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The Effect of Market Segmentation and Illiquidity on Asset Prices: Evidence from Exchange Listings

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ABSTRACT

This article documents the effect on share value of listing on the New York Stock Exchange and reports the results of a joint test of Merton's (1987) investor recognition factor and Amihud and Mendelson's (1986) liquidity factor as explanations of the change in share value. We find that during the 1980s stocks earned abnormal returns of 5 percent in response to the listing announcement and that listing is associated with an increase in the number of shareholders and a reduction in bid-ask spreads. Cross-sectional regressions provide support for both investor recognition and liquidity as sources of value from exchange listing.

THE EFFECT ON SHARE value of listing on the New York Stock Exchange (NYSE) by over-the-counter (OTC) stocks has been the focus of empirical investigation by scholars and practitioners for at least 50 years.[1] The consensus conclusion is that an NYSE listing is (or at least has been) associated with a significant increase in share price. "Streetlore" has historically attributed this increase in value to the increased investor recognition that is believed to accompany listing on a major exchange. Until recently, this investor recognition explanation has lacked a rigorous analytical foundation.

Merton (1987) fills this void with a model of capital market equilibrium with incomplete information. To develop his model, Merton adopts most of the assumptions of the original Sharpe-Lintner-Mossin Capital Asset Pricing Model (CAPM) but relaxes the assumption of equal information across investors. He further assumes that investors invest only in the those securities of which they are aware.[2] With this modification to the original CAPM framework, Merton derives a model in which expected returns increase with systematic risk, firm-specific risk, and relative market value and decrease

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[1] See, e.g., Merjos (1962, 1963), Goulet (1974), Ying et al. (1977), and Sanger and McConnell (1986).

[2] As motivation for this assumption, Merton observes that portfolios held by actual investors (including institutions) contain only a small fraction of all available traded securities.

with the relative size of the firm's investor base—characterized by Merton as "the degree of investor recognition."

According to Merton's model, all else equal, an increase in the size of a firm's investor base will lower investors' expected return and increase the market value of the firm's shares. Thus, managers have an incentive to undertake activities that expand the firm's investor base. Merton goes on to suggest that one of the ways in which managers can increase the size of the firm's investor base is to have the firm's shares listed on a national exchange (Merton (1987), p. 501). With Merton's model as the foundation, this article seeks to determine the degree to which investor recognition can explain stock price reactions to announcements of new listings on the NYSE.

While investor recognition may represent one source of value from exchange listing, other potential sources have been suggested. Of these, perhaps the most widely accepted explanation for the increase in stock price that accompanies listing is superior liquidity. For example, Sanger and McConnell (1986) suggest that differences in the costs of liquidity services provided by the major exchanges and those provided by the OTC market could result from the dissimilar structure and means of transacting in the markets. To the extent that the organized exchanges provide superior liquidity services relative to the OTC market, the increase in stock price experienced by those firms that obtain a listing is a natural consequence of the increased demand for the more liquid security.[3]

Because investor recognition and liquidity are likely to be related, and because exchange listing is presumed to affect both, an appropriate test of the investor recognition hypothesis (i.e., Merton's model) using evidence from exchange listings requires that we control for the effects of changes in liquidity as well. A theoretical framework for this control is provided by Amihud and Mendelson (1986) in their analysis of asset-pricing and the bid-ask spread. Their model of capital market equilibrium predicts that gross expected returns are an increasing and concave function of liquidity as measured by the relative bid-ask spread. According to their model, if bid-ask spreads are lower following listing, the lower expected returns required by investors should give rise to an increase in the market value of the firm's shares.

This article reports the results of three primary inquiries. First, are NYSE listings during the 1980s associated with a significant increase in stock price? Second, do firms that list their shares on the NYSE experience an increase in investor base (i.e., number of shareholders) and an increase in liquidity (i.e., reduction in bid-ask spread)? Third, is the change in share value that is associated with listing related to changes in the investor base and to changes in liquidity in a manner consistent with the predictions of Merton (1987) and Amihud and Mendelson (1986).

[3] For empirical evidence on the cost of liquidity services in various securities markets see, e.g, Tinic and West (1974), Hamilton (1976, 1978, 1979), Klemkosky and Conroy (1985), Hasbrouk and Schwartz (1986), Marsh and Rock (1986), and Reinganum (1990).

The results indicate that during the 1980s, stocks, on average, earn abnormal returns of 5 to 6 percent in response to the announcement of listing on the NYSE. Additionally, on average, listing is associated with a 19 percent increase in the number of registered shareholders, a 27 percent increase in the number of institutional shareholders, a 5 percent reduction in absolute bid-ask spreads, and a 7 percent reduction in relative bid-ask spreads.

To test the investor recognition hypothesis, each stock's announcement period excess return is regressed against a proxy variable for Merton's investor recognition factor while controlling for the effects of changes in the bid-ask spread. Our proxy for Merton's investor recognition factor consists of the change in the number of registered shareholders from the pre- to postlisting period and the relative market value and market model residual variance of the listing stock. Our control for the effect of changes in liquidity, based on Amihud and Mendelson (1986), is the change in the bid-ask spread from pre- to postlisting periods.

The results provide support for investor recognition as a source of value from exchange listing and, therefore, support for Merton's (1987) model. Controlling for changes in bid-ask spreads, firms that experience the greatest increase in number of shareholders following listing exhibit the greatest increase in stock price in response to the listing announcement. The results also provide support for superior liquidity as a source of value from exchange listing, and, therefore, support for Amihud and Mendelson's (1986) model. Controlling for changes in the number of shareholders, firms that experience a reduction in bid-ask spreads following listing exhibit a greater increase in stock price in response to the listing announcement, however, the significance level of this relation is sensitive to the manner in which changes in spread are measured.

