

Report - May 29, 2015

The NASDAQ Stock Market LLC's Nasdaq Options Market ("NOM" or "Exchange")

Pilot Program Regarding Options Obvious and Catastrophic Errors in Response to the Regulation NMS Plan to Address Extraordinary Market Volatility

Requirement:

1. Evaluate the statistical and economic impact of Limit and Straddle States on liquidity and market quality in the options markets.
2. Assess whether the lack of obvious error rules in effect during the Straddle and Limit States are problematic.

Analysis:

The Exchange will conduct an analysis concerning the elimination of obvious and catastrophic error provisions during Limit States and Straddle States and agrees to provide the Commission with relevant data to assess the impact of this proposed rule change. As part of its analysis, the Exchange will: (1) evaluate the options market quality during Limit States and Straddle States; (2) assess the character of incoming order flow and transactions during Limit States and Straddle States; and (3) review any complaints from members and their customers concerning executions during Limit States and Straddle States.

The Exchange reports the following (covering October 2014 – April 2015 (the "Current Period")):

- There were no requests for a review of an options trade occurring during a Limit State or Straddle State on NOM.
- There were no complaints regarding the Pilot Program.
- The Exchange observes that the Pilot Program once again coincides with a period of relatively low volatility in the marketplace as demonstrated by a VIX averaging below 16.

- The ability of the Exchange to provide comprehensive analysis of market quality continues to be limited by the small number of cases available. The vast majority of Limit and Straddle States that have occurred were in underlying securities that did not have exchange-traded options contracts listed and available for trading. Of those securities that do have overlying options contracts, few had any options trading volume during Limit and Straddle States.
- The ability of the Exchange to offer conclusive analysis is further hindered by the instability of options market quality statistics in such a small sample. While the small number of Limit and Straddle State cases available for study reveals highly variable market quality, market quality in any small sample of relatively illiquid options series is similarly highly variable. Both the available cases of options markets in Limit or Straddle States and their non-Limit State and non-Straddle State control cases often have no trading volume, little depth, relatively wide quotes or lack two-sided quotes.

This analysis covers all Limit State and Straddle State events that occurred during the Current Period (Table 1). An “event” is a case when at least one trade occurred on NOM in at least one option series during a Limit or Straddle State in the underlying. Every event that occurred during an included month was evaluated for this report.

Table 1: Cases evaluated for this report

Year	Month	Limit State Events	Straddle State Events
2014	October	25	9
2014	November	5	2
2014	December	5	5
2015	January	5	5
2015	February	6	1
2015	March	5	4
2015	April	7	2
Total		58	28
Average per month		8.3	4.0

During the months studied, 42 underlying symbols had cases of option series with at least one trade on NOM during a Limit or Straddle State (Table 2). Two were exchange traded products. The symbols had a wide variety distribution of characteristics. They ranged in market capitalization from \$6M to \$647B, in price

from \$0.44 to \$282.02, and in average daily volume from less than 500,000 shares to over 61M.

For this analysis, market quality during events was compared to market quality during control periods. For each Limit or Straddle State event, a control was found by measuring market quality in the same option series during the same period on the day before. Each control period lasts the same amount of time as the event.

For each event, this analysis looks for an impact in every option series on the affected underlying as long as one of the series had a trade on NOM. In the results that follow, averages are shown both across all series and across only those that had trading volume on NOM.

