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Rich Fortin
New Mexico State University

Judy Maese
New Mexico State University

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Rich Fortin

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This paper examines the impact of option listing in the NASDAQ equity market on the bid-ask spread of the underlying stock. We find that both the market adjusted percentage and dollar spreads decrease with option listing, which is consistent with a value enhancing impact of derivative security introduction.

INTRODUCTION

The primary purpose of this paper is to examine the impact of option listing in the NASDAQ equity market on the bid-ask spread of the underlying security.

This is an interesting area of research for several reasons. First, it has been previously documented that bid-ask spreads are an important component of transaction costs and, hence, examining spread changes is another approach to view the economic impact of option listing on security market operations.[1] Second, changes in a stock's spread will have important implications for the firm's cost of capital. Amihud and Mendelson [1] found that observed risk-adjusted stock returns are an increasing function of the bid-ask spread, suggesting that a lower (higher) spread will result in a lower (higher) cost of equity capital and, ceteris paribus, increase (reduce) firm value. Finally, prior studies on the effects of option listing openly speculate, but do not empirically test, that spread changes would be consistent with their results.[2]

It seems likely that option introduction will have an effect on the stock's spread because of the potential listing impacts on spread determinants. Stoll

Rich Fortin • New Mexico State University, Department of Finance, Las Cruces, N.M. 88003.
Judy Maese • New Mexico State University, Department of Finance, Las Cruces.

[13] theorized that the spread depends on the dealer's order costs, inventory holding costs, adverse information costs, and dealer competition. In his empirical work, Stoll [13] used the securities' price as a proxy for dealer order costs, trading volume and return variability were used to measure inventory holding costs, and the number of competing dealers was used to measure dealer competition. To measure the adverse information cost, Stoll [13] used turnover, defined as the fraction of shares outstanding that are traded. He found that all five of these explanatory variables were of the correct sign and significant in explaining the dealer's spread.[3]

Skinner [12] argues that there are two reasons why options listing may be associated with a decline in the costs of trading the underlying securities. First, options written on common stocks are similar to highly levered positions in the stock. For this reason, options are a relatively more attractive investment vehicle than the underlying stock for informed investors. Therefore, it is plausible that options listing is associated with movement by the informed traders out of the stock market and into the options market.[4] As a result, the dealer anticipated losses from traders with superior information will decline. This decrease in adverse information costs will likely result in a lower spread. Second, the existence of options markets and the associated hedging and arbitrage demands of traders may increase trading activity in the stock market. This would lower inventory holding costs, and other things being equal, this also implies a lower bid-ask spread.

Damodaran and Lim [5] note that option introduction may decrease spreads because of 1) increased competition from market makers on the option market and 2) increased institutional interest since spreads are generally a decreasing function of trade size and institutions trade in larger quantities than individuals do. Institutions are also more likely to take their trades to the lowest transaction cost market, thus increasing competitive pressures on dealers in the underlying stock.

Much empirical research has been conducted to test whether options have an impact on the underlying securities characteristics and thus on spread determinants. Conrad [3] examined the price effect of option introduction from 1974 to 1980. She found that the introduction of options caused a permanent price increase in the underlying security, beginning approximately three days before introduction. Conrad [3] also found that the variance of the average market model excess returns declined with option introduction. This reduction in volatility after option listing has also been documented by other researchers.[5] These results have, however, been questioned by Lamoureux [8], who argues that the decline in return volatility associated with option listing is "spurious in the sense that the same effect is observed over the same time period for stocks without listed options." Skinner [12] also found an increase in underlying security trading volume

after option listing. Thus, option listing does appear to have some impact on spread determinants and suggests a post listing decline in spreads. This, of course, is ultimately an empirical question.

