

Report – November 25, 2015

NASDAQ OMX BX, Inc. (“BX Options”), The NASDAQ Stock Market LLC’s Nasdaq Options Market (“NOM”) and NASDAQ OMX PHLX LLC (“PHLX”) (“together, the “Exchanges”)

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 Exchanges report the following (covering May 2015 – October 2015 (the “Current Period”)):

- There were no requests for a review of an options trade occurring during a Limit State or Straddle State on BX Options, NOM or PHLX.
- There were no complaints regarding the Pilot Program.

- The Exchanges observe that the Pilot Program once again coincides with a period of relatively low volatility in the marketplace as demonstrated by a VIX averaging slightly above 17.
- The ability of the Exchanges 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 Exchanges 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 PHLX 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. Compared to the period October 2014 – April 2015, the total number of Limit State Events was lower during the Current Period while the total number of Straddle State Events was slightly higher during the Current Period. Similarly, the average number per month of Limit States was lower while the average number of Straddle States was higher.

Table 1: Cases evaluated for this report

Year	Month	Limit State Events	Straddle State Events
2015	May	7	3
2015	June	5	1
2015	July	7	3
2015	August	8	20
2015	September	3	5
2015	October	3	8
Total		33	40
Average per month		4.7	5.7

During the months studied, 49 underlying symbols had cases of option series with at least one trade on PHLX during a Limit or Straddle State (Table 2). Ten of the underlying symbols were exchange traded products. The symbols had a wide variety of characteristics. They ranged in market capitalization from \$53M to \$155B, in price from \$4.37 to \$214.65, and in average daily volume from less than 20,000 shares to 40M.

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 PHLX. In the results that follow, averages are shown both across all series and across only those that had trading volume on PHLX.

Table 2: Characteristics of underlying

Year	Month	Underlying	Limit State Events	Straddle State Events	Name	ETP	Market Capitalization (M)	Price	ADV (M)	ADSV (M)
2015	5	AVP	1	0	Avon Products, Inc.	No	\$2,924	\$6.72	16.3	115.1
2015	5	BRCM	1	0	Broadcom Corporation Class A	No	\$31,211	\$56.85	14.4	761.6
2015	5	CRM	1	0	salesforce.com, inc.	No	\$47,692	\$72.75	6.8	496.2
2015	5	DGX	1	2	Quest Diagnostics Incorporated	No	\$10,816	\$75.23	2.2	162.9
2015	5	ESI	0	1	ITT Educational Services, Inc.	No	\$103	\$4.37	1.7	5.7
2015	5	HUM	1	0	Humana Inc.	No	\$32,150	\$214.65	1.7	315.8
2015	5	POM	1	0	Pepco Holdings, Inc.	No	\$6,895	\$27.25	3.0	79.2
2015	5	XLNX	1	0	Xilinx, Inc.	No	\$12,397	\$47.42	3.2	144.6
2015	6	ATML	1	0	Atmel Corporation	No	\$4,113	\$9.86	7.7	75.3
2015	6	CI	1	0	Cigna Corporation	No	\$41,693	\$162.00	4.1	655.0
2015	6	HUM	1	0	Humana Inc.	No	\$28,650	\$191.28	3.9	777.1
2015	6	JUNO	1	0	Juno Therapeutics, Inc.	No	\$4,848	\$53.33	3.1	169.9
2015	6	VTL	0	1	Vital Therapies, Inc.	No	\$507	\$21.10	0.2	3.6
2015	6	ZTS	1	0	Zoetis, Inc. Class A	No	\$24,108	\$48.22	3.6	176.9
2015	7	CZR	3	1	Caesars Entertainment Corporation	No	\$754	\$5.21	2.2	12.7
2015	7	LOCK	2	0	LifeLock, Inc.	No	\$747	\$7.92	7.0	61.7
2015	7	MYL	2	0	Mylan N.V.	No	\$27,437	\$55.99	8.1	509.9
2015	7	RGC	0	2	Regal Entertainment Group Class A	No	\$2,735	\$20.60	1.2	23.4
2015	8	ALNY	1	0	Alnylam Pharmaceuticals, Inc	No	\$8,674	\$102.91	0.9	93.1
2015	8	CACC	0	1	Credit Acceptance Corporation	No	\$4,198	\$203.81	0.1	28.3
2015	8	CELG	1	1	Celgene Corporation	No	\$93,347	\$118.08	4.9	609.6
2015	8	DVY	0	1	iShares Select Dividend	Yes		\$74.71	0.8	61.1
2015	8	GILD	1	0	Gilead Sciences, Inc.	No	\$154,768	\$105.07	11.0	1,202.2
2015	8	IAT	0	1	iShares US Regional Banks	Yes		\$35.56	0.3	9.8
2015	8	IJS	0	1	iShares S&P Small-Cap 600 Value	Yes		\$111.48	0.1	15.6
2015	8	IVW	0	1	iShares S&P 500 Growth	Yes		\$113.69	1.1	121.3
2015	8	IYZ	0	1	iShares US Telecommunications	Yes		\$28.61	0.3	7.5
2015	8	JBLU	3	0	JetBlue Airways Corporation	No	\$6,992	\$22.32	7.4	169.6
2015	8	KSS	0	1	Kohl's Corporation	No	\$10,098	\$51.03	4.4	244.3
2015	8	LEG	0	2	Leggett & Platt, Incorporated	No	\$6,121	\$44.42	1.3	58.4
2015	8	MNST	0	1	Monster Beverage Corporation	No	\$28,281	\$138.46	1.6	234.7
2015	8	MRVL	1	0	Marvell Technology Group Ltd.	No	\$5,833	\$11.27	6.9	81.6
2015	8	OEF	0	1	iShares S&P 100	Yes		\$89.70	1.1	95.9
2015	8	PHH	0	1	PHH Corporation	No	\$805	\$16.20	1.9	30.8
2015	8	PSEC	0	2	Prospect Capital Corporation	No	\$2,670	\$7.40	2.7	19.8
2015	8	QQQ	1	0	PowerShares QQQ ETF	Yes		\$107.45	39.6	4,209.2
2015	8	SVXY	0	1	ProShares Short VIX Short-Term Futures	Yes		\$72.70	4.5	269.2
2015	8	XLF	0	1	Financial Select Sector SPDR ETF	Yes		\$24.14	39.8	949.1
2015	8	XLV	0	3	Health Care Select Sector SPDR ETF	Yes		\$73.09	13.4	958.0
2015	9	CBIO	0	1	Catalyst Biosciences, Inc.	No	\$53	\$4.66	0.0	0.2
2015	9	CDK	1	0	CDK Global Inc	No	\$7,648	\$47.78	0.9	43.6
2015	9	FUEL	0	1	Rocket Fuel, Inc.	No	\$199	\$4.67	0.3	1.7
2015	9	MNST	0	3	Monster Beverage Corporation	No	\$27,771	\$135.14	1.2	167.0
2015	9	SYNA	1	0	Synaptics Incorporated	No	\$3,004	\$82.46	1.0	72.8
2015	9	ZSPH	1	0	ZS Pharma, Inc.	No	\$1,649	\$65.66	1.0	69.5
2015	10	BLUE	2	3	bluebird bio, Inc.	No	\$3,102	\$85.55	1.0	111.2
2015	10	HOT	0	1	Starwood Hotels & Resorts Worldwide, Inc.	No	\$11,327	\$66.48	2.0	142.7
2015	10	MCK	0	4	McKesson Corporation	No	\$43,002	\$185.03	1.9	375.4
2015	10	RLYP	1	0	Relypsa, Inc.	No	\$770	\$18.51	0.9	20.0
Min							\$53	\$4.37	0.0	0.2
Max							\$154,768	\$214.65	39.8	4,209.2
Average							\$17,951	\$67.93	5.0	306.5

