a to 6e is as follows: 10 for Tier 6a, 37 for Tier 6b, 16 for Tier 6c, 20 for Tier 6d, and 16 for Tier 6e. The FINRA/Cornerstone Study also excluded Tiers 6a to 6e from its analysis due to the small number of stocks in each of these tiers. We also note that it would be difficult to interpret the results of a regression analysis that combined stocks in Tiers 6a to 6e. This is because stocks in these tiers experienced very different changes in minimum quotation size as a result of the pilot (see Table 1).



In addition, the FINRA/Cornerstone Study used the time-weighted quoted spread and the volume-weighted effective spread variables as measured in dollars. In contrast, we redefine these variables in terms of basis points relative to the VWAP. As discussed above, this makes it easier to compare spreads across stocks with different prices, as well as to compare spreads of the same stock over time.<sup>23</sup>

Finally, and perhaps most importantly, the FINRA/Cornerstone Study does not address the issue of causality. We attempt to shed more light on causality in Section IV below, where we analyze the timing of changes in quoted and effective spreads around the implementation of the pilot.<sup>24</sup>

### III. Regression Results

Table 3 presents the regression results for quoted and effective spreads by tier. For each regression, we report the point estimate and the standard error of  $\beta$ .<sup>25</sup>

Table 3 shows that for Tiers 3, 4, 5a and 5b, where the pilot decreased the minimum quotation size, the pilot is associated with lower quoted and effective spreads. Specifically, the point estimates in Table 3 imply that between the pre-pilot period and the pilot period, quoted spreads decreased by 473 basis points for Tier 3, by 286 basis points for Tier 4, by 258 basis points for Tier 5a, and by 98 basis points for Tier 5b. Likewise, the point estimates in Table 3 imply that between the pre-pilot period and the pilot period, effective spreads decreased by 346 basis points for Tier 3, by 207 basis points for Tier 4, by 218 basis points for Tier 5a, and by 80 basis points for Tier 5b. All these point estimates are statistically significant at the 1% level.

Table 3 also shows that for Tier 1, where the pilot increased the minimum quotation size, the pilot is associated with higher quoted and effective spreads. In particular, the point estimates in Table 3 imply that between the pre-pilot period and the pilot period, quoted and effective spreads for Tier 1 increased by 1,874 basis points and by 2,064 basis points respectively. Both point estimates are statistically significant at the 1% level.

Table 3 shows mixed results for tiers where the minimum quotation size requirement remained the same. In the regressions for Tier 5c, the point estimates of  $\beta$  are small and statistically insignificant

<sup>23</sup> In addition to the time-weighted quoted spread and the volume-weighted effective spread, the FINRA/Cornerstone Study also considered other measures of liquidity such as the time-weighted quoted depth within a set range of prices around the BBO midpoint or the time-weighted price impact of hypothetical market orders. We could not use these alternative measures of liquidity in our analysis because they were not required to be included as part of the data submitted by FINRA consistent with the Amendment No. 2 Filing. See Amendment No. 2 Filing, supra note 8).

<sup>24</sup> Our analysis also covers a longer time period than the FINRA/Cornerstone Study. In particular, while both studies use data for the same pre-pilot period of November 2011 to October 2012, our analysis covers a longer period after the implementation of the pilot (November 2012 to November 2014 in our analysis versus November 2012 to June 2013 in the FINRA/Cornerstone Study). However, we do not think that the longer time coverage represents a significant difference between the two studies.

<sup>25</sup> We cluster standard errors at the stock level.

suggesting that the pilot had no effect on quoted and effective spreads for stocks in this tier. In contrast, Table 3 shows that for stocks in Tier 2, the pilot is associated with lower quoted and effective spreads. The point estimates imply that between the pre-pilot period and the pilot period, quoted and effective spreads for Tier 2 decreased by 393 basis points and by 391 basis points respectively. Both of these point estimates are statistically significant at the 1% level.

The changes in quoted and effective spreads associated with the pilot are economically important, when evaluated relative to the average values of these dependent variables in our data.<sup>26</sup> For example, a 346 basis point reduction in effective spreads for Tier 3 is sizable relative to the average effective spread of 1,480 basis points for stocks in this tier. Likewise, a 2,064 basis point increase in effective spreads for Tier 1 is important when compared to the average effective spread of 5,394 basis points for stocks in Tier 1.

Another way to interpret the magnitude of the changes in quoted and effective spreads documented in Table 3 is to compare them to typical fluctuations in these variables over time. We provide such comparison in Table 4. Specifically, in Table 4 we reproduce the point estimates of  $\beta$  (from Table 3) along with the average within-stock standard deviations of quoted or effective spread (from Table 2). Then, for each tier and each dependent variable, we compute the ratio of  $\beta$  to the corresponding standard deviation.<sup>27</sup>

Table 4 shows that for Tiers 3, 4, 5a and 5b, where the pilot decreased the minimum quotation size, the point estimates of  $\beta$  imply that the pilot is associated with a decrease of 0.42 to 0.60 standard deviations in quoted spread and a decrease of 0.31 to 0.52 standard deviations in effective spread. Table 4 also shows that for Tier 1, where the pilot increased the minimum quotation size, the point estimates of  $\beta$  imply that the pilot is associated with an increase of 0.31 standard deviations in quoted spread and an increase in 0.25 standard deviations in effective spread. Finally, Table 4 shows that for Tier 2, where the minimum quotation size remained the same, the pilot is associated with a decrease of 0.27 standard deviations in quoted spread and a decrease of 0.26 standard deviations in effective spreads. We interpret these changes in spreads as economically important.

Overall, the regression results in Table 3 indicate that for stocks for which the minimum quotation size requirement decreased (Tiers 3, 4, 5a, and 5b) the pilot is associated with lower spreads, while for stocks for which the minimum quotation size requirement increased (Tier 1) it is associated with higher spreads. These results are theoretically consistent in the sense that in both cases lower (higher) minimum quotation size is associated with lower (higher) spreads. In particular, the results for Tiers 3, 4, 5a, and 5b indicate improvement in liquidity. In contrast, the results for Tier 1 indicate deterioration in liquidity.

We also note that the regression results for Tier 2 are somewhat puzzling, because they indicate a decrease in spreads for stocks that did not experience any change in the minimum quotation size requirement. This brings us to the issue of causality.

<sup>26</sup> Table 2 shows the mean values of quoted and effective spreads in our data (by tier).

<sup>27</sup> Tier 5c is excluded from Table 4, because in Table 3 the point estimates of  $\beta$  for this tier were statistically insignificant.

An important question for the assessment of the pilot is whether the changes in spreads that we document in Table 3 capture causal effects of the pilot or whether they might be driven by changes in some other determinants of liquidity between the pre-pilot period and the pilot period. Although by including stock fixed effects and stock-specific time trends in our regressions we control for some of the confounding factors that could have affected our results, we still cannot be sure that the point estimates of  $\beta$  identify causal effects of the pilot on spreads.

To shed more light on the issue of causality, in the next section we analyze the timing of changes in quoted and effective spreads around the implementation of the pilot.

#### IV. The Timing of Changes in Quoted and Effective Spreads

In order to study the timing of changes in quoted and effective spreads around the implementation of the pilot, we estimate the following modified version of equation (1) for each tier:

$$Y_{st} = \sum_{k=1}^{13} \beta^k * Month_{st}^k + \mu_s + \theta_s t + \varepsilon_{st} \quad (2)$$

As before,  $Y_{st}$  is the quoted or effective spread for stock  $s$  on day  $t$ , while  $\mu_s$  and  $\theta_s t$  denote stock fixed effects and stock-specific linear time trends respectively. However, the single indicator variable  $Pilot_{st}$  is now replaced with a set of 13 indicator variables  $Month_{st}^k$  (with index  $k$  running from 1 to 13). The first six of these indicator variables (with  $k$  running from 1 to 6) correspond to each of the six months immediately preceding the implementation of the pilot (the months of May 2012 to October 2012). The next six of the indicator variables (with  $k$  running from 7 to 12) correspond to each of the six months immediately following the implementation of the pilot (the months of November 2012 to April 2013).<sup>28</sup> The last indicator variable (with  $k$  equal 13) corresponds to the remainder of the pilot period covered by our data (the months of May 2013 to November 2014). Each indicator variable is equal to 1 for stock-day observations in the corresponding month(s) and is equal to 0 otherwise.