DATA AND METHODOLOGY

Data

The NASDAQ/NMS OTC option listing dates were obtained from lists provided by the Chicago Board Options Exchange and the American Stock Exchange (only NMS issues are eligible for option trading). These lists included option listing and delisting information on OTC issues that were traded on the following five exchanges: Chicago Board Options Exchange, American Stock Exchange, Philadelphia Stock Exchange, New York Stock Exchange and the Pacific Stock Exchange (options on an OTC firm can be traded on more than one exchange). The first OTC options were listed on June 3, 1985 and a total of 122 OTC options were listed through December 31, 1988. Any differences between CBOE and AMEX lists or incomplete information on the lists were reconciled with a direct call to the appropriate exchanges.

The final sample was chosen by matching these 122 firms with the 1988 version of the NASDAQ CRSP tape. The closing bid and ask information was provided by an auxiliary NMS tape provided by CRSP, since the December 31, 1988 NASDAQ CRSP tape included high and low prices rather than closing bid and asks for NMS issues. All the bid and ask quotes used are "inside" quotes, i.e., the highest closing bid and the lowest closing ask. 250 trading day observations were required on either side of the listing date for a firm to be included in the final sample. This resulted in a final sample of sixty-two firms.[6]

Methodology

The empirical analysis is partitioned into short run and long run segments. The short-term analysis examines spreads in the days immediately surrounding the option listing date. Descriptive summary statistics along with parametric and non-parametric tests are used to assess the magnitude of spread changes around the option listing date. Four spread measures are used: Percentage spreads, dollar spreads and market adjusted versions of each of these measures. Percentage spread is defined as the closing ask price minus the closing bid price divided by the average of the two. This is the standard spread measure that has been widely used in the literature. Dollar spread

is simply the closing ask minus the closing bid price.[7] Fortin, Grube and Joy [7] have documented seasonalities in NASDAQ dealer spreads, finding that spreads tend to increase persistently during the calendar year for all but the smallest firms and peak in December for all size classes of firms. In order to recognize this temporal movement in spreads, the market adjusted percentage spread measure scales a given firm's percentage spread on a given trading day by the average percentage spread across all NASDAQ/NMS firms on that trading day. In a similar fashion, the market adjusted dollar spread measure scales a given firm's dollar spread on a given trading day by the average dollar spread across all NASDAQ/NMS firms on that day. NMS firms are used rather than the whole NASDAQ population since only NMS firms are eligible for option listing.

The short run statistical tests involve comparing the spread measures on and immediately adjacent to the listing date with averages of the other days in a forty day window around the listing date. A parametric t-test and a non-parametric median test is used.

The long-term analysis focuses on spreads and their determinants in the pre and post listing period. The spread determinants analyzed are those used by Stoll [13] to proxy for dealer order costs (price), inventory holding costs (volume and variance of return), adverse information costs (turnover) and competition (number of dealers). For each firm, the average value of each variable is computed over a 200-day trading period fifty days before and after the option listing date (i.e., -250 through -51 and 51 through 250). The choice of this time frame is arbitrary but would seem appropriate given the desire not to overlap any potential announcement effects. [8] This time frame is also used because numerous researchers have found a delayed return variance reduction after option listing of between 3-4 months.[9]

Descriptive cross sectional summary statistics of these pre and post variable averages are provided as well as both a parametric t-test and a non-parametric median test of the pre listing and post listing variable distributions.

Finally, percentage differences between the post listing and pre listing average variables are computed for each firm. Cross sectional descriptive summary statistics are provided for each variable, as well as a nonparametric sign test.

EMPIRICAL RESULTS

Panels A and B of Table 1 presents cross sectional descriptive statistics for percentage spreads and dollar spreads for the 20-day period around the option listing date.[10,11] Panel A clearly indicates a lack of significant movement for

Table 1
Panel A
Cross Sectional Descriptive Statistics for Percentage Spreads and Market Adjusted Percentage Spreads Around the Option Listing Date (Day 0) for the Final Sample of Sixty-two NASDAQ/NMS Issues