Table 2: Characteristics of underlying

Year	Month	Underlying	Limit State Events	Straddle State Events	Name	ETP	Market Capitalization (M)	Price	ADV (M)	AD\$V (M)
2014	10	ARWR	2	0	Arrowhead Research Corporation	No	\$345	\$6.52	6.8	\$48.1
2014	10	CLF	3	0	Cliffs Natural Resources Inc.	No	\$1,720	\$11.23	16.1	\$147.2
2014	10	ESI	1	0	ITT Educational Services, Inc.	No	\$237	\$10.11	2.5	\$21.6
2014	10	GPRO	2	2	GoPro Inc Class A	No	\$1,578	\$77.10	9.5	\$755.7
2014	10	GTAT	10	3	GoPro Inc Class A	No	\$1,578	\$77.10	9.5	\$755.7
2014	10	OCN	4	1	Ocwen Financial Corp	No	\$3,000	\$21.72	4.4	\$88.6
2014	10	RBCN	1	0	Rubicon Technology, Inc.	No	\$116	\$4.43	1.2	\$5.4
2014	10	SHLD	1	2	Sears Holdings Corporation	No	\$3,718	\$34.92	1.7	\$56.5
2014	10	TRN	0	1	Trinity Industries, Inc.	No	\$5,573	\$35.71	6.6	\$230.4
2014	10	XLS	1	0	Exelis Inc.	No	\$3,362	\$17.85	2.1	\$35.4
2014	11	BHI	3	0	Baker Hughes Incorporated	No	\$24,663	\$57.00	14.1	\$859.0
2014	11	SHLD	1	2	Sears Holdings Corporation	No	\$3,844	\$36.10	2.1	\$81.7
2014	11	ZTS	1	0	Zoetis, Inc. Class A	No	\$22,525	\$44.93	7.4	\$312.1
2014	12	AAPL	0	5	Apple Inc.	No	\$647,361	\$110.38	46.5	\$5,204.9
2014	12	ARCP	3	0	American Realty Capital Properties, Inc. Cl	No	\$8,217	\$9.05	20.1	\$171.5
2014	12	GDX	1	0	Market Vectors Gold Miners ETF	Yes		\$19.32	61.5	\$1,176.7
2014	12	TLM	1	0	Talisman Energy Inc.	No	\$8,113	\$7.83	37.0	\$250.0
2015	1	CLF	0	1	Cliffs Natural Resources Inc	No	\$850	\$6.44	9.1	\$58.9
2015	1	DKS	1	0	Dick's Sporting Goods, Inc.	No	\$4,893	\$51.65	1.9	\$102.6
2015	1	HLF	2	1	Herbalife Ltd.	No	\$2,798	\$30.48	2.5	\$79.4
2015	1	ILMN	1	1	Illumina, Inc.	No	\$27,717	\$195.19	1.7	\$332.7
2015	1	OWW	1	1	Orbitz Worldwide, Inc.	No	\$1,022	\$9.23	1.9	\$17.8
2015	1	WHX	0	1	Whiting USA Trust I	No	\$6	\$0.41	0.5	\$0.4
2015	2	ARUN	1	0	Aruba Networks, Inc.	No	\$2,723	\$24.81	4.2	\$85.8
2015	2	OCN	0	1	Ocwen Financial Corporation	No	\$1,024	\$8.14	8.6	\$73.7
2015	2	PCYC	4	0	Pharmacyclics, Inc.	No	\$16,311	\$215.93	1.5	\$296.6
2015	2	ROVI	1	0	Rovi Corporation	No	\$2,365	\$24.88	1.1	\$25.5
2015	3	BGC	1	0	General Cable Corporation	No	\$839	\$17.23	1.2	\$20.5
2015	3	ICPT	1	2	Intercept Pharmaceuticals, Inc.	No	\$6,321	\$282.02	0.9	\$237.9
2015	3	SGYP	1	0	Synergy Pharmaceuticals, Inc.	No	\$446	\$4.62	2.5	\$9.7
2015	3	UNIS	0	1	Unilife Corporation	No	\$517	\$4.01	1.3	\$4.7
2015	3	VXX	1	0	IPATH SP 500 VIX SHORT TERM FUT ETN	Yes		\$30.35	46.5	\$1,436.7
2015	3	WLL	1	0	Whiting Petroleum Corporation	No	\$5,157	\$30.90	12.9	\$447.1
2015	3	ZU	0	1	Zulily, Inc. Class A	No	\$888	\$12.99	2.6	\$34.4
2015	4	AVP	1	0	Avon Products, Inc.	No	\$3,550	\$8.17	12.1	\$104.9
2015	4	CRM	1	1	salesforce.com, inc.	No	\$45,949	\$72.82	4.7	\$333.5
2015	4	IMMU	1	0	Immunomedics, Inc.	No	\$336	\$3.60	0.9	\$3.5
2015	4	MAC	1	0	Macerich Company	No	\$12,931	\$81.76	1.9	\$150.7
2015	4	MYL	1	0	Mylan N.V.	No	\$35,364	\$72.26	15.7	\$1,092.3
2015	4	OCR	1	0	Omnicare, Inc.	No	\$8,544	\$87.98	1.5	\$129.0
2015	4	PDCO	0	1	Patterson Companies, Inc.	No	\$4,847	\$46.96	0.9	\$44.9
2015	4	TWC	1	0	Time Warner Cable Inc.	No	\$43,686	\$155.52	5.0	\$773.0
Min							\$6	\$0.41	0.5	\$0
Max							\$647,361	\$282.02	61.5	\$5,205
Average							\$24,126	\$49.04	9.4	\$383