Our parameters of interest are now  $\beta^k$  (with  $k$  running from 1 to 13), which are the 13 coefficients on the indicator variables  $Month_{st}^k$ . Each of the 13 coefficients measures the quoted or effective spread in the corresponding month(s) relative to the average value of one of these dependent variables in the reference period of November 2011 to April 2012 (which are the first 6 months of the pre-pilot period covered by our data).

In Figures 1a to 3b, we plot the estimated coefficients  $\beta^k$  from the regressions for quoted and effective spreads. For easier comparison, we also plot the data points for the reference period, with relative spreads being equal to 0 by construction. The results for each price tier are presented in a separate figure.

##### A. Tiers Where Minimum Quotation Size Decreased (Tiers 3, 4, 5a, and 5b)

<sup>28</sup> Our data for November 2012 includes only the trading days after the start of the pilot on November 12, 2012.

Figure 1a displays the coefficients from the regressions for Tier 3, one of the tiers where the pilot decreased the minimum quotation size. Figure 1a shows that quoted and effective spreads for Tier 3 remained relatively constant in the six months immediately preceding the implementation of the pilot (between the reference period of April 2012 and earlier and October 2012). Then, the spreads declined sharply in the first month of the pilot. Specifically, between October 2012 and November 2012, quoted and effective spreads for Tier 3 decreased by 378 basis points and by 293 basis points respectively. In the second month and in the third month of the pilot, the spreads continued to decline but not as sharply. Specifically, between November 2012 and January 2013, quoted and effective spreads for Tier 3 decreased by additional 182 basis points and 162 basis points respectively. The spreads stabilized at the new and lower levels in subsequent months.

Figures 1b to 1d display the coefficients from the regressions for Tiers 4, 5a and 5b, the other tiers where the pilot decreased the minimum quotation size. Figures 1b to 1d show that for Tiers 4, 5a and 5b the pattern of the changes in quoted and effective spreads was similar to that for Tier 3. For all these tiers, the spreads remained relatively constant prior to October 2012, declined sharply between October 2012 and November 2012 (i.e., in the first month of the pilot), continued to decline but at more moderate rates in the next two or three months, and then stabilized at the new and lower levels in subsequent months.<sup>29</sup>

The timing of the changes in quoted and effective spreads, as described in Figures 1a to 1d, is consistent with the existence of causal effects of the pilot on spreads for Tiers 3, 4, 5a, and 5b. This is because the sharpest declines in spreads occurred in the very first month after the implementation of the pilot, as expected under the causal interpretation. The more moderate declines in spreads in the following two or three months are also consistent with the causal interpretation and suggest that the market participants may have needed this additional time to adjust to the new rules. In contrast, Figures 1a to 1d show no evidence that these estimated decreases in spreads were driven by more general downward trends in spreads that could have reflected the effects of other determinants of liquidity.

### B. Tiers Where Minimum Quotation Size Increased (Tier 1)

Figure 2 displays the coefficients  $\beta^k$  from the regressions for Tier 1, where the pilot increased the minimum quotation size. Figure 2 shows that quoted and effective spreads for Tier 1 exhibited strong upward trends in the six months immediately preceding the implementation of the pilot. In total, between the reference period of April 2012 and earlier and October 2012, quoted spreads increased by 2,929 basis points, while effective spreads increased by 4,752 basis points. In the first two months of the pilot (between October 2012 and December 2012), quoted and effective spreads continued with their upward trends, increasing by an additional 1,230 basis points and 362 basis points respectively.<sup>30</sup> Then, in January 2013 (the third month of the pilot), spreads plummeted, with quoted spreads decreasing by 2,059 basis points and effective spreads dropping by 2,328 basis points in a single month. Although these declines in spreads were quite substantial, they did not fully offset the even larger increases in

<sup>29</sup> Between October 2012 and November 2012, quoted (effective) spreads decreased by 243 (179) basis points for Tier 4, by 180 (169) basis points for Tier 5a, and by 69 (67) basis points for Tier 5b. Between November 2012 and January 2013, quoted (effective) spreads decreased by additional 123 (88) basis points for Tier 4, 65 (62) basis points for Tier 5a, and 44 (39) basis points for Tier 5b.

<sup>30</sup> Effective spreads temporarily declined in November 2012, before recovering in December 2012.



spreads that occurred in the previous eight months. Thus, while the spreads remained relatively constant after January 2013, they were still considerably higher than during most of the pre-pilot period.

In Table 3, we showed that quoted and effective spreads for Tier 1 were significantly higher in the pilot period than they were in the pre-pilot period. However, Figure 2 provides no evidence that these differences capture causal effects of the pilot on spreads. In particular, as discussed above, these differences are driven by the upward trends in spreads that started many months prior to the pilot rather than by changes in spreads that occurred after the implementation of the pilot. While the pilot could have caused market participants to change their behavior before the actual start of the pilot (i.e., in anticipation of the forthcoming increase in the minimum quotation size), it seems unlikely that such a change in behavior would begin as early as six months before the pilot. Furthermore, if the pilot caused a continuous increase in spreads in the months preceding the pilot, it is unclear why the spreads would sharply decline in January 2013, only three months after the pilot started. Instead, we think that the changes in spreads described in Figure 2 may have been caused by factors unrelated to the pilot.

### C. Tiers Where Minimum Quotation Size Remained the Same (Tiers 2 and 5c)

Figure 3a displays the coefficients  $\beta^k$  from the regressions for Tier 2, one of the tiers where the minimum quotation size requirement remained the same. Figure 3a shows that quoted and effective spreads for Tier 2 exhibited strong downward trends in the four months immediately preceding the implementation of the pilot. In total, between June 2012 and October 2012, quoted spreads decreased by 552 basis points, while effective spreads decreased by 529 basis points. After the implementation of the pilot, the spreads continued with their downward trends, although at somewhat slower rates of decline. In the first two months of the pilot (between October 2012 and December 2012), quoted and effective spreads decreased by 169 basis points and 202 basis points respectively, while in the following three months (between December 2012 and March 2013) they decreased by additional 228 basis points and 151 basis points respectively.<sup>31</sup>

In Table 3, we showed that quoted and effective spreads for Tier 2 were significantly lower in the pilot period than they were in the pre-pilot period. We also noted that these regression results were somewhat puzzling, because they indicated a decrease in spreads for stocks that did not experience any change in the minimum quotation size requirement. Indeed, Figure 3a provides no evidence that the differences in spreads between the pre-pilot period and the pilot period capture causal effects of the pilot. This is because these differences are driven by the downward trends in spreads that started as early as four months prior to the implementation of the pilot. We think that such pre-existing trends in spreads were unlikely to be caused by the pilot and may instead reflect changes in other determinants of liquidity.

The results in Table 3 also suggested that the pilot had no effect on quoted and effective spreads for stocks in Tier 5c (another tier where the minimum quotation size requirement remained the same). Figure 3b which displays the coefficients  $\beta^k$  from the regressions for this tier, is consistent with this finding. Although quoted and effective spreads for Tier 5c fluctuated from month to month, there is no evidence that these fluctuations were related to the implementation of the pilot.

<sup>31</sup> Both quoted and effective spreads temporarily increased in January 2013, before continuing their decline in February 2013 and March 2013.

## V. Conclusions

We conclude by summarizing our empirical findings and comparing them to the findings in the FINRA/Cornerstone Study.<sup>32</sup>

With respect to stocks for which the minimum quotation size requirement decreased (Tiers 3, 4, 5a, and 5b), we find that both quoted and effective spreads decreased between the pre-pilot period and the pilot period. Furthermore, our analysis of the timing of changes in spreads suggests that these decreases may reflect causal effects of the pilot.

The FINRA/Cornerstone Study also found that after the implementation of the pilot quoted spreads decreased for each of the four tiers (Tiers 3, 4, 5a, and 5b). However, it found that effective spreads decreased only for Tiers 5a and 5b, but did not change for Tiers 3 and 4. Thus, our results provide more uniform evidence of a reduction in spreads for tiers where the minimum quotation size requirement decreased. Furthermore, unlike the FINRA/Cornerstone Study, we provide evidence that this reduction in spreads was caused by the pilot.

With respect to stocks for which the minimum quotation size requirement increased (Tier 1), we find that both quoted and effective spreads increased between the pre-pilot period and the pilot period. However, we also find that these changes in spreads were driven by upward trends that started at least six months prior to the implementation of the pilot. This latter finding suggests that the increases in spreads between the pre-pilot period and the pilot period may have been caused by factors unrelated to the pilot.