Day	Mean1*	Mean2**	Median1*	Median2**	STD1*	STD2**
−20	.0089	.2188	.0073	.1786	.0053	.1341
−19	.0095	.2357	.0083	.2048	.0051	.1339
−18	.0096	.2352	.0081	.1954	.0056	.1345
−17	.0091	.2248	.0080	.1953	.0055	.1317
−16	.0088	.2184	.0081	.1954	.0040	.1053
−15	.0091	.2249	.0079	.1968	.0045	.1163
−14	.0088	.2192	.0081	.1966	.0050	.1313
−13	.0089	.2211	.0081	.1995	.0046	.1177
−12	.0087	.2157	.0079	.1906	.0047	.1218
−11	.0088	.2166	.0080	.1889	.0045	.1120
−10	.0085	.2106	.0071	.1804	.0044	.1136
−9	.0093	.2304	.0088	.2173	.0046	.1177
−8	.0084	.2081	.0078	.1812	.0043	.1100
−7	.0087	.2164	.0078	.1994	.0043	.1103
−6	.0089	.2218	.0079	.1997	.0046	.1218
−5	.0088	.2168	.0080	.1874	.0042	.1091
−4	.0868	.2125	.0072	.1838	.0044	.1134
−3	.0090	.2224	.0087	.2219	.0046	.1181
−2	.0089	.2209	.0071	.1816	.0047	.1230
−1	.0093	.2307	.0085	.2125	.0050	.1193
0	.0096	.2399	.0087	.2190	.0059	.1521
1	.0093	.2308	.0088	.2216	.0045	.1163
2	.0091	.2258	.0088	.2157	.0043	.1122
3	.0093	.2312	.0087	.2126	.0046	.1199
4	.0096	.2375	.0087	.2064	.0050	.1316
5	.0088	.2165	.0086	.2103	.0037	.0980
6	.0093	.2295	.0088	.2146	.0041	.1040
7	.0090	.2212	.0079	.2028	.0048	.1207
8	.0100	.2457	.0092	.2212	.0054	.1383
9	.0096	.2356	.0093	.2254	.0048	.1228
10	.0098	.2381	.0096	.2378	.0042	.1038
11	.0097	.2359	.0088	.2209	.0056	.1353
12	.0101	.2480	.0080	.1961	.0056	.1370
13	.0094	.2299	.0084	.1966	.0049	.1210
14	.0091	.2243	.0085	.1981	.0044	.1064
15	.0096	.2345	.0085	.2196	.0053	.1311
16	.0090	.2204	.0085	.2147	.0041	.0972
17	.0089	.2154	.0069	.1824	.0051	.1178
18	.0091	.2211	.0081	.2021	.0047	.1085

(continued)

Table 1
Continued

Day	Mean1*	Mean2**	Median1*	Median2**	STD1*	STD2**
19	.0090	.2198	.0069	.1842	.0051	.1229
20	.0087	.2124	.0074	.1800	.0050	.1204

Notes: * Mean, Median and Standard Deviation for Percentage Spread = $\dfrac{\text{Ask}-\text{Bid}}{\dfrac{\text{Ask}+\text{Bid}}{2}}$

** Mean, Median and Standard Deviation for Market Adjusted Percentage Spread =

$\dfrac{\text{Percentage Spread}}{\text{Avergae NMS Percentage Spread}}$

Panel B
Cross Sectional Descriptive Statistics for
Dollar Spreads and Market Adjusted Dollar
Spreads Around the Option Listing Date (Day 0) for the
Final Sample of Sixty-two NASDAQ/NMS Issues

