



Philadelphia Stock Exchange  
Options Penny Pricing  
Pilot Report\*

May 31, 2007

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*\* This version of the Report has been redacted to preserve confidential treatment of privileged information in accordance with the Freedom of Information Act.*

### Background

On June 7, 2006, the Philadelphia Stock Exchange (“Phlx”) received a letter from Chairman Cox of the Securities and Exchange Commission (“Commission”) urging the Phlx to begin quoting a limited number of options classes with a minimum price variation (“MPV”) of a penny by January 29, 2007. The options exchanges, in conjunction with the Commission, began a six-month pilot (“Penny Pilot”) in which 13 options would be quoted and traded in penny increments. Under the Penny Pilot, all option series overlying QQQQ are quoted and traded with an MPV of \$0.01, and all other options included in the Penny Pilot are quoted and traded with an MPV of \$0.01 if priced below \$3.00 or with an MPV of \$0.05 if priced at \$3.00 and above. As part of Commission approval of the Penny Pilot, the options exchanges were ordered to prepare and submit an analytical report to the Commission that addresses the impact of the first three months of the Penny Pilot on the quality of the Exchange’s markets and option quote traffic and capacity.

The Phlx began a phased implementation of the pilot options on January 26, 2007 and completed the implementation of the remaining options by February 9, 2007 as follows:

- January 26, 2007
  - Whole Foods Market, Inc. (WFMI)
- February 2, 2007
  - General Electric Company (GE)

- Microsoft Corporation (MSFT)
- February 9, 2007
  - Agilent Technologies, Inc. (A)
  - Advanced Micro Devices, Inc. (AMD)
  - Caterpillar Inc. (CAT)
  - Flextronics International Ltd. (FLEX)
  - Intel Corporation (INTC)
  - Ishares Russell 2000 Index (IWM)
  - NASDAQ-100 Trust Shares (QQQQ)
  - Semiconductor HDLRs (SMH)
  - Sun Microsystems, Inc. (SUNW)
  - Texas Instruments Incorporated (TXN)

Summary of Report Findings

The following is a summary of the data on the impact of the Penny Pilot:

1. Average quote spreads at the Phlx Best/Bid Offer (“PBBO”) in Penny Pilot options decreased by 36% during the first three months of the Penny Pilot when compared to the three months preceding the implementation of the Penny Pilot.  
(See Page 4);
2. The Exchange’s average disseminated size at the PBBO in Penny Pilot options decreased by 71% during the first three months of the Penny Pilot when compared

- to the three months preceding the implementation of the Penny Pilot. (See Page 6);
3. The average disseminated size at the National Best Bid/Offer (“NBBO”) in Penny Pilot options decreased by 78% during the first three months of the Penny Pilot when compared to the three months preceding the implementation of the Penny Pilot. (See Page 6);
  4. Penny Pilot series trading at a price under \$1.00 represented (see Page 7):
    - a. 15.5% of all Penny Pilot quotes submitted to the Exchange, and
    - b. 65.9% of all Penny Pilot contracts traded on the Exchange.
  5. Penny Pilot series trading at a price of \$1.00 and higher represented (see Page 7):
    - a. 84.5% of all Penny Pilot quotes submitted to the Exchange, and
    - b. 34.1% of all Penny Pilot contracts traded on the Exchange.
  6. Outbound quotes reported to the Options Price Reporting Authority (“OPRA”) in all Penny Pilot options increased overall by 62% while outbound quotes reported in QQQQ options increased by 206%, when compared to the three months preceding the implementation of the Penny Pilot (see Page 7).

## Findings

## Reduced spreads

The spread of the NBBO in the pilot issues has been reduced overall by an average of 40%. In QQQQ options, the average quote spread was reduced by 54% and all other options, excluding QQQQ in the Penny Pilot, were reduced by 32% when compared to the three months preceding the implementation of the Penny Pilot.

The option series trading at a \$0.01 MPV (all QQQQs and all other pilot series trading at less than three dollars) have seen an NBBO spread reduction of approximately 54% when compared to the three months preceding the implementation of the Penny Pilot.