The FINRA/Cornerstone Study also found an increase in effective spreads for Tier 1 between the pre-pilot period and the pilot period. However, it found no statistically significant change in quoted spreads for that tier. Thus, our results provide more consistent evidence of an increase in spreads for stocks in Tier 1. However, we find no evidence that this increase in spreads reflects causal effects of the pilot. (The FINRA/Cornerstone Study did not address the issue of causality.)

With respect to stocks for which the minimum quotation size requirement remained the same (Tiers 2 and 5c), we find that between the pre-pilot period and the pilot period, quoted and effective spreads decreased for stocks in Tier 2 but did not change for stocks in Tier 5c. However, for stocks in Tier 2, we also find that the decreases in spreads were largely driven by downward trends that started four months prior to the implementation of the pilot. This latter finding suggests that the decreases in spreads for stocks in Tier 2 may have been caused by factors unrelated to the pilot.

For stocks in Tier 5c, the FINRA/Cornerstone Study also found no change in spreads between the pre-pilot period and the pilot period. However, for stocks in Tier 2, it found a decrease in quoted spreads but no statistically significant change in effective spreads. Thus, our results provide more consistent evidence of a decrease in spreads for stocks in Tier 2. However, as noted in the preceding paragraph, we find no evidence that this decrease in spreads reflects causal effects of the pilot.

Overall, despite some methodological differences, our findings are broadly consistent with the findings of the FINRA/Cornerstone Study. In particular, our findings are consistent with FINRA's assessment that the pilot had a neutral to positive impact on liquidity for the majority of OTC equity securities and

<sup>32</sup> See FINRA/Cornerstone Study, *supra* note 3, at 5-7, 19-21, Tables 3-5.

tiers.<sup>33</sup> At the same time, like the FINRA/Cornerstone Study, we find inconclusive evidence regarding the effects of the pilot on liquidity of Tier 1 securities.<sup>34,35</sup>

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<sup>33</sup> In the context of our study, a neutral to positive impact on liquidity corresponds to a decrease or no change in quoted and effective spreads as a result of the pilot. See supra note 2.

<sup>34</sup> The two studies have different reasons for finding inconclusive evidence for stocks in Tier 1. As discussed above, in our analysis we are uncertain that the increases in quoted and effective spreads for these stocks reflect causal effects of the pilot. In contrast, in the FINRA/Cornerstone Study, the evidence for stocks in Tier 1 is inconclusive because of inconsistent results for different measures of liquidity (the pilot is associated with larger effective spreads (indicating lower liquidity) but also with smaller price impact for hypothetical market orders (indicating higher liquidity)). The FINRA/Cornerstone Study does not address the issue of causality for any of its results.

<sup>35</sup> In addition, as discussed in Section II, neither our analysis nor the FINRA/Cornerstone Study could reliably assess the effects of the pilot on liquidity of stocks in Tiers 6a to 6e due to the small number of stocks in each of these tiers.



**Table 1: Minimum Quote Size Comparison by Tier - Pre-Pilot Rule vs Pilot Rule**

Tier	Price Range (Bid or Offer)	Minimum Quote Size (# of shares)		Quote Size Change
		Pre-Pilot Rule	Pilot Rule	
<b>1</b>	$\$0 < p < \$0.10$	5,000	10,000	Increase
<b>2</b>	$\$0.10 \leq p < \$0.20$	5,000	5,000	Same
<b>3</b>	$\$0.20 \leq p < \$0.51$	5,000	2,500	Decrease
<b>4</b>	$\$0.51 \leq p < \$1.00$	2,500	1,000	Decrease
<b>5a</b>	$\$1.00 \leq p \leq \$10.00$	500	100	Decrease
<b>5b</b>	$\$10.00 < p \leq \$100.00$	200	100	Decrease
<b>5c</b>	$\$100.00 < p < \$175.00$	100	100	Same
<b>6a</b>	$\$175.00 \leq p \leq \$200.00$	100	1	Decrease
<b>6b</b>	$\$200.00 < p \leq \$500.00$	25	1	Decrease
<b>6c</b>	$\$500.00 < p \leq \$1,000.00$	10	1	Decrease
<b>6d</b>	$\$1,000.00 < p \leq \$2,500.00$	5	1	Decrease
<b>6e</b>	$\$2,500.00 < p$	1	1	Same

Notes: "p" refers to the bid or offer price. "Quote size change" refers to the change in the minimum quote size from the pre-pilot rule to the pilot rule.

**Table 2: Summary Statistics for Quoted and Effective Spreads by Tier (November 2011 - November 2014)**

		Tier 1	Tier 2	Tier 3	Tier 4	Tier 5a	Tier 5b	Tier 5c
<i>Price Range</i>		$\$0 < p < \$0.10$	$\$0.10 \leq p < \$0.20$	$\$0.20 \leq p < \$0.51$	$\$0.51 \leq p < \$1.00$	$\$1.00 \leq p \leq \$10$	$\$10 < p \leq \$100$	$\$100 < p < \$175$
<i>Minimum Quotation Size Change</i>		<i>Increased</i>	<i>Same</i>	<i>Decreased</i>	<i>Decreased</i>	<i>Decreased</i>	<i>Decreased</i>	<i>Same</i>
<b>Time Weighted Quoted Spread (Basis Points)</b>	Stocks	3,486	1,044	1,114	626	1,663	1,467	94
	Observations	611,659	71,555	107,878	57,742	291,390	348,905	7,417
	Mean	5,412	2,159	1,678	870	478	180	368
	Standard Deviation	6,063	1,441	1,116	561	428	193	435
<b>Volume Weighted Effective Spread (Basis Points)</b>	Stocks	3,471	1,038	1,110	625	1,656	1,465	94
	Observations	609,723	71,305	107,637	57,675	290,885	348,209	7,397
	Mean	5,394	1,941	1,480	759	412	151	334
	Standard Deviation	8,320	1,483	1,124	567	421	193	457

Notes: Stocks refer to the number of individual stocks in a given tier that have at least one non-missing observation for quoted or effective spread in both the pre-pilot period (November 2011 - October 2012) and the pilot period (November 2012 - November 2014). Observations refer to the total number of stock-day observations in a given tier that correspond to these stocks. Mean refers to the mean value of quoted or effective spread across these stock-day observations. Standard Deviation refers to the average within-stock standard deviation of quoted or effective spread. This Standard Deviation is computed as follows. First, we compute the time-series standard deviation of quoted or effective spread for each individual stock in a given tier. Then we compute the weighted average of these individual standard deviations, weighting each stock by its number of observations in that tier.