Day	Mean1*	Mean2**	Median1*	Median2**	STD1*	STD2**
−20	.2379	.4856	.1250	.2784	.2537	.4936
−19	.2721	.5594	.2500	.4717	.3722	.7313
−18	.2379	.4892	.2500	.4849	.1704	.3321
−17	.2439	.5004	.1250	.2794	.2245	.4411
−16	.2459	.5050	.2500	.4678	.3094	.6089
−15	.2479	.5093	.2500	.4719	.2525	.4970
−14	.2419	.4988	.1250	.2763	.2559	.5049
−13	.2459	.5066	.2500	.4668	.2629	.5225
−12	.2358	.4853	.1250	.2794	.2541	.5034
−11	.2258	.4648	.2500	.4675	.1498	.2970
−10	.2177	.4486	.2500	.4678	.1412	.2823
−9	.2500	.5158	.2500	.4939	.2479	.4909
−8	.2076	.4290	.1875	.3730	.1060	.2109
−7	.2208	.4565	.2500	.4807	.1387	.2750
−6	.2395	.4939	.2500	.4776	.2513	.4946
−5	.2312	.4756	.2500	.4584	.1977	.3921
−4	.2354	.4827	.1250	.2788	.2563	.5015
−3	.2437	.4996	.2500	.4583	.3125	.5998
−2	.2208	.4573	.1875	.3702	.1480	.2913
−1	.2437	.4990	.2500	.4808	.2546	.4828
0	.2250	.4640	.2500	.4755	.1318	.2591
1	.2208	.4575	.2500	.4748	.1181	.2345
2	.2166	.4504	.2500	.4679	.1147	.2335

Table 1
Continued

Day	Mean1*	Mean2**	Median1*	Median2**	STD1*	STD2**
3	.2208	.4586	.1875	.3713	.1247	.2528
4	.2250	.4658	.2500	.4750	.1168	.2390
5	.2062	.4277	.2500	.4656	.0944	.1956
6	.2171	.4511	.2500	.4823	.1016	.2026
7	.2083	.4325	.1250	.2775	.1165	.2359
8	.2302	.4771	.2500	.4697	.1310	.2700
9	.2209	.4571	.2500	.4718	.1215	.2431
10	.2280	.4701	.2500	.4755	.1252	.2491
11	.2149	.4449	.2500	.4593	.1244	.2522
12	.2266	.4693	.2500	.4736	.1171	.2393
13	.2118	.4366	.2500	.4775	.1070	.2093
14	.2097	.4343	.2500	.4748	.1023	.2024
15	.2219	.4561	.2500	.4739	.1148	.2223
16	.2176	.4488	.2500	.4724	.1136	.2270
17	.2068	.4247	.1250	.2779	.1183	.2312
18	.2118	.4343	.2500	.4732	.0991	.1984
19	.2097	.4315	.1250	.2758	.1099	.2245
20	.1991	.4088	.1250	.2766	.1014	.2023

Notes: * Mean, Median and Standard Deviation for Dollar Spread = Ask–Bid

** Mean, Median and Standard Deviation for Market Adjusted Dollar Spread =

$$\frac{\text{Dollar Spread}}{\text{Avergae NMS Dollar Spread}}$$

either percentage spread measure around the option listing date (day 0). Mean percentage spreads increase marginally from .93% on day -1 to .96% on day 0 and decline to .93% on day 1. Mean market adjusted percentage spreads increase from 23.07% on day -1 to 23.99% on day 0 and decline to 23.08% on day 1. The median results for both spread variables display a similar lack of movement. Both a parametric t-test and a non parametric median test indicate no significant difference between days -1, 0 or 1 when compared to the averages of the other thirty-eight days in the window examined. Interestingly, the standard deviation of the two spread measures is highest on day zero. It is also interesting to note that the average percentage spread for the NMS firms analyzed here is around 1% and is approximately 21-23% of the average percentage spreads for all NMS firms.

In Panel B, although the two dollar spread measures appear to marginally decline with option listing, there again is no significant difference between days -1, 0 or 1 when compared to the averages of the other thirty-eight days in the window. Unlike percentage spreads, the standard deviations are not highest on day zero for dollar spreads.

Table 2 begins the empirical results for the long term analysis. Panel A provides cross sectional means, medians and statistical tests for the average values of the four spread measures in the pre (day -250 through day -51) and post (day 51 through day 250) option listing periods. With the exception of the pre and post mean percentage spread, all the mean and median measures are lower in the post listing period. The parametric t-test indicates that both market adjusted percentage spreads and dollar spreads are significantly lower in the post option listing period while the nonparametric median test finds significant declines for market adjusted dollar spreads. These results are consistent with a post option listing narrowing of spreads after market movements are considered.