NBBO Spread

Option premium	ALL														
	1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			mon. to expir.			All months		
	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
<1	0.0637	0.0263	-58.71%	0.0619	0.0218	-64.78%	0.0680	0.0285	-58.09%	0.0781	0.0361	-53.78%	0.0675	0.0279	-58.67%
1-<3	0.0861	0.0470	-45.41%	0.0795	0.0331	-58.36%	0.0836	0.0421	-49.64%	0.1026	0.0543	-47.08%	0.0861	0.0433	-49.71%
3-<5	0.1384	0.0829	-40.10%	0.1308	0.0709	-45.80%	0.1321	0.0743	-43.75%	0.1539	0.0944	-38.66%	0.1369	0.0791	-42.22%
5-<10	0.1543	0.0945	-38.76%	0.1466	0.0833	-43.18%	0.1505	0.0913	-39.34%	0.1788	0.1259	-29.59%	0.1563	0.0992	-36.53%
10-<20	0.1685	0.1141	-32.28%	0.1654	0.1058	-36.03%	0.1723	0.1089	-36.80%	0.2208	0.1629	-26.22%	0.1816	0.1239	-31.77%
20+	0.1935	0.1265	-34.63%	0.2041	0.1286	-36.99%	0.2175	0.1455	-33.10%	0.2875	0.2269	-21.08%	0.2256	0.1770	-21.54%
All	0.1341	0.0819	-41.65%	0.1314	0.0739	-47.52%	0.1373	0.0818	-43.45%	0.1703	0.1168	-36.07%	0.1423	0.0917	<b>-40.07%</b>

QQQQ

Option premium	QQQQ														
	1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
<1	0.0549	0.0194	-64.66%	0.0549	0.0162	-70.49%	0.0610	0.0255	-58.20%	0.0827	0.0394	-52.36%	0.0615	0.0252	-59.02%
1-<3	0.0737	0.0357	-51.56%	0.0674	0.0238	-64.69%	0.0712	0.0340	-52.25%	0.0974	0.0523	-46.30%	0.0748	0.0366	-51.07%
3-<5	0.1191	0.0505	-57.60%	0.1157	0.0380	-67.16%	0.1168	0.0474	-59.42%	0.1385	0.0668	-51.77%	0.1213	0.0510	-57.96%
5-<10	0.1270	0.0541	-57.40%	0.1188	0.0465	-60.86%	0.1231	0.0586	-52.40%	0.1579	0.0870	-44.90%	0.1305	0.0629	-51.80%
10-<20	0.1283	0.0530	-58.69%	0.1210	0.0484	-60.00%	0.1267	0.0601	-52.57%	0.1805	0.0988	-45.26%	0.1418	0.0702	-50.49%
20+	0.0000	0.0000		0.1199	0.0407	-66.06%	0.1309	0.0566	-56.76%	0.2108	0.1197	-43.22%	0.1663	0.0810	-51.29%
All	0.1006	0.0425	-57.98%	0.0996	0.0356	-64.88%	0.1050	0.0470	-55.26%	0.1446	0.0773	-47.30%	0.1160	0.0545	<b>-53.61%</b>

All less QQQQ

Option premium	All less QQQQ														
	1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
<1	0.0664	0.0284	-57.23%	0.0641	0.0234	-63.49%	0.0700	0.0301	-57.00%	0.0769	0.0350	-54.49%	0.0693	0.0291	-58.01%
1-<3	0.0900	0.0505	-43.89%	0.0835	0.0356	-57.37%	0.0879	0.0456	-48.12%	0.1044	0.0551	-47.22%	0.0898	0.0460	-48.78%
3-<5	0.1429	0.1045	-26.87%	0.1343	0.0886	-34.03%	0.1364	0.0961	-29.55%	0.1582	0.1142	-27.81%	0.1410	0.0998	-29.22%
5-<10	0.1617	0.1224	-24.30%	0.1534	0.1086	-29.20%	0.1576	0.1178	-25.25%	0.1846	0.1491	-19.23%	0.1630	0.1254	-23.07%
10-<20	0.1794	0.1351	-24.69%	0.1749	0.1263	-27.79%	0.1855	0.1458	-21.40%	0.2375	0.2093	-11.87%	0.1936	0.1581	-18.34%
20+	0.1948	0.1265	-35.06%	0.2051	0.1354	-33.98%	0.2218	0.1770	-20.20%	0.2953	0.2479	-16.05%	0.2283	0.1975	-13.49%
All	0.1392	0.0946	-35.34%	0.1359	0.0863	-40.98%	0.1432	0.1021	-33.59%	0.1762	0.1351	-29.45%	0.1475	0.1093	<b>-31.82%</b>

The spread of the PBBO in the Penny Pilot options has been reduced overall by an average of 36% with QQQQ reduced by 48% and all other issues, excluding QQQQ, by

28% when compared to the three months preceding the implementation of the Penny Pilot.