**Table 3: Regression Results for Quoted and Effective Spreads by Tier**

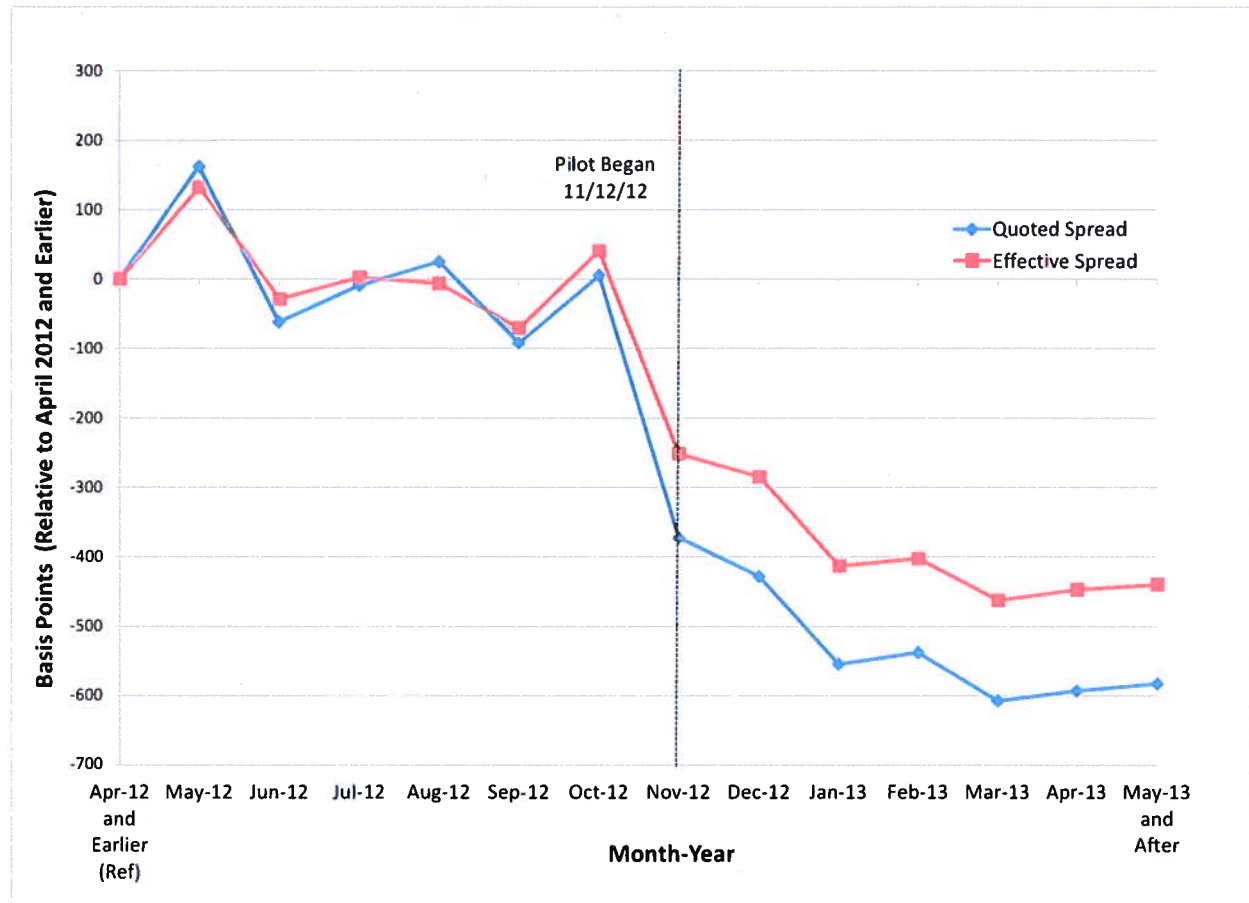
		Tier 1	Tier 2	Tier 3	Tier 4	Tier 5a	Tier 5b	Tier 5c
<i>Price Range</i>		$\$0 < p < \$0.10$	$\$0.10 \leq p < \$0.20$	$\$0.20 \leq p < \$0.51$	$\$0.51 \leq p < \$1.00$	$\$1.00 \leq p \leq \$10$	$\$10 < p \leq \$100$	$\$100 < p \leq \$175$
<i>Minimum Quotation Size Change</i>		<i>Increased</i>	<i>Same</i>	<i>Decreased</i>	<i>Decreased</i>	<i>Decreased</i>	<i>Decreased</i>	<i>Same</i>
<b>Time Weighted Quoted Spread (Basis Points)</b>	$\beta$ (Pilot vs Pre-Pilot)	1,874	-393	-473	-286	-258	-98	4
	Standard Error	(220)***	(112)***	(67)***	(47)***	(20)***	(12)***	(147)
<b>Volume Weighted Effective Spread (Basis Points)</b>	$\beta$ (Pilot vs Pre-Pilot)	2,064	-391	-346	-207	-218	-80	22
	Standard Error	(438)***	(122)***	(65)***	(43)***	(18)***	(10)***	(147)

Notes: For each regression, the table shows the point estimate and the standard error of  $\beta$ , the coefficient on the *Pilot* indicator variable. For a given tier,  $\beta$  measures the average change in quoted or effective spread between the pre-pilot period (November 2011 - October 2012) and the pilot period (November 2012 - November 2014), controlling for stock fixed effects and stock-specific time trends. Standard errors are clustered at the stock level. \*\*\* denotes significance at the 1% level, \*\* at the 5% level, \* at the 10% level.

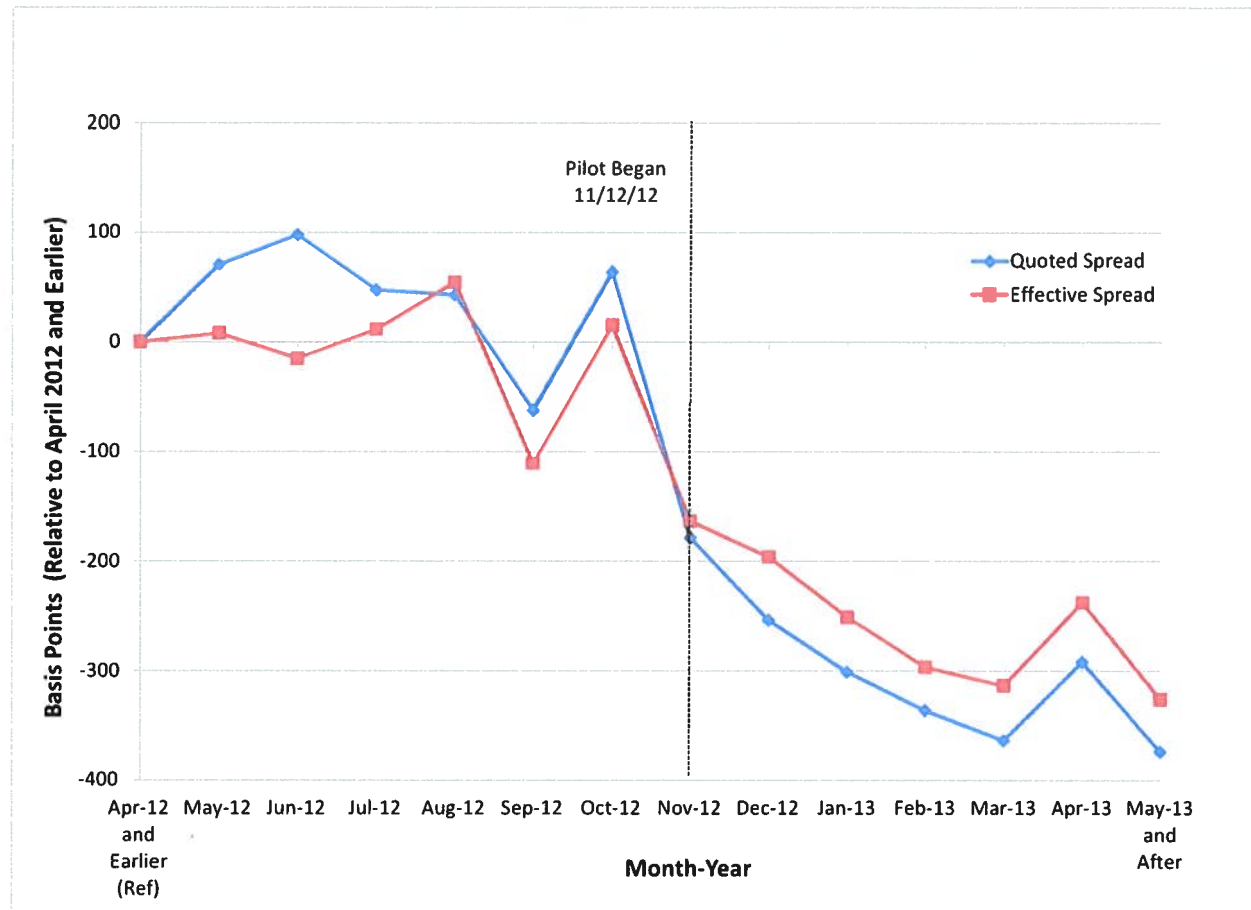
**Table 4: Magnitude of Regression Coefficients in Terms of Standard Deviations of Dependent Variables**

		Tier 1	Tier 2	Tier 3	Tier 4	Tier 5a	Tier 5b
<i>Price Range</i>		$\$0 < p < \$0.10$	$\$0.10 \leq p < \$0.20$	$\$0.20 \leq p < \$0.51$	$\$0.51 \leq p < \$1.00$	$\$1.00 \leq p \leq \$10$	$\$10 < p \leq \$100$
<i>Minimum Quotation Size Change</i>		<i>Increased</i>	<i>Same</i>	<i>Decreased</i>	<i>Decreased</i>	<i>Decreased</i>	<i>Decreased</i>
<b>Time Weighted Quoted Spread (Basis Points)</b>	Pilot Coefficient ( $\beta$ )	1,874	-393	-473	-286	-258	-98
	Standard Deviation (SD)	6,063	1,441	1,116	561	428	193
	$\beta/SD$	<b>0.31</b>	<b>-0.27</b>	<b>-0.42</b>	<b>-0.51</b>	<b>-0.60</b>	<b>-0.51</b>
<b>Volume Weighted Effective Spread (Basis Points)</b>	Pilot Coefficient ( $\beta$ )	2,064	-391	-346	-207	-218	-80
	Standard Deviation (SD)	8,320	1,483	1,124	567	421	193
	$\beta/SD$	<b>0.25</b>	<b>-0.26</b>	<b>-0.31</b>	<b>-0.36</b>	<b>-0.52</b>	<b>-0.42</b>

Notes: The table expresses the regression coefficients in Table 3 in terms of standard deviations of the dependent variables (from Table 2). The table excludes Tier 5c, because in Table 3 the regression coefficients for this tier were statistically insignificant.  $\beta$  is the coefficient on the *Pilot* indicator variable. For a given tier,  $\beta$  measures the average change in quoted or effective spread between the pre-pilot period (November 2011 - October 2012) and the pilot period (November 2012 - November 2014), controlling for stock fixed effects and stock-specific time trends. Standard Deviation is the average within-stock standard deviation of quoted or effective spread. This Standard Deviation is computed as follows. First, we compute the time-series standard deviation of quoted or effective spread for each individual stock in a given tier. Then we compute the weighted average of these individual standard deviations, weighting each stock by its number of observations in that tier.