Table 3 shows PHLX 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
2015	5	Limit State	100.0%	0.0%
2015	5	Straddle State	100.0%	0.0%
2015	6	Limit State	100.0%	0.0%
2015	6	Straddle State	100.0%	0.0%
2015	7	Limit State	100.0%	0.0%
2015	7	Straddle State	100.0%	0.0%
2015	8	Limit State	100.0%	17.0%
2015	8	Straddle State	100.0%	0.0%
2015	9	Limit State	100.0%	0.0%
2015	9	Straddle State	100.0%	0.0%
2015	10	Limit State	100.0%	0.0%
2015	10	Straddle State	100.0%	0.0%

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

Year	Month	State Code	Event Cases	Control Cases
2015	5	Limit State	0.5%	0.0%
2015	5	Straddle State	0.6%	0.0%
2015	6	Limit State	0.7%	0.0%
2015	6	Straddle State	1.1%	1.1%
2015	7	Limit State	0.5%	0.0%
2015	7	Straddle State	0.5%	0.0%
2015	8	Limit State	0.2%	0.1%
2015	8	Straddle State	0.4%	0.0%
2015	9	Limit State	0.3%	0.0%
2015	9	Straddle State	0.2%	0.0%
2015	10	Limit State	0.3%	0.0%
2015	10	Straddle State	0.2%	0.0%

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
2015	5	Limit State	81%	0%
2015	5	Straddle State	100%	0%
2015	6	Limit State	69%	0%
2015	6	Straddle State	100%	0%
2015	7	Limit State	65%	0%
2015	7	Straddle State	67%	0%
2015	8	Limit State	67%	0%
2015	8	Straddle State	71%	0%
2015	9	Limit State	67%	0%
2015	9	Straddle State	83%	0%
2015	10	Limit State	100%	0%
2015	10	Straddle State	78%	0%

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

Year	Month	State Code	Event Cases	Control Cases
2015	5	Limit State	52%	0%
2015	5	Straddle State	20%	0%
2015	6	Limit State	37%	0%
2015	6	Straddle State	83%	0%
2015	7	Limit State	23%	0%
2015	7	Straddle State	47%	0%
2015	8	Limit State	17%	0%
2015	8	Straddle State	13%	0%
2015	9	Limit State	55%	0%
2015	9	Straddle State	12%	0%
2015	10	Limit State	83%	0%
2015	10	Straddle State	35%	0%