Panel B of Table 2 provides further evidence of a general decline in spreads after option listing. This panel provides cross sectional descriptive statistics on the percentage differences between the average post listing (day 51 through day 250) and pre listing (day -250 through day - 51) spread measures. Interestingly, the medians of all four percentage difference measures are negative. Since the median is not unduly influenced by a few very large or small observations, this measure may more accurately represent the true post listing spread differences. In addition, greater than half of the sixty-two firms for all four spread measures experienced a decline in post option listing spreads, three of which were significant via the sign test.

Although spread determinant analysis is not the primary focus of this paper, the univariate results for the spread determinants generally used in the literature may shed some light on what is driving the observed spread changes. Table 3, in a manner similar to Table 2 for spreads, provides cross sectional tests for pre and post listing average spread determinants (Panel A) and for pre and post listing percentage differences in average spread determinants (Panel B). The seven variables analyzed are:

PRC_{it} = Closing price for firm i on trading day t

$DVOL_{it}$ = Dollar volume of trading for firm i on trading day t computed by: number of shares traded * PRC

$MDVOL_{it}$ = Market adjusted dollar volume for firm i on trading day t computed by:

$$\frac{DVOL_{it}}{\text{NASDAQ Dollar Volume on Traading Day } t^{12}}$$

TO_{it} = Turnover for firm i on trading day t computed by

$$\frac{\text{No. of shares traded}}{\text{No. of shares outstanding}}$$

$MMCNT_{it}$ = Number of market makers for firm i on trading day t

$VRET_i =$ Return variance for firm i over the pre-listing (day -250 through day - 51) or post listing (day 51 through day 250) periods respectively.

$MVRET_i =$ Market adjusted return variance for firm i over the pre and post listing periods computed by:

$$\frac{VRET_i}{\text{Variance of the NASDAQ Value Weighted Index for the Comparable Pre or Post Listing Period}}$$

The theoretical consistency of the determinant results in Panel A are mixed. There is no significant change in either the mean or median price. Therefore, price changes do not appear to be driving the results. Dollar volume increases significantly, a result consistent with a narrowing of spreads. Market adjusted dollar volume, however, only shows a marginal insignificant increase. It thus appears that the majority of the raw dollar volume increase is market driven. Turnover increases significantly, a result counter to a narrowing of market adjusted spreads. These results may simply reflect the large increases in unadjusted volume between the two periods. The number of market makers increases, which is consistent with theory. However, the statistical significance of this result is mixed, with support only provided by the parametric t-test. Finally, both unadjusted and market adjusted variances show no significant change, although the post listing figures are higher. It might be argued that these variance results are also driven by the large changes in volume, considering the positive empirical association between volume and variance. The market adjusted return variance of over twenty indicates that, on average, the volatility of an individual NMS option listed security is over twenty times greater than the volatility of the CRSP NASDAQ value weighted index.

The spread determinant results for percentage differences in Panel B are similar to those reported in panel A. Although both the mean and median price percentage differences are positive with thirty-three of the firms experiencing increases, this is not significant via the sign test. Both the mean and median of the unadjusted and adjusted dollar volume percentage differences are positive, which is consistent with spread declines. The fifty firms experiencing increases in unadjusted dollar volume is significant via the sign test. In addition, fifty firms experience an increase in the number of market makers (significant via the sign test) and both mean and median measure are positive which is in accord with lower spreads. Although both unadjusted return variance measures are positive (with a significant forty-two firms experiencing increases), a large shift occurs for market adjusted

Table 2
Panel A
Cross Sectional Means, Medians, and Statistical Tests on Average Percentage Spreads and Average Dollar Spreads for the Pre (Day -250 through Day -51) and the Post (Day 51 through Day 250) Option Listing Periods for the Sixty-two Sample Firms