Table 3 shows NOM trading activity in the events analyzed. By construction, all events have trading volume in at least one series. By contrast, in almost all cases the control period had no trading in any series (Table 3a). Similarly, when all series are included in the event averages, very few have traded volume (Table 3b).

Table 3a: Percent of cases with traded volume, including only series with traded volume

Year	Month	State Code	Event Cases	Control Cases
2014	10	Limit State	100%	16%
2014	10	Straddle State	100%	0%
2014	11	Limit State	100%	0%
2014	11	Straddle State	100%	0%
2014	12	Limit State	100%	0%
2014	12	Straddle State	100%	0%
2015	1	Limit State	100%	0%
2015	1	Straddle State	100%	0%
2015	2	Limit State	100%	0%
2015	2	Straddle State	100%	0%
2015	3	Limit State	100%	0%
2015	3	Straddle State	100%	0%
2015	4	Limit State	100%	0%
2015	4	Straddle State	100%	0%

Table 3b: Percent of cases with traded volume, including all options series

Year	Month	State Code	Event Cases	Control Cases
2014	10	Limit State	0.3%	0%
2014	10	Straddle State	0.1%	0%
2014	11	Limit State	0.2%	0%
2014	11	Straddle State	0.3%	0%
2014	12	Limit State	0.3%	0%
2014	12	Straddle State	0.1%	0%
2015	1	Limit State	0.3%	0%
2015	1	Straddle State	0.2%	0%
2015	2	Limit State	0.4%	0%
2015	2	Straddle State	0.3%	0%
2015	3	Limit State	0.3%	0%
2015	3	Straddle State	0.1%	0%
2015	4	Limit State	0.6%	0%
2015	4	Straddle State	0.2%	0%

In most cases, quote quality during the control periods was worse than during the Limit or Straddle State events (Tables 4a and 4b). This may be because news and greater trading activity led to greater market participation during the Limit or Straddle State.

Table 4a: Percent of cases with two-sided quotes, including only series with volume

Year	Month	State Code	Event Cases	Control Cases
2014	10	Limit State	71%	0%
2014	10	Straddle State	44%	0%
2014	11	Limit State	91%	0%
2014	11	Straddle State	100%	0%
2014	12	Limit State	57%	0%
2014	12	Straddle State	100%	0%
2015	1	Limit State	56%	0%
2015	1	Straddle State	20%	0%
2015	2	Limit State	57%	0%
2015	2	Straddle State	100%	0%
2015	3	Limit State	54%	0%
2015	3	Straddle State	75%	0%
2015	4	Limit State	60%	0%
2015	4	Straddle State	50%	0%