PBBO Spread

Option premium	ALL														
	1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
<1	0.0718	0.0376	-47.63%	0.0685	0.0311	-54.60%	0.0738	0.0357	-51.63%	0.0865	0.0453	-47.63%	0.0742	0.0364	-50.94%
1-<3	0.0976	0.0607	-37.81%	0.0887	0.0454	-48.82%	0.0906	0.0503	-44.48%	0.1120	0.0652	-41.79%	0.0944	0.0532	-43.64%
3-<5	0.1502	0.0978	-34.89%	0.1425	0.0852	-40.21%	0.1413	0.0847	-40.06%	0.1651	0.1080	-34.59%	0.1472	0.0912	-38.04%
5-<10	0.1647	0.1074	-34.79%	0.1590	0.0952	-40.13%	0.1624	0.1033	-36.39%	0.1915	0.1428	-25.43%	0.1682	0.1124	-33.17%
10-<20	0.1777	0.1265	-28.81%	0.1780	0.1179	-33.76%	0.1848	0.1213	-34.36%	0.2343	0.1814	-22.58%	0.1940	0.1379	-28.92%
20+	0.2060	0.1378	-33.11%	0.2171	0.1405	-35.28%	0.2287	0.1580	-30.91%	0.3000	0.2444	-18.53%	0.2377	0.1915	-19.44%
All	0.1447	0.0946	-36.17%	0.1423	0.0859	-42.13%	0.1469	0.0922	-39.64%	0.1816	0.1312	-31.76%	0.1526	0.1038	-35.69%

Option premium	QQQQ														
	1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
<1	0.0617	0.0314	-49.11%	0.0607	0.0261	-57.00%	0.0665	0.0314	-52.78%	0.0889	0.0478	-46.23%	0.0673	0.0327	-51.41%
1-<3	0.0840	0.0496	-40.95%	0.0761	0.0371	-51.25%	0.0779	0.0412	-47.11%	0.1030	0.0615	-40.29%	0.0821	0.0454	-44.70%
3-<5	0.1260	0.0601	-52.30%	0.1229	0.0483	-60.70%	0.1243	0.0560	-54.95%	0.1445	0.0785	-45.67%	0.1284	0.0605	-52.88%
5-<10	0.1334	0.0626	-53.07%	0.1253	0.0544	-58.58%	0.1326	0.0665	-49.85%	0.1669	0.1027	-38.47%	0.1390	0.0726	-47.77%
10-<20	0.1353	0.0613	-54.69%	0.1278	0.0561	-56.10%	0.1377	0.0687	-50.11%	0.1942	0.1152	-40.68%	0.1525	0.0810	-46.89%
20+	0.0000	0.0000		0.1249	0.0495	-60.37%	0.1411	0.0657	-53.44%	0.2237	0.1379	-38.35%	0.1772	0.0938	-47.07%
All	0.1081	0.0530	-50.03%	0.1063	0.0453	-57.00%	0.1134	0.0549	-51.37%	0.1535	0.0906	-41.62%	0.1244	0.0643	-48.45%

Option premium	All less QQQQ														
	1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
<1	0.0749	0.0395	-47.26%	0.0710	0.0326	-54.08%	0.0759	0.0381	-49.80%	0.0859	0.0444	-48.31%	0.0762	0.0379	-50.26%
1-<3	0.1019	0.0642	-37.00%	0.0928	0.0476	-48.71%	0.0950	0.0543	-42.84%	0.1150	0.0667	-42.00%	0.0985	0.0563	-42.84%
3-<5	0.1559	0.1229	-21.17%	0.1471	0.1051	-28.55%	0.1460	0.1081	-25.96%	0.1708	0.1292	-24.36%	0.1522	0.1138	-25.23%
5-<10	0.1731	0.1384	-20.05%	0.1673	0.1232	-28.36%	0.1701	0.1331	-21.75%	0.1982	0.1667	-15.89%	0.1758	0.1413	-19.62%
10-<20	0.1892	0.1489	-21.30%	0.1888	0.1400	-25.85%	0.1984	0.1610	-18.85%	0.2509	0.2294	-8.57%	0.2064	0.1742	-15.60%
20+	0.2074	0.1378	-33.56%	0.2181	0.1475	-32.37%	0.2331	0.1906	-18.23%	0.3078	0.2653	-13.81%	0.2405	0.2124	-11.68%
All	0.1504	0.1086	-30.06%	0.1475	0.0993	-35.99%	0.1531	0.1142	-29.57%	0.1881	0.1503	-25.49%	0.1583	0.1227	-27.54%