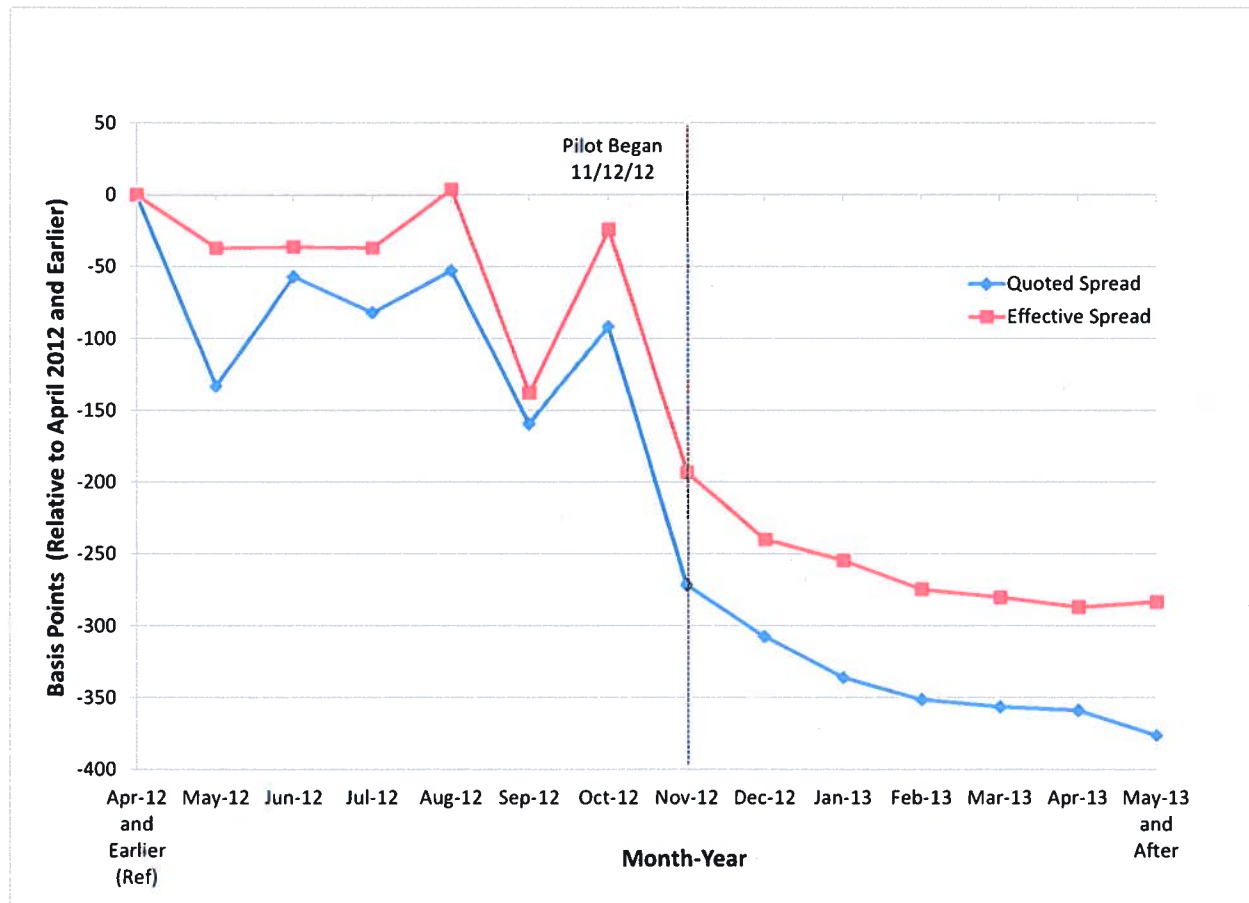
**Figure 1a: Tier 3 - Changes in Quoted and Effective Spreads Around the Start of the Pilot**

Notes: The figure plots the estimated coefficients for 13 indicator variables (one for each month or a group of months) from the regressions for quoted and effective spreads that control for stock fixed effects and stock-specific time trends. Each coefficient measures the quoted or effective spread in the corresponding month(s) relative to the average spread in the reference period of November 2011 to April 2012. "April-12 and Earlier" refers to the reference period itself, with the relative spreads being equal to 0 by construction. The pilot began on November 12, 2012. Data for November 2012 includes only trading days after the start of the pilot. "May-13 and After" refers to the months of May 2013 to November 2014.

**Figure 1b: Tier 4 - Changes in Quoted and Effective Spreads Around the Start of the Pilot**

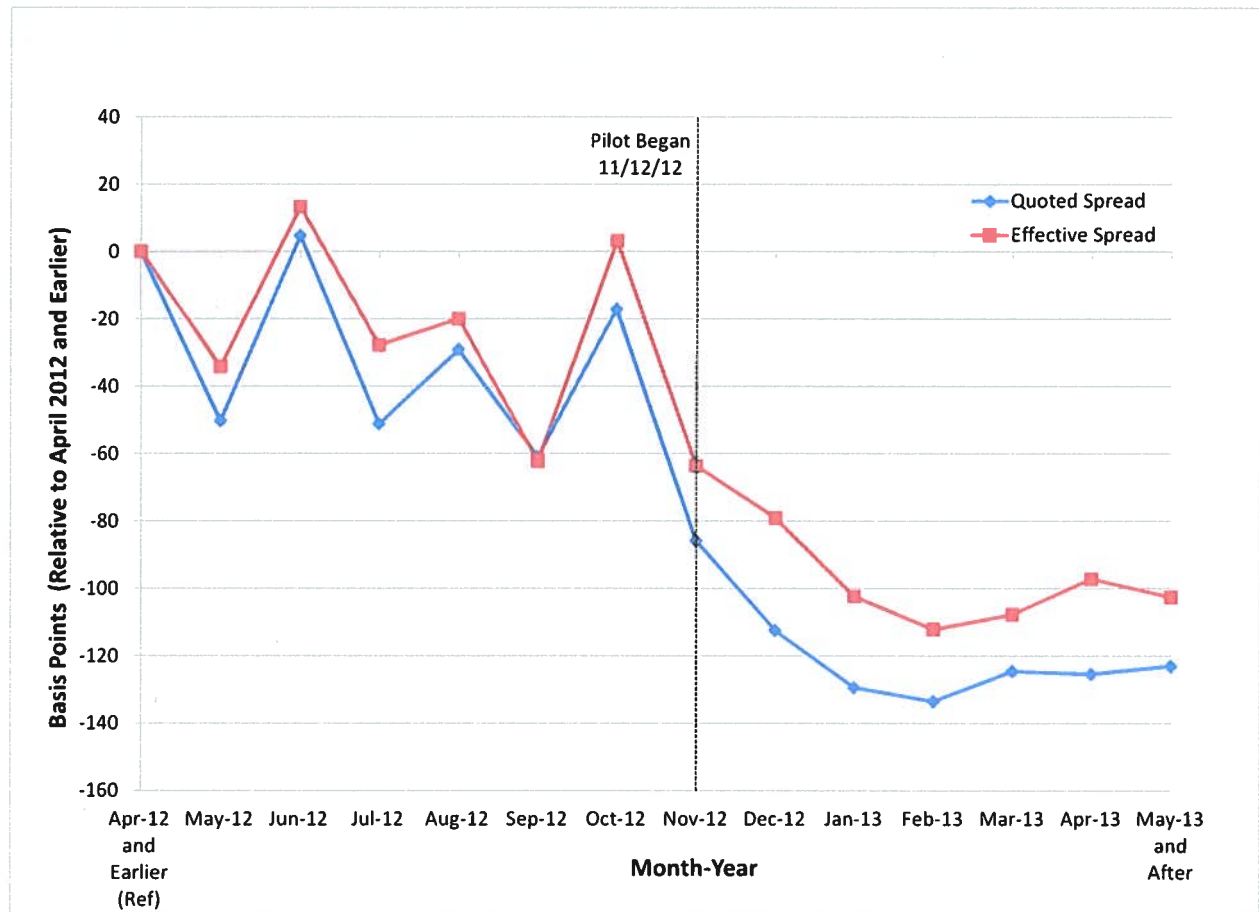
Notes: The figure plots the estimated coefficients for 13 indicator variables (one for each month or a group of months) from the regressions for quoted and effective spreads that control for stock fixed effects and stock-specific time trends. Each coefficient measures the quoted or effective spread in the corresponding month(s) relative to the average spread in the reference period of November 2011 to April 2012. "April-12 and Earlier" refers to the reference period itself, with the relative spreads being equal to 0 by construction. The pilot began on November 12, 2012. Data for November 2012 includes only trading days after the start of the pilot. "May-13 and After" refers to the months of May 2013 to November 2014.