Table 4b: Percent of cases with two-sided quotes, including all contract series

Year	Month	State Code	Event Cases	Control Cases
2014	10	Limit State	18%	0%
2014	10	Straddle State	2%	0%
2014	11	Limit State	29%	0%
2014	11	Straddle State	17%	0%
2014	12	Limit State	21%	0%
2014	12	Straddle State	0%	0%
2015	1	Limit State	38%	0%
2015	1	Straddle State	2%	0%
2015	2	Limit State	6%	0%
2015	2	Straddle State	5%	0%
2015	3	Limit State	16%	0%
2015	3	Straddle State	1%	0%
2015	4	Limit State	44%	0%
2015	4	Straddle State	53%	0%

Time-weighted Average Quoted Spreads were highly variable and sensitive to outliers (Tables 5a and 5b). In some cases they were narrower during Limit and

Straddle State events. The results are not very informative because of the small number of cases.

Table 5a: Average percent quoted spread, including only series with volume

Year	Month	State Code	Event Cases	Control Cases
2014	10	Limit State	200%	NA
2014	10	Straddle State	200%	NA
2014	11	Limit State	200%	NA
2014	11	Straddle State	200%	NA
2014	12	Limit State	200%	NA
2014	12	Straddle State	200%	NA
2015	1	Limit State	200%	NA
2015	1	Straddle State	200%	NA
2015	2	Limit State	200%	NA
2015	2	Straddle State	200%	NA
2015	3	Limit State	200%	NA
2015	3	Straddle State	200%	NA
2015	4	Limit State	200%	NA
2015	4	Straddle State	200%	NA

Table 5b: Average percent quoted spread, including all option series

Year	Month	State Code	Event Cases	Control Cases
2014	10	Limit State	200%	NA
2014	10	Straddle State	200%	NA
2014	11	Limit State	200%	NA
2014	11	Straddle State	200%	NA
2014	12	Limit State	200%	NA
2014	12	Straddle State	200%	NA
2015	1	Limit State	200%	NA
2015	1	Straddle State	200%	NA
2015	2	Limit State	200%	NA
2015	2	Straddle State	200%	NA
2015	3	Limit State	200%	NA
2015	3	Straddle State	200%	NA
2015	4	Limit State	200%	NA
2015	4	Straddle State	200%	NA

Time-weighted average depth at the NOM inside was often higher during events than during control periods (Tables 6a and 6b).

Table 6a: Average depth in contracts, including only series with trading

Year	Month	StateCode	Event Cases	Control Cases
2014	10	Limit State	23	NA
2014	10	Straddle State	61	NA
2014	11	Limit State	6	NA
2014	11	Straddle State	7	NA
2014	12	Limit State	20	NA
2014	12	Straddle State	21	NA
2015	1	Limit State	4	NA
2015	1	Straddle State	102	NA
2015	2	Limit State	17	NA
2015	2	Straddle State	71	NA
2015	3	Limit State	5	NA
2015	3	Straddle State	26	NA
2015	4	Limit State	5	NA
2015	4	Straddle State	1	NA

Table 6b: Average depth in contracts, including all option series

Year	Month	StateCode	Event Cases	Control Cases
2014	10	Limit State	18	NA
2014	10	Straddle State	17	NA
2014	11	Limit State	2	NA
2014	11	Straddle State	4	NA
2014	12	Limit State	11	NA
2014	12	Straddle State	25	NA
2015	1	Limit State	3	NA
2015	1	Straddle State	6	NA
2015	2	Limit State	3	NA
2015	2	Straddle State	10	NA
2015	3	Limit State	2	NA
2015	3	Straddle State	12	NA
2015	4	Limit State	3	NA
2015	4	Straddle State	4	NA

In many cases traded prices on NOM during the event were more than 30% away from the most recent OPRA price before the Limit or Straddle State event (Tables 7a and 7b). There was almost no trading during the control periods.