Reduced Quote Size

During the first three months of the Penny Pilot, the average size associated with the quotation at the NBBO decreased by 78% for all Penny Pilot options, while the reduction in average quote size for options series overlying QQQQ decreased by 87%, when compared to the three months preceding the implementation of the Penny Pilot.

NBBO quote size

ALL														
1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
7006	1226	-82.50%	8537	1415	-83.43%	8137	1860	-77.14%	3783	1200	-68.28%	7270	1581	-78.25%

QQQQ														
1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
23157	2285	-90.13%	26864	2848	-89.40%	23546	3007	-87.23%	9992	2060	-79.38%	21337	2719	-87.26%

All less QQQQ														
1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
3558	789	-77.82%	4390	874	-80.09%	4012	1137	-71.66%	1938	741	-61.76%	3658	965	-73.62%

The average size associated with the quotation at the PBBO decreased by 71% for all Penny Pilot options and by 82% for options overlying QQQQ.

PBBO quote size

ALL														
1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
3068	664	-78.36%	3610	824	-77.17%	3940	1198	-69.59%	2124	742	-65.07%	3426	985	-71.25%

  

QQQQ														
1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
11137	1295	-88.37%	12802	1866	-85.42%	12424	2255	-81.85%	6153	1519	-75.31%	11067	1968	-82.22%

  

All less QQQQ														
1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
1345	402	-70.11%	1530	430	-71.90%	1668	531	-68.17%	927	327	-64.72%	1464	454	-68.99%

### Quote Message Traffic and Efficiency

During the first three months of the Penny Pilot, the Exchange noted an increase in quote message traffic in the Penny Pilot options when compared with quote message traffic during the three months preceding the implementation of the Penny Pilot. Overall, series included in the Penny Pilot that previously had traded in nickels (i.e., premium price under \$3.00, together with options overlying QQQQ, which had traded in nickels and dimes, experienced a 145% increase in quotes reported to OPRA, when compared to quotes reported to OPRA during the three months preceding the implementation of the Penny Pilot, while Penny Pilot total outbound quotes reported to OPRA increased by 62% and series overlying QQQQ increased by 206%.



PBBO Q/B (outbound) quotes to OPRA

ALL															
Option premium	1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
<1	124156.36	209620.84	68.84%	189948.16	341516.72	79.79%	492127.52	825932.91	67.83%	124507.53	229689.86	84.48%	930739.57	1586814.70	70.49%
1-<3	154584.45	260050.95	68.23%	261451.66	455932.49	74.39%	707602.27	1502314.19	112.31%	209168.10	517207.69	147.27%	1332806.48	2710705.47	103.38%
3-<5	86977.08	129023.86	48.34%	129928.83	192613.91	48.25%	381889.66	765599.41	100.48%	146803.29	317135.75	116.03%	745598.86	1392058.83	86.70%
5-<10	159463.59	242328.68	51.96%	228053.14	350838.31	53.84%	659039.02	1240680.61	88.26%	279406.80	610680.52	118.56%	1325962.56	2421427.74	82.62%
10-<20	164501.51	170330.44	3.54%	214612.22	254727.90	18.69%	555983.11	902957.25	62.41%	276923.39	505857.54	82.67%	1212020.24	1817775.83	49.98%
20+	69807.61	26085.02	-62.63%	92588.47	39128.54	-57.74%	160587.41	119419.82	-25.64%	89524.90	140628.69	57.08%	412508.40	322873.04	-21.73%
All	759490.60	1037439.79	29.71%	1116582.48	1634757.87	36.20%	2957228.99	5356904.19	67.61%	1126334.01	2321200.05	101.02%	5959636.11	10251655.61	<b>61.91%</b>