Time-weighted Average Quoted Spreads were highly variable and sensitive to outliers (Tables 5a and 5b). 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
2015	5	Limit State	67%	NA
2015	5	Straddle State	93%	NA
2015	6	Limit State	115%	NA
2015	6	Straddle State	200%	NA
2015	7	Limit State	35%	NA
2015	7	Straddle State	84%	NA
2015	8	Limit State	114%	NA
2015	8	Straddle State	70%	NA
2015	9	Limit State	191%	NA
2015	9	Straddle State	119%	NA
2015	10	Limit State	97%	NA
2015	10	Straddle State	84%	NA

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

Year	Month	State Code	Event Cases	Control Cases
2015	5	Limit State	63%	NA
2015	5	Straddle State	72%	NA
2015	6	Limit State	66%	NA
2015	6	Straddle State	68%	NA
2015	7	Limit State	76%	NA
2015	7	Straddle State	88%	NA
2015	8	Limit State	49%	NA
2015	8	Straddle State	74%	NA
2015	9	Limit State	70%	NA
2015	9	Straddle State	63%	NA
2015	10	Limit State	44%	NA
2015	10	Straddle State	25%	NA

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

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

Year	Month	State Code	Event Cases	Control Cases
2015	5	Limit State	30	NA
2015	5	Straddle State	252	NA
2015	6	Limit State	15	NA
2015	6	Straddle State	8	NA
2015	7	Limit State	74	NA
2015	7	Straddle State	17	NA
2015	8	Limit State	24	NA
2015	8	Straddle State	24	NA
2015	9	Limit State	38	NA
2015	9	Straddle State	24	NA
2015	10	Limit State	12	NA
2015	10	Straddle State	20	NA

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

Year	Month	State Code	Event Cases	Control Cases
2015	5	Limit State	31	NA
2015	5	Straddle State	194	NA
2015	6	Limit State	13	NA
2015	6	Straddle State	16	NA
2015	7	Limit State	72	NA
2015	7	Straddle State	78	NA
2015	8	Limit State	21	NA
2015	8	Straddle State	12	NA
2015	9	Limit State	11	NA
2015	9	Straddle State	24	NA
2015	10	Limit State	20	NA
2015	10	Straddle State	15	NA



In many cases traded prices on PHLX 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 Code	Event Cases	Control Cases
2015	5	Limit State	100.0%	0.0%
2015	5	Straddle State	100.0%	0.0%
2015	6	Limit State	100.0%	0.0%
2015	6	Straddle State	100.0%	0.0%
2015	7	Limit State	100.0%	0.0%
2015	7	Straddle State	100.0%	0.0%
2015	8	Limit State	100.0%	17.0%
2015	8	Straddle State	100.0%	0.0%
2015	9	Limit State	100.0%	0.0%
2015	9	Straddle State	100.0%	0.0%
2015	10	Limit State	100.0%	0.0%
2015	10	Straddle State	100.0%	0.0%

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

Year	Month	State Code	Event Cases	Control Cases
2015	5	Limit State	0.5%	0.0%
2015	5	Straddle State	0.6%	0.0%
2015	6	Limit State	0.7%	0.0%
2015	6	Straddle State	1.1%	1.1%
2015	7	Limit State	0.5%	0.0%
2015	7	Straddle State	0.5%	0.0%
2015	8	Limit State	0.2%	0.1%
2015	8	Straddle State	0.4%	0.0%
2015	9	Limit State	0.3%	0.0%
2015	9	Straddle State	0.2%	0.0%
2015	10	Limit State	0.3%	0.0%
2015	10	Straddle State	0.2%	0.0%

During the analyzed period traded prices on PHLX within 5 minutes after the event never increased or decreased 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 Code	Event Cases	Control Cases
2015	5	Limit State	0%	0%
2015	5	Straddle State	0%	0%
2015	6	Limit State	0%	0%
2015	6	Straddle State	0%	0%
2015	7	Limit State	0%	0%
2015	7	Straddle State	0%	0%
2015	8	Limit State	0%	0%
2015	8	Straddle State	0%	0%
2015	9	Limit State	0%	0%
2015	9	Straddle State	0%	0%
2015	10	Limit State	0%	0%
2015	10	Straddle State	0%	0%

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

Year	Month	State Code	Event Cases	Control Cases
2015	5	Limit State	0%	0%
2015	5	Straddle State	0%	0%
2015	6	Limit State	0%	0%
2015	6	Straddle State	0%	0%
2015	7	Limit State	0%	0%
2015	7	Straddle State	0%	0%
2015	8	Limit State	0%	0%
2015	8	Straddle State	0%	0%
2015	9	Limit State	0%	0%
2015	9	Straddle State	0%	0%
2015	10	Limit State	0%	0%
2015	10	Straddle State	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 Exchanges believe 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 Exchanges believe 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 Exchanges believe 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 Pilots.