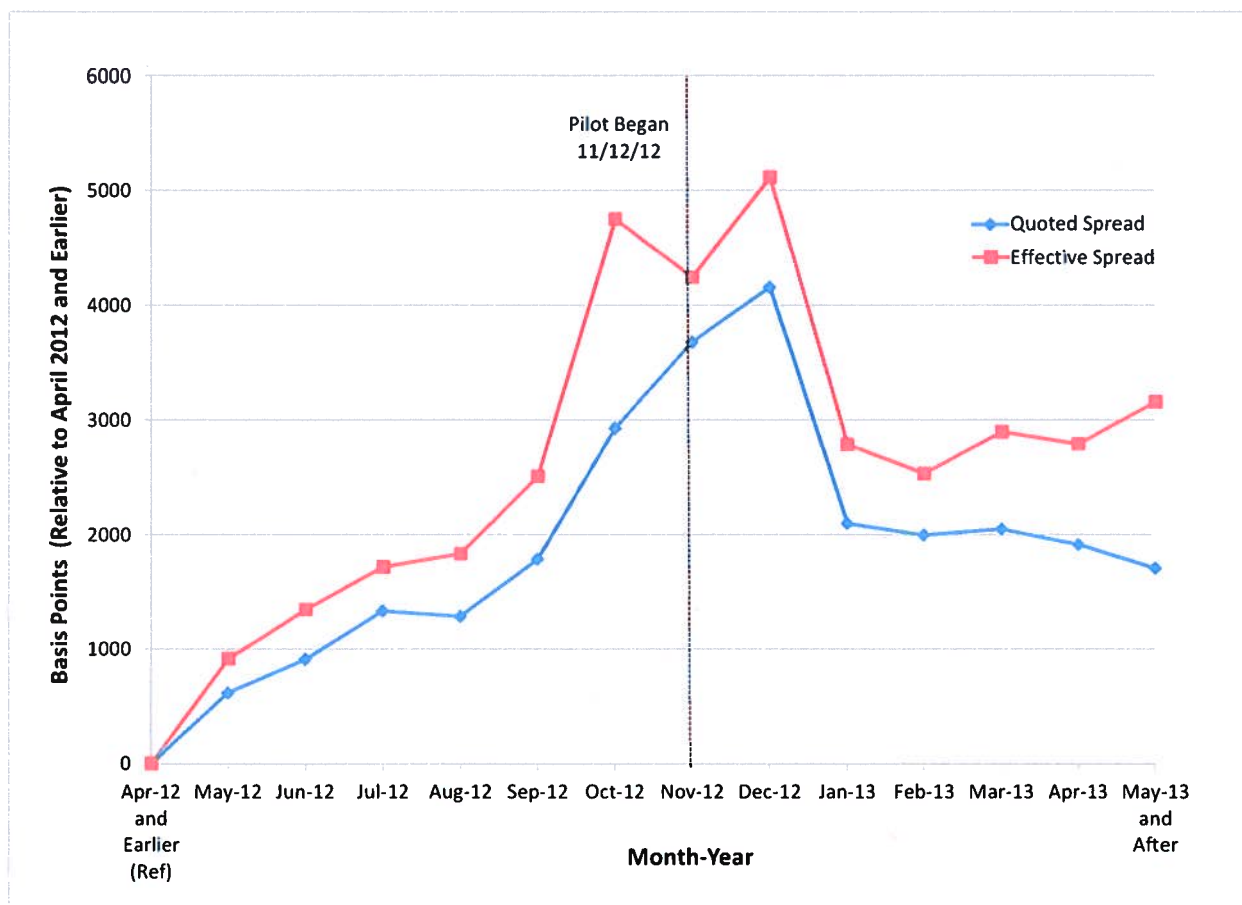
**Figure 1c: Tier 5a - Changes in Quoted and Effective Spreads Around the Start of the Pilot**

Notes: The figure plots the estimated coefficients for 13 indicator variables (one for each month or a group of months) from the regressions for quoted and effective spreads that control for stock fixed effects and stock-specific time trends. Each coefficient measures the quoted or effective spread in the corresponding month(s) relative to the average spread in the reference period of November 2011 to April 2012. "April-12 and Earlier" refers to the reference period itself, with the relative spreads being equal to 0 by construction. The pilot began on November 12, 2012. Data for November 2012 includes only trading days after the start of the pilot. "May-13 and After" refers to the months of May 2013 to November 2014.



**Figure 1d: Tier 5b - Changes in Quoted and Effective Spreads Around the Start of the Pilot**

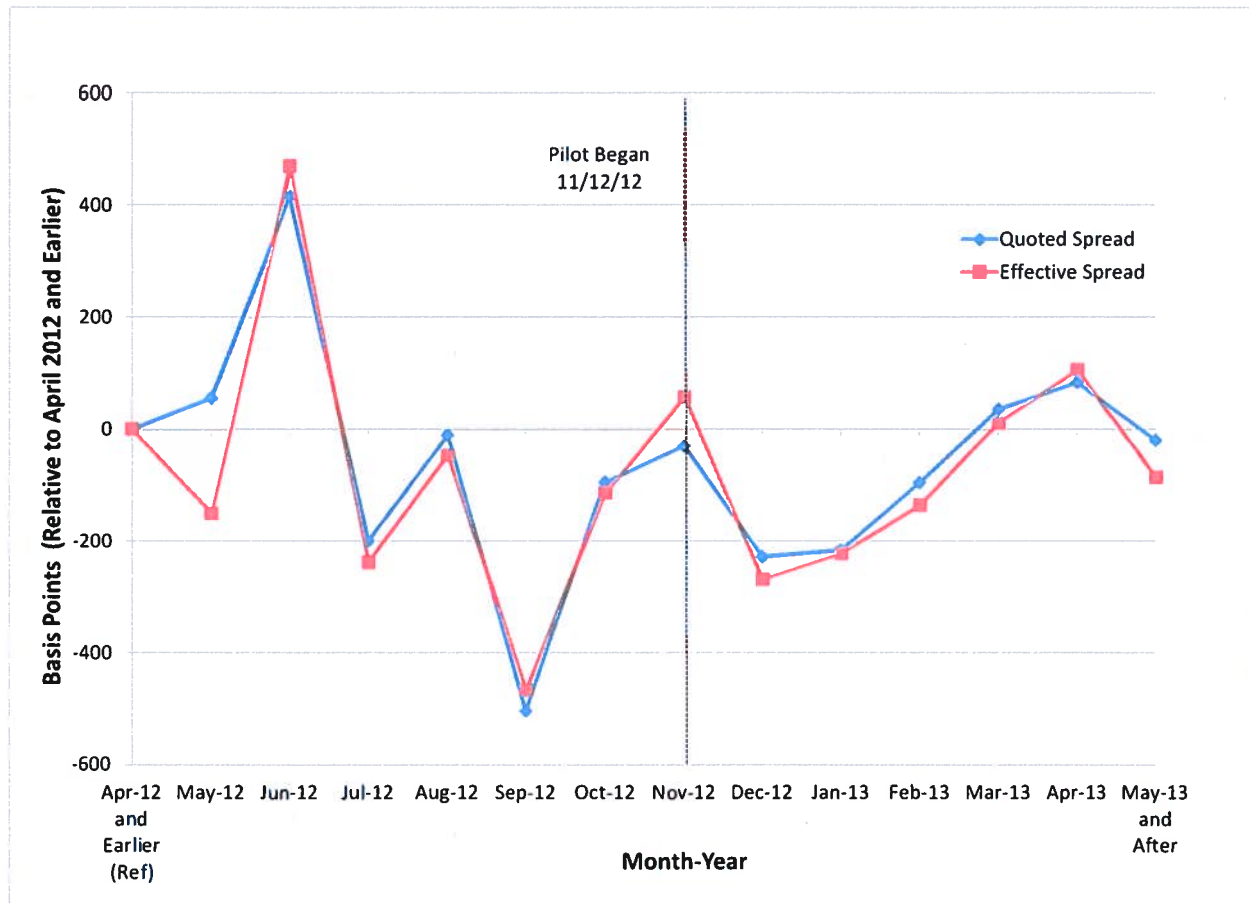
Notes: The figure plots the estimated coefficients for 13 indicator variables (one for each month or a group of months) from the regressions for quoted and effective spreads that control for stock fixed effects and stock-specific time trends. Each coefficient measures the quoted or effective spread in the corresponding month(s) relative to the average spread in the reference period of November 2011 to April 2012. "April-12 and Earlier" refers to the reference period itself, with the relative spreads being equal to 0 by construction. The pilot began on November 12, 2012. Data for November 2012 includes only trading days after the start of the pilot. "May-13 and After" refers to the months of May 2013 to November 2014.