QQQQ															
Option premium	1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
<1	28786.81	49192.60	70.89%	44758.22	76286.73	70.44%	105707.45	295488.73	179.53%	25167.67	61872.38	145.84%	204420.15	478110.38	133.89%
1-<3	36165.37	62793.19	73.63%	63163.64	94538.33	49.67%	178027.63	467276.65	162.47%	51302.07	155506.10	203.12%	328658.72	774076.46	135.53%
3-<5	16335.48	52079.94	218.81%	24158.13	68164.52	182.16%	81212.61	345842.13	325.85%	31433.31	134551.81	328.05%	153139.54	595630.71	288.95%
5-<10	33377.85	100200.06	200.20%	44094.88	144807.04	228.40%	133226.09	560261.29	320.53%	59028.63	231087.27	291.48%	269727.45	1026721.04	280.65%
10-<20	34401.36	44511.23	29.39%	37177.27	68568.88	84.44%	122336.01	394684.37	222.62%	79845.46	215255.52	169.59%	273760.10	718743.08	162.54%
20+	0.00	0.00		995.81	2947.88	196.03%	7312.60	32311.06	341.85%	7988.46	23540.98	194.69%	17535.97	58799.92	235.31%
All	149066.87	308777.02	118.58%	214347.95	455313.38	135.19%	627822.39	2095864.23	258.81%	254765.60	821817.06	222.13%	1247241.93	3652081.59	<b>206.14%</b>

All less QQQQ															
Option premium	1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
<1	95369.55	160428.25	68.22%	145189.94	265229.98	82.68%	386420.08	530444.18	37.27%	99339.85	167817.47	68.93%	726319.42	1108704.31	52.65%
1-<3	118419.07	197257.76	66.58%	198288.02	361394.16	82.26%	529574.64	1035037.53	95.45%	157866.03	361701.60	129.12%	1004147.76	1936629.01	92.86%
3-<5	70641.60	76943.92	8.92%	105770.70	124449.39	17.66%	300677.05	419757.27	39.60%	115369.98	182583.94	58.26%	592459.32	796428.11	34.43%
5-<10	126085.74	142128.62	12.72%	183958.26	206031.27	12.00%	525812.93	680419.32	29.40%	22037818.00	379593.26	-98.28%	1056235.11	1394706.70	32.05%
10-<20	130100.15	125819.20	-3.29%	177434.95	186159.01	4.92%	433647.10	508272.89	17.21%	197077.93	290599.02	47.45%	938260.14	1099032.15	17.14%
20+	68568.50	26085.02	-61.96%	91592.67	36180.66	-60.50%	153274.82	87108.76	-43.17%	81536.44	117087.71	43.60%	394972.43	264073.11	-33.14%
All	101530.77	121443.80	15.20%	902234.54	1179444.47	23.17%	2329406.62	3261039.95	29.29%	22689008.23	1499383.00	41.51%	4712394.18	6599573.39	<b>32.66%</b>

All .01 MPV's															
Option premium	1 mon. to expir.			2 mon. to expir.			3-9 mon. to expir.			10+ mon. to expir.			All months		
	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg	Before	After	% chg
<1	244436.42	469205.27	91.95%	359537.89	720543.36	100.41%	1014242.47	2626308.41	158.94%	354105.45	989634.53	179.47%	1973561.35	4760785.90	141.23%
1-<3	267485.94	506034.78	89.18%	412635.97	816707.54	97.92%	1157397.03	3130901.76	170.51%	412631.63	1183518.66	186.82%	2251389.69	5588710.60	148.23%
All	511922.36	975240.05	90.57%	772173.86	1537250.90	99.17%	2171639.50	5757210.17	164.73%	766737.08	2173153.19	183.15%	4224951.04	10349496.50	<b>144.73%</b>

[Redacted]

Lastly, the Exchange calculated the contracts traded versus the quotes sent to OPRA (“C/Q Ratio”), which is the percentage of executed contracts divided by the percentage of quotes submitted in Penny Pilot options during the first three months of the Penny Pilot. Thus, a higher number represents fewer quotes per contracts traded, and a C/Q Ratio of 1.00 indicates that the ratio of contracts and quotes is 1:1.

The Exchange found that the C/Q Ratios did not vary widely before and during the Penny Pilot.

Specifically, the Exchange found that series trading at a premium price of less than \$1.00 comprised 65.9% of all contracts traded, 70.0% of all trades and, significantly, resulted from just 15.5% of all quotes submitted in Penny Pilot options during the first three months of the Penny Pilot, resulting in a C/Q Ratio of 4.25.