Variable	Pre Mean*	Post Mean*	T-Statistic** (Prob. Value)
% Spread	.0099	.0100	−.09 (.926)
Market Adjusted % Spread	.2712	.2259	2.37 (.019)
Dollar Spread	.2317	.2061	1.44 (.151)
Market Adjusted Dollar Spread	.5763	.4026	4.30 (.000)

Variable	Pre Median*	Post Median*	Chi-Square Statistic** (Prob. Value)
% Spread	.0094	.0092	.13 (.720)
Market Adjusted % Spread	.2439	.2145	2.05 (.152)
Dollar Spread	.1906	.1763	.51 (.474)
Market Adjusted Dollar Spread	.4780	.3439	6.27 (.012)

Notes: * Cross Sectional mean (median) of the average variable values for the sixty-two sample firms in the pre option listing (Day -250 through Day -51) and post option listing (Day 51 through Day 250) periods, respectively

** For the parametric two sample t-test and the non-parametric median test, respectively.

Panel B
Cross Sectional Descriptive Statistics on the Percentage Differences* Between the Avergae Post Listing (Day 51 through Day 250) and Pre Listing (Day -250 through Day -51) Spread Variables for the Sixty-two Sample Firms

Variable	Mean	Median	Standard Deviation	Number Negative
% Spread	.0756	−.0428	.4843	34
Market Adjusted % Spread	−.1050	−.1805	.3912	.42**
Dollar Spread	−.0409	−.0448	.2444	41**
Market Adjusted Dollar Spread	−.2264	−.3005	.2609	55**

Notes: * Percentage differences are computed as $\dfrac{\text{Variable}_{post} - \text{Variable}_{pre}}{\text{Variable}_{pre}}$

**Significant at the 5% level for the sign test.

Table 3

Panel A

Cross Sectional Means, Medians, and Statistical Tests on Average Spread Determinants for the Pre (Day -250 through Day -51) and the Post (Day 51 through Day 250) Option Listing Periods for the Sixty-two Sample Firms

Variable*	Pre Mean**	Post Mean***	T-Statistic*** (Prob. Value)
PRC	27.6753	25.4676	.67 (.501)
DVOL	4,547,826	8,155,018	−3.34 (.001)
MDVOL	.0052	.0054	.−.22 (.822)
TO	.0075	.0103	−3.10 (.002)
VRET	.0007	.0009	−1.94 (.054)
MVRET	21.9744	23.6298	−.57 (.566)
MMCNT	21.2932	24.3486	−2.19 (.030)

Variable*	Pre Median**	Post Median**	Chi-Statistic*** (Prob. Value)
PRC	23.9137	22.1534	.51 (.474)
DVOL	3,427,623	6,097,380	15.49 (.000)
MDVOL	.0034	.0038	1.15 (.283)
TO	.0063	.0087	4.61 (.031)
VRET	.0007	.0008	2.05 (.152)
MVRET	20.3677	17.9011	1.15 (.283)
MMCNT	20.4770	23.2805	3.20 (.073)

*PRC = Price

DVOL = Dollar Volume

$MDVOL = \dfrac{\text{Dollar Volume}}{\text{NASDAQ Dollar Volume}}$

$TO = \dfrac{\text{Share Volume}}{\text{Number of Shares Outstanding}}$

VRET = Variance of Daily Return

$MVRET = \dfrac{VRET}{\text{Variance of CRSP NASDAQ Value Weighted Index}}$

MMCNT = Number of Market Makers

Notes: ** Cross sectional mean (median) of the average variable values for the sixty-two sample firms in the pre option listing (Day -250 through Day -51) and post option listing (Day 51 through Day 250) periods, respectively.