**Figure 2: Tier 1 - Changes in Quoted and Effective Spreads Around the Start of the Pilot**

Notes: The figure plots the estimated coefficients for 13 indicator variables (one for each month or a group of months) from the regressions for quoted and effective spreads that control for stock fixed effects and stock-specific time trends. Each coefficient measures the quoted or effective spread in the corresponding month(s) relative to the average spread in the reference period of November 2011 to April 2012. "April-12 and Earlier" refers to the reference period itself, with the relative spreads being equal to 0 by construction. The pilot began on November 12, 2012. Data for November 2012 includes only trading days after the start of the pilot. "May-13 and After" refers to the months of May 2013 to November 2014.

**Figure 3a: Tier 2 - Changes in Quoted and Effective Spreads Around the Start of the Pilot**

Notes: The figure plots the estimated coefficients for 13 indicator variables (one for each month or a group of months) from the regressions for quoted and effective spreads that control for stock fixed effects and stock-specific time trends. Each coefficient measures the quoted or effective spread in the corresponding month(s) relative to the average spread in the reference period of November 2011 to April 2012. "April-12 and Earlier" refers to the reference period itself, with the relative spreads being equal to 0 by construction. The pilot began on November 12, 2012. Data for November 2012 includes only trading days after the start of the pilot. "May-13 and After" refers to the months of May 2013 to November 2014.

**Figure 3b: Tier 5c - Changes in Quoted and Effective Spreads Around the Start of the Pilot**

Notes: The figure plots the estimated coefficients for 13 indicator variables (one for each month or a group of months) from the regressions for quoted and effective spreads that control for stock fixed effects and stock-specific time trends. Each coefficient measures the quoted or effective spread in the corresponding month(s) relative to the average spread in the reference period of November 2011 to April 2012. "April-12 and Earlier" refers to the reference period itself, with the relative spreads being equal to 0 by construction. The pilot began on November 12, 2012. Data for November 2012 includes only trading days after the start of the pilot. "May-13 and After" refers to the months of May 2013 to November 2014.

**TO: File****FROM: Division of Risk, Strategy, and Financial Innovation****DATE: June 1, 2012****RE: FINRA Proposal to Reduce Minimum Quotation Size in OTC Market Tiers (SR-FINRA-2011-058)**

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This memorandum provides an empirical analysis conducted by the Staff of the Division of Risk, Strategy and Financial Innovation ("Staff") related to the potential effects of a FINRA proposed rule change that would reduce minimum quotation sizes in OTC markets.<sup>1</sup> This memorandum is intended to supplement FINRA's analysis.

On October 14, 2011, FINRA submitted to the Commission a proposed rule change that would amend Rule 6433 to substantially modify the requirements to display customer limit orders. The proposed rule change would establish lower minimum quotation sizes for most OTC customer orders. In support of this proposed rule change, FINRA submitted as part of its initial proposed rule change the results of an internal analysis of customer limit orders which concluded that the amendment would increase the display of customer limit orders from 50% to 90%. FINRA received several comments on its analysis, which are in the comment file.

On April 17, 2012, FINRA filed Amendment 1 to the Proposed Rule Change to Amend FINRA Rule 6433, which, among other things, increased the minimum quotation sizes from what was previously proposed. In support of Amendment 1, FINRA stated that revised tier sizes would facilitate the display of approximately 95% of all customer limit orders.<sup>2</sup>

To assist the Commission in evaluating FINRA's rule change and Amendment 1, the Staff extended the scope of the analysis used by FINRA from October 2011 by evaluating the impact on the Best Bid/Offer. The Staff's findings are summarized as follows:

- The Staff found that the percentage of all customer limit orders displayed under the current rule (92.5%) increases to 97.5% under Amendment 1 as proposed in April 2012. The Staff also found that the greatest increase in transparency would likely occur for stocks between \$.10 and \$1.
- The Staff estimates that Amendment 1 might reduce the transaction costs for executed limit orders that would be newly visible by an upper bound of \$7,173 per day, or 1.75% of dollar volume for these limit order executions.

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<sup>1</sup> See Release No. 34-65568 (October 14, 2011) (Notice of Filing of Proposed Rule Change); Release No. 34-66168 (January 17, 2012) (Order Instituting Proceedings to Determine Whether to Disapprove) and Release No. 34-66819 (April 17, 2012) (Notice of Filing of Amendment 1 to Proposed Rule Change).

<sup>2</sup>According to this amendment, FINRA obtained this result after analyzing a random sample of 100 million customer limit orders in OTC equities during a six month period.

*This is a memo prepared by the Staff of the Division of Division of Risk, Strategy and Financial Innovation. The Commission has expressed no view regarding the analysis, findings or conclusions herein.*

## Background

FINRA Rule 6433 currently establishes minimum quotation sizes by security price tiers that Market Makers in OTC equity securities must display in any inter-dealer quotation system that permits updates on a real-time basis.<sup>3</sup> Table 1 compares the current quotation sizes by security price to the proposed quotation sizes (both as initially proposed and under Amendment 1).

Table 1: Comparison of Proposed Rules to Current Rule

	Current Rule	Proposed Rule October 2011	Proposed Rule April 2012
Price Range	Shares Required	Shares Required	Shares Required
<-\$0.02	5,000	10,000	10,000
\$0.02-<0.10	5,000	1,000	10,000
\$0.10-<0.20	5,000	1,000	5,000
\$0.20-<0.26	5,000	1,000	2,500
\$0.26-<0.50	5,000	500	2,500
\$0.50-<0.51	2,500	500	2,500
<b>\$0.51-&lt;1.00</b>	<b>2,500</b>	<b>200</b>	<b>1,000</b>
\$1.00-<10.01	500	100	100
\$10.01-<100.01	200	100	100
\$100.01-<175	100	100	100
\$175-<200.01	100	1	1
\$200.01-<500.01	25	1	1
\$500.01-<1,000.01	10	1	1
\$1,000.01-<2,500	5	1	1
\$2,500-100,000	1	1	1

FINRA stated in its October filing that the proposed changes “simplify the tier structure, [and] facilitate the display of customer limit orders”.<sup>4</sup> FINRA’s stated goal for the proposed rule change is to increase transparency in the marketplace: with lower minimum quote sizes, more customer orders would be visible for possible execution.<sup>5</sup>

## Replication of FINRA’s analysis

FINRA supports its initial proposed rule change with the results of an analysis of customer orders with a limit price between \$0.51 and \$1.00 (highlighted in bold in Table 1) over a random sample of three to five days in each month of 2011.<sup>6</sup> FINRA finds that the fraction of customer limit orders that would be

<sup>3</sup> By contrast, exchange-listed securities require quotes of at least 1 round lot.