Table 7a: Percent of cases where price changed 30% during event, including only series with trading

Year	Month	State	Event Cases	Control Cases
2014	10	Limit State	45%	9%
2014	10	Straddle State	44%	0%
2014	11	Limit State	45%	0%
2014	11	Straddle State	100%	0%
2014	12	Limit State	57%	0%
2014	12	Straddle State	29%	0%
2015	1	Limit State	100%	0%
2015	1	Straddle State	100%	0%
2015	2	Limit State	100%	0%
2015	2	Straddle State	100%	0%
2015	3	Limit State	100%	0%
2015	3	Straddle State	100%	0%
2015	4	Limit State	100%	0%
2015	4	Straddle State	100%	0%

Table 7b: Percent of cases where price changed 30% during event, including all option series

Year	Month	State	Event Cases	Control Cases
2014	10	Limit State	0.1%	0%
2014	10	Straddle State	0.1%	0%
2014	11	Limit State	0.1%	0%
2014	11	Straddle State	0.3%	0%
2014	12	Limit State	0.1%	0%
2014	12	Straddle State	0.0%	0%
2015	1	Limit State	0.3%	0%
2015	1	Straddle State	0.2%	0%
2015	2	Limit State	0.4%	0%
2015	2	Straddle State	0.3%	0%
2015	3	Limit State	0.3%	0%
2015	3	Straddle State	0.1%	0%
2015	4	Limit State	0.6%	0%
2015	4	Straddle State	0.2%	0%

In some cases traded prices on NOM within 5 minutes after the event were more than 30% away from the most recent OPRA price before the Limit or Straddle State event (Tables 8a and 8b).

Table 8a: Percent of cases where price changed more than 30% after event, including only series with trading

Year	Month	State	Event Cases	Control Cases
2014	10	Limit State	15%	8%
2014	10	Straddle State	33%	0%
2014	11	Limit State	18%	0%
2014	11	Straddle State	0%	0%
2014	12	Limit State	29%	0%
2014	12	Straddle State	86%	0%
2015	1	Limit State	0%	0%
2015	1	Straddle State	0%	0%
2015	2	Limit State	0%	0%
2015	2	Straddle State	0%	0%
2015	3	Limit State	0%	0%
2015	3	Straddle State	0%	0%
2015	4	Limit State	0%	0%
2015	4	Straddle State	0%	0%

Table 8b: Percent of cases where price changed more than 30% after event, including all option series

Year	Month	State	Event Cases	Control Cases
2014	10	Limit State	0.5%	0%
2014	10	Straddle State	1.4%	0%
2014	11	Limit State	2.2%	0%
2014	11	Straddle State	0.5%	0%
2014	12	Limit State	0.3%	0%
2014	12	Straddle State	12.8%	0%
2015	1	Limit State	0.0%	0%
2015	1	Straddle State	0.0%	0%
2015	2	Limit State	0.0%	0%
2015	2	Straddle State	0.0%	0%
2015	3	Limit State	0.0%	0%
2015	3	Straddle State	0.0%	0%
2015	4	Limit State	0.0%	0%
2015	4	Straddle State	0.0%	0%

Market quality results to date are mixed and limited by the small number of cases available each month for analysis. While the results reveal variable market quality including wide spreads and significant price changes, market quality in any small sample of relatively illiquid options series is similarly highly variable (as shown by the control cases). Perhaps the most telling statistic is the lack of member or customer complaints.

Under the Pilot Program, limit orders that are filled during a Limit State or Straddle State have certainty of execution. Moreover, given that options prices during brief Limit States or Straddle States may deviate substantially from those available shortly following the Limit State or Straddle State, the Exchange believes giving market participants time to re-evaluate a transaction would create an unreasonable adverse selection opportunity that would discourage participants from providing liquidity during Limit States or Straddle States. On balance, the Exchange believes that removing the potential inequity of nullifying or adjusting executions occurring during Limit States or Straddle States outweighs any potential benefits from applying those provisions during such unusual market conditions.

The Exchange believes that continuing the Pilot Program should protect against any unanticipated consequences and permit the industry to gain further experience operating the Plan and further data to evaluate the impact of the Pilot Program.