***For the parametric two sample t-test and the non-parametric median test, respectively.

Panel B
Cross Sectional Descriptive Statistics on the Percentage Differences Between the Avergae Post Listing (Day 51 through Day 250) and Pre Listing (Day -250 through Day -51) Spread Determinant Variables for the Sixty-two Sample Firms

Variable*	Mean	Median	Standard Deviation	Number Negative
PRC	.0771	.0243	.5521	29
DVOL	1.2228	.6056	2.3958	12**
MDVOL	.4787	.0033	1.5699	31
TO	.5156	.3079	.8027	12**
VRET	.4696	.1905	.9307	20**
MVRET	.1985	−.1147	.8434	35
MMCNT	.1773	.1569	.2530	12**

Notes: *Same variable definitions as in Panel A. Percentage differences are computed.

$$\text{as } \frac{\text{Variable}_{post} - \text{Variable}_{pre}}{\text{Variable}_{pre}}$$

**Significant at the 5% level for the sign test.

return variance percentage differences. Although the mean is positive, the median for the market adjusted return variance percentage difference distribution is a negative 11.47% and thirty-five of the firms experienced a decline in market adjusted variance. This is a large turnaround and suggests that, after adjusting for market movements, there may be a decline in return variance after option listing. This would be consistent with spread declines. These market adjusted results are, however, not significant. The turnover results are inconsistent with a decline in spreads as a significant fifty firms experience an increase and both mean and median measures are positive. As noted previously, the strong upsurge in volume may be driving these results.

SUMMARY AND CONCLUSIONS

This study has examined the impact of option listing in the NASDAQ/NMS market on the liquidity (bid-ask spread) of the underlying securities.

The evidence presented showed very little short run movement in either unadjusted or market adjusted spread measures during the 40 day period around the option listing date. The long-term analysis found significant post option listing reductions in both market adjusted percentage and dollar spread measures.[13]

The univariate determinant results suggest that the underlying spread change influences were post listing increases in dollar volume (although

market adjusted volume did not appear to change) and number of market makers with an arguably accompanying reduction in market adjusted return variance. The above evidence in total is consistent with reductions in the dealer's inventory holding cost function and increases in dealer competition after option listing.

This study has provided further evidence in support of the introduction of derivative securities. Previous research has documented permanent price increases, volume increases, and, possibly, return variance declines on the underlying security after option introduction. There also appears to be an associated reduction in the market adjusted bid-ask spread component of transaction costs. This has important implications since Amihud and Mendelson [1] have documented a positive association between investor expected returns and percentage spreads. Lower spreads could potentially lower investor expected returns and hence lower the firm's cost of capital leading to increases in firm value. Spread decreases were not uniform across all securities, however, and an avenue for further research would be to investigate the differential firm characteristics between those firms experiencing decreases and increases in spreads after option introduction.

NOTES

1. See, for example, [7] and [9].
2. See [12].
3. Return Volatility and Turnover (price, trading volume and number of dealers) were positively (negatively) related to percentage spread.
4. This argument was originally made in [2].
5. See, for example, [12],[5],[6], and [10].
6. There were forty unique listing dates for the sixty-two firms in our sample. The dates are well distributed over the time frame analyzed except for June 3, 1985 when eighteen issues were listed, the initial date for OTC options listing. The sixty-two firms in the sample had a mean (median) market value of outstanding equity on the option listing date of $822($570) million.
7. This measure is also used in order to assess the potential problem of observing percentage spread changes that are driven by price changes with no economic change in the actual dollar spread.
8. Of the sixty-two firms only thirteen had WSJ Index announcements of the option listing with a mean (maximum) time between announcement and listing of 25(45) days.
9. See, for example, [5] and [10].
10. All references to statistical significance in this paper refer to the 5% level.

11. In order to avoid potential biases that may result from including observations around the market crash of October 19,1987, all results reported in this section are based on a data file that eliminates all observations within a ten day window around this date.
12. This information was provided by Bob Bannon of the Economic Research Section of the NASD. NMS dollar volume figures were not available.
13. Two other current working papers have found results consistent with ours: P. Schultz and M. Zaman [11], and A. R. Cowan and M. Haddad [4]. Schultz and Zaman [11] found a post option listing reduction in spreads for NASDAQ/NMS issues while Cowan and Haddad [4] found a similar reduction for N.Y.S.E. firms.

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