<sup>4</sup> See <http://www.finra.org/web/groups/industry/@ip/@reg/@rulfil/documents/rulefilings/p124830.pdf> for FINRA Filing of Proposed Rule Change in Federal Register Vol. 76, No. 203.

<sup>5</sup> See supra note 4.

<sup>6</sup> See supra note 4.

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displayed would rise from 50% to 90%. FINRA did not consider the marketability of the orders upon submission. Therefore, the limit orders included in the FINRA statistics might be priced away from the inside quote.

The Staff performed a modification of the analysis FINRA discussed in its October filing using the first five trading days in November, 2011.<sup>7</sup> Staff found that for customer orders with limit prices between \$0.51 and \$1.00, displayable orders would increase from 47.5% to 92.6% under FINRA's filing from October 2011. This finding is consistent with results reported by FINRA for this particular tier size. Using FINRA's amendment from April 2012 with modified thresholds, the percentage of displayable orders for this tier size increases from 47.5% to 73.8% (highlighted in Table 2).

We examined all limit orders to gain a more complete perspective, and find the effect is less dramatic but would still increase transparency. Specifically, when we include all customer orders regardless of limit price entered during the sample period, displayable orders would have increased from 92.5% to 97.5% under the April proposed amendment. The difference between this and the result provided above is that, under the current rule, more than 90% of customer limit orders over \$1 are already visible.

Table 2: Classification of Customer Orders Under Current, Proposed and Amended Tier Sizes

	Current Rule			Tier Sizes for Rule Change - October 2011			Tier Sizes as per Amendment 1 - April 2012		
Price Range	Shares Required	Orders	% Visible	Shares Required	Orders	% Visible	Shares Required	Orders	% Visible
<\$0.02	5,000	20,771	93.7%	10,000	18,796	84.8%	10,000	18,796	84.8%
\$0.02-<0.10	5,000	13,564	71.0%	1,000	17,634	92.3%	10,000	9,823	51.4%
\$0.10-<0.20	5,000	5,384	60.8%	1,000	7,769	87.7%	5,000	5,384	60.8%
\$0.20-<0.26	5,000	3,183	59.0%	1,000	4,632	85.8%	2,500	3,772	69.9%
\$0.26-<0.50	5,000	5,238	47.4%	500	9,845	89.2%	2,500	6,582	59.6%
\$0.50-<0.51	2,500	199	59.5%	500	293	87.5%	2,500	199	59.5%
<b>\$0.51-&lt;1.00</b>	<b>2,500</b>	<b>5,426</b>	<b>47.5%</b>	<b>200</b>	<b>10,588</b>	<b>92.6%</b>	<b>1,000</b>	<b>8,433</b>	<b>73.8%</b>
\$1.00-<10	500	157,226	89.7%	100	174,009	99.3%	100	174,009	99.3%
\$10.01-<100	200	902,795	94.9%	100	947,225	99.5%	100	947,225	99.5%
\$100-<175	100	17,519	98.9%	100	17,519	98.9%	100	17,519	98.9%
\$175-<200	100	538	98.5%	1	546	100%	1	546	100%
\$200-<500	25	1,526	90.7%	1	1,681	100%	1	1,681	100%
\$500-<1,000	10	45	66.8%	1	67	100%	1	67	100%
\$1,000-<2.5K	5	26	76.7%	1	34	100%	1	34	100%
\$2,500-100K	1	55	100%	1	55	100%	1	55	100%
<b>Visible</b>	<b>1,133,495</b>		<b>92.5%</b>	<b>1,210,693</b>		<b>98.8%</b>	<b>1,194,125</b>		<b>97.5%</b>

<sup>7</sup> The data and the reason for their selection are described in the appendix.



### Execution of orders that are currently not visible

This section examines those orders at the BBO or better that were hidden, but were nonetheless executed. The Staff's objective was to determine if execution costs would decrease with enhanced visibility of customer limit orders.

Using data from the first five trading days of November 2011 the Staff matched customer limit orders to the best bid/offer and found an average of 38,056 hidden orders per day that are priced at the quote or better but were not displayed under the tier sizes proposed in Amendment 1. Of these orders, approximately 26% are executed. For these executions, the Staff finds:

- 68.9% are executed at the original limit price.
- 26.7% are executed at a price superior to the limit price.
- 4.4% are executed at a price inferior to the original limit price.

We focus on the last category because these orders might have been executed at the original limit price if they had been visible. The Staff estimates the potential loss to customers as the difference between the limit price and the execution prices multiplied by the number of shares executed. We find that customers might have potentially lost as much as \$7,173 per day on average, or 1.75% of the dollar volume for these executions because of the level of customer limit order transparency in the market. This is an upper bound for orders that provided price improvement.

The Staff cannot calculate implementation shortfall for unexecuted orders since our dataset does not provide an unambiguous end for the life cycle of each order.

### Conclusion

We supplement FINRA's analysis of the rule change and Amendment 1 by examining all customer limit orders, and find that the visibility of these orders would increase from 92.5% to 97.5% if the amendment were approved. When we examine customer limit orders regardless of price that were at the BBO or better, we estimate that customers could potentially save a maximum of \$7,173 per day in execution costs if these orders were visible.

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### Appendix: Data Selection

Our initial data set was FINRA's OATS files for the first two weeks of both August and November, 2011. The Staff chose these two periods in order to include both the high volatility in August and the relative calm in November. The VIX Index measures the expectation of near-term volatility of the S&P 500 index and reached a level of 48 last August. This was a high level when compared to the 200 day moving average for March of 2012, which is 26. The level of expected volatility in August of 2011 was also considerably higher than the maximum level reached by the VIX index in November of 2011, which was 36.16. We found that the distribution of orders sizes in OTC markets was similar in August and November 2011. Therefore, we chose a sample of the first five days in November to minimize the amount of data required in our sample. Our sample period may differ from FINRA since the sample of days was not revealed in any of FINRA's filings or amendments.

FINRA delivered the raw data files containing trading activity of August 1-15 and November 1-15, 2011 on December 23, 2011. In January and February, 2012, SEC Staff discussed the selection of data from OATS with FINRA. FINRA and the SEC agreed that only those orders in the primary file that contained a limit price and with one of the following account codes (OATS designation of ACCNT\_TYPE\_CD) contained relevant data for the analysis:

- A - Institutional Customer
- C - Combined
- E - Employee Account
- I - Individual Customer
- R - Not a Broker/Dealer
- U - Unknown (only in November Data)
- W - Wholesale (only in August Data)

The data sent by FINRA contained two files, a primary file which contained all new orders and executions entered by a FINRA member and a secondary file with routing, executions, and cancellations information.<sup>8</sup> Combined orders are grouped customer orders. Employee accounts are orders sent in by a person that is an employee of a FINRA member. Unknown and wholesale accounts were included since they are routed orders and therefore likely to be originated by a customer.

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<sup>8</sup> Only new customer orders were considered in the Staff's analysis; routed orders were duplicative and therefore removed from the sample.

## EXHIBIT 5

Below is the text of the proposed rule change. Proposed deletions are in brackets.

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### 6000. QUOTATION, ORDER, AND TRANSACTION REPORTING FACILITIES

\* \* \* \* \*

### 6400. QUOTING AND TRADING IN OTC EQUITY SECURITIES

\* \* \* \* \*

#### 6430. OTC Equity Quotation Requirements

\* \* \* \* \*

#### 6433. Minimum Quotation Size Requirements For OTC Equity Securities

Every member entering quotations in any inter-dealer quotation system that permits quotation updates on a real-time basis must enter and honor those quotations for at least the minimum size defined in the table below. In this regard, it is the member's responsibility to determine the minimum size requirement applicable to its quotation. Depending on the price level of the quotation, a different minimum size can apply to each side of the market being quoted by the member in a given security.

Price (Bid or Offer)	Minimum Quote Size
0.0001–0.0999	10,000
0.10-0.1999	5,000
0.20–0.5099	2,500
0.51–0.9999	1,000
1.00–174.99	100
175.00+	1

**[• • • Supplementary Material: -----]**

[.01 The amendments set forth in File No. SR-FINRA-2011-058 shall be in effect until June 7, 2018. If the pilot is not extended or approved as permanent by this date, the version of this Rule prior to SR-FINRA-2011-058 shall be in effect.]

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