For the three months prior to the Penny Pilot series trading at a premium price of less than \$1.00 comprised 62.0% of all contracts traded, 64.0% of all trades and resulted from just 15.6% of all quotes submitted for a C/Q Ratio of 3.97.

The Exchange also found that series overlying QQQQ in the Penny Pilot comprised 70.6% of all contracts traded, 82.9% of all option trades and only 13.1% of all QQQQ quotes, for a C/Q Ratio of 5.39.

All other Penny Pilot series trading at over \$1.00 comprised 34.1% of all contracts traded, 30.0% of all trades and 84.5% of all quotes, resulting in a C/Q Ratio of 0.40.

Options with a trade price of under \$3.00 comprised 94.8% of all contracts traded, 92.8% of all trades and 42.0% of all quotes, with a C/Q Ratio of 2.26.

Options series overlying QQQQ trading under \$3.00 comprised 97.1% of all contracts traded, 98.0% of all trades and just 34.3% of all quotes with a C/Q Ratio of 2.83.

Series in the Penny Pilot with a trade price of \$20.00 or more comprised 0.00% of all contracts traded, 0.1% of all trades and 1.6% of all quotes.

Significantly, illustrative of efficiency in quoting in the near-expiration months when compared to longer expirations, Penny Pilot series with 2 or fewer months until expiration encompass 67.7% of all contracts traded and 72.1% of all trades, while only representing 25.8% of all quotes sent to OPRA resulting in a C/Q Ratio of 2.62.

Respecting options overlying QQQQ in the Penny Pilot, such series (*i.e.*, series with 2 or fewer months until expiration) comprised 80.7% of all contracts traded and 88.3% of all trades, while only representing 20.8% of all QQQQ option quotes submitted on the Exchange.

In contrast the Penny Pilot series with 3 to 9 months till expiration encompass 24.7% of all contracts traded and 20.8% of all trades, while representing 51.8% of all quotes sent to OPRA, resulting in a C/Q Ratio of 0.48.

Respecting options overlying QQQQ in the Penny Pilot, in such series (*i.e.*, series with 3 to 9 months to expiration) 16.9% of all contracts traded and 10.4% of all trades resulted from 56.9% of all QQQQ option quotes submitted to OPRA resulting in a C/Q Ratio of 0.30.

Series with 9 or fewer months until expiration in the Penny Pilot comprised 92.4% of all contracts traded, 92.9% of all trades and 77.6% of all quotes with a C/Q Ratio of 2.62.

Series with a trade price of under \$1.00 and with 2 or fewer months until expiration in the Penny Pilot comprised 50.9% of all contracts traded, 59.1% of all trades and 5.3% of all quotes with a C/Q Ratio of 9.60.

Series overlying QQQQ in the Penny Pilot comprised 64.1% of all contracts traded, 78.8% of all trades and 3.4% of all quotes, or a C/Q Ratio of 18.85.

Thus, the data also showed that in the Penny Pilot, the C/Q Ratios were generally higher for series with a trade price of under \$3.00 and with 2 or fewer months until expiration which comprised 66.1% of all contracts traded, 70.1% of all trades and just 12.2% of all quotes with a C/Q Ratio of 5.42.

Series overlying QQQQ in the Penny Pilot with a trade price of under \$3.00 and with 2 or fewer months until expiration comprised 79.7% of all contracts traded, 87.7% of all trades and 7.7% of all quotes with a C/Q Ratio of 10.35.

Series in the Penny Pilot with a trade price of under \$3.00 and with 9 or fewer months until expiration comprised 88.8% of all contracts traded, 88.0% of all trades and just 34.7% of all quotes with a C/Q Ratio of 2.56.

Series overlying QQQQ in the Penny Pilot with this trade price and expiration comprised 95.5% of all contracts traded, 97.3% of all trades and 28.4% of all quotes with a C/Q Ratio of 3.36.

**Options under \$3, all expiration months**

	<b>% of quotes</b>	<b>% of contracts trades</b>	<b>% of trades</b>
<b>ALL</b>	<b>42.0 %</b>	<b>94.8 %</b>	<b>92.8 %</b>
<b>All non-QQQQ</b>	<b>46.2 %</b>	<b>93.0 %</b>	<b>86.6 %</b>
<b>QQQQ</b>	<b>34.3 %</b>	<b>97.1 %</b>	<b>98.0 %</b>

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**Options \$3 and up, all expiration months**

	<b>% of quotes</b>	<b>% of contracts traded</b>	<b>% of trades</b>
<b>ALL</b>	<b>58.0 %</b>	<b>5.2 %</b>	<b>7.2 %</b>
<b>All non-QQQQ</b>	<b>53.8 %</b>	<b>7.0 %</b>	<b>13.4 %</b>
<b>QQQQ</b>	<b>65.7 %</b>	<b>2.9 %</b>	<b>2.0 %</b>

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**Options \$20 and up, all expiration months**

	<b>% of quotes</b>	<b>% of contracts traded</b>	<b>% of trades</b>
<b>ALL</b>	<b>3.1 %</b>	<b>0.1 %</b>	<b>0.0 %</b>
<b>All non-QQQQ</b>	<b>4.0 %</b>	<b>0.1 %</b>	<b>0.0 %</b>
<b>QQQQ</b>	<b>1.6 %</b>	<b>0.1 %</b>	<b>0.0 %</b>

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**Options with 2 months or less to expiration, all prices**

	<b>% of quotes</b>	<b>% of contracts traded</b>	<b>% of trades</b>
<b>ALL</b>	<b>25.8 %</b>	<b>67.7 %</b>	<b>72.1 %</b>
<b>All non-QQQQ</b>	<b>28.6 %</b>	<b>56.9 %</b>	<b>52.6 %</b>
<b>QQQQ</b>	<b>20.8 %</b>	<b>80.7 %</b>	<b>88.3 %</b>

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**Options with 9 months or less to expiration (all but LEAPS), all prices**

	<b>% of quotes</b>	<b>% of contracts traded</b>	<b>% of trades</b>
<b>ALL</b>	<b>77.6 %</b>	<b>92.4 %</b>	<b>92.9 %</b>
<b>All non-QQQQ</b>	<b>77.5 %</b>	<b>88.1 %</b>	<b>85.9 %</b>
<b>QQQQ</b>	<b>77.7 %</b>	<b>97.6 %</b>	<b>98.7 %</b>

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**Options under \$3 and with 2 months or less to expiration**

	<b>% of quotes</b>	<b>% of contracts traded</b>	<b>% of trades</b>
<b>ALL</b>	<b>12.2 %</b>	<b>66.1 %</b>	<b>70.1 %</b>
<b>All non-QQQQ</b>	<b>14.8 %</b>	<b>54.8 %</b>	<b>49.0 %</b>
<b>QQQQ</b>	<b>7.7 %</b>	<b>79.7 %</b>	<b>87.7 %</b>

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**Options under \$3 and with 9 months or less to expiration**

	<b>% of quotes</b>	<b>% of contracts traded</b>	<b>% of trades</b>
<b>ALL</b>	<b>34.7 %</b>	<b>88.8 %</b>	<b>88.0 %</b>
<b>All non-QQQQ</b>	<b>38.2 %</b>	<b>83.3 %</b>	<b>76.9 %</b>

## Conclusions

As indicated in the Summary of Findings, the Exchange found a number of significant results from the Penny Pilot, particularly an increase in quote traffic, a decrease in quote sizes and a narrowing of quote spreads.

The Exchange also observed that these results were particularly pronounced in the series with 9 months or less until expiration priced under \$1.00, which are the most actively traded series in the options marketplace. Thus, the Penny Pilot's impact on the quality of markets overall was most pronounced in the most active series.

In addition to the charts and other summaries of data that appear in this Report, attached in the Appendix is *[redacted]* the methodology associated with collecting such data.

# APPENDIX A



## **1. Data and Methodology**

The methodology used to measure and compare the different data statistics for the Penny Pilot was to capture electronic data on the Penny Pilot options for the three months prior to the start of the Penny Pilot (the “baseline data”). This electronic data was compared to electronic data gathered from the first three months of the Penny Pilot. In all our reports we provided average percentage changes of the baseline data as compared to the first three months of the Penny Pilot. This report is intended to measure the short-term impact of the Penny Pilot on quoting and trading.

### Resources

The primary resource used to capture data came from our trading systems database logs (trade log, quote log and order log). The required data was extracted through customized programs on our Trade Data Access System (“TDAS”) regulatory system and loaded into a PC spreadsheet application for analysis. The TDAS system is a comprehensive database that receives and archives detailed order, quote and trade information.

*[Redacted]*