The remainder of the paper is organized as follows. Because the antecedent study of new listings by Sanger and McConnell (1986) provides the framework for measuring the valuation effects of new listings and because Merton's model is central to the tests conducted, the following section reviews the prior work of Sanger and McConnell and outlines Merton's model in greater detail. Section II describes the sample selection criteria and data sources used in the study. Section III reports descriptive statistics of abnormal returns, numbers of shareholders, and bid-ask spread surrounding listing on the NYSE. Section IV describes the various regressions used to test the investor recognition hypothesis (i.e., Merton's model) and superior liquidity hypothesis (i.e., Amihud and Mendelson's model) and reports the estimated coefficients. Section V concludes the paper.

I. Exchange Listing, Market Segmentation, and Share Value

A. Prior Analysis of Exchange Listings

Sanger and McConnell (1986) analyze the returns to 329 OTC stocks that were listed on the NYSE over the period 1966 through 1977. Their purpose is twofold: first, they address the issue of whether a major stock exchange listing over this period is associated with an increase in share value; and second, they assess whether the impact of exchange listing on share value was diminished by the introduction of the National Association of Security Dealers Automated Quotation (NASDAQ) system in 1971.

To conduct their investigation, Sanger and McConnell note that the first announcement of an impending listing is the publication of a notice of the listing application in the NYSE's *Weekly Bulletin*. Thus, they use the application week as the announcement date in their analysis of excess returns. They divide their sample into a pre-NASDAQ sample that includes 153 stocks listed during the period 1966 to 1970 and a post-NASDAQ sample that includes 166 stocks listed during the period 1971 to 1977.

For each sample, they calculate average cumulative excess (i.e., market model adjusted) returns for the intervals encompassing the application week through the following week, the application week through the week of listing, and the application week through two weeks after the week of listing. They refer to the cumulative excess returns over the three intervals as the initial listing effect, the gross listing effect, and the net listing effect. Identification of the excess returns over the application week through the following week as the initial listing effect is, perhaps, obvious—in an efficient market, the valuation effects of listing should be incorporated in stock price at the initial announcement date. Identification of excess returns over the other the two intervals as the gross and net listing effects are dictated by the data. In particular, Sanger and McConnell report that market model excess returns continue to be positive and significant following the application week up through the week of listing—an interval that averages eight weeks in duration. Over the first two weeks following listing, however, excess returns are significantly negative—especially in the post-NASDAQ period. Interpretation of the results depends upon whether the initial, gross, or net listing effect is considered.

For the pre-NASDAQ period, the initial, gross, and net listing effects are 1.92 ($z = 3.65$), 7.67 ($z = 6.34$), and 5.44 percent ($z = 4.04$), respectively. Thus, new listings are associated with positive and significant excess returns regardless of the interval considered. The same is not true during the post-NASDAQ period. For the post-NASDAQ period, the initial, gross, and net listing effects are 0.64 ($z = 1.13$), 4.44 ($z = 4.10$), and 1.18 percent ($z = 1.43$), respectively, and the conclusion as to whether exchange listing is associated with a significant increase in stock price depends upon whether the average excess return of negative 3 percent over the two weeks following listing is considered part of the listing effect. In the absence of the decline in stock price following listing, listing on the NYSE is associated with a significant increase in stock price even in the post-NASDAQ period.[4]

[4] The persistence of negative abnormal returns following listing is thoroughly investigated in McConnell and Sanger (1987).

Finally, Sanger and McConnell compare excess returns between the pre- and post-NASDAQ periods. Their tests indicate that excess returns over each of these three intervals are significantly lower in the post-NASDAQ period than in the pre-NASDAQ period, regardless of the interval considered. They interpret their results to indicate that NASDAQ has reduced the net advantage of an NYSE listing.

B. Merton's (1987) model

The key distinction between Merton's (1987) analysis of capital market equilibrium and that of Sharpe, Lintner, and Mossin (i.e., CAPM) is that investors invest only in those securities of which they are "aware." Merton refers to this assumption as incomplete information, however, the more general implication is that securities markets are segmented. Indeed, Merton observes that there are a number of other factors in addition to incomplete information that may contribute to this type of behavior by individuals. For example, the existence of prudent-investing laws and traditions, as well as other regulatory constraints, can also rule out investment in a particular firm by some investors. With this assumption, Merton shows that expected returns depend on other factors in addition to market risk. More specifically, from Merton (1987), the shadow cost of incomplete information for security k can be written as

$$\lambda_k = \frac{\delta\sigma_k^2 x_k(1 - q_k)}{q_k}, \tag{1}$$

where δ is the coefficient of aggregate risk aversion, σ_k^2 is the firm-specific component of security k's return variance, x_k is the value of firm k relative to the aggregate market value of traded securities, and q_k is the size of firm k's investor base relative to the total number of investors. The relation between the shadow cost and the incremental expected return on security k is given by

$$E(R_k) - E(R_k^*) = \lambda_k \frac{E(R_k^*)}{R}, \tag{2}$$

where $E(R_k)$ is the equilibrium expected return on security k for the incomplete information case ($q_k < 1$), $E(R_k^*)$ is the expected rate of return on security k for the complete information case ($q_k = 1$), and R is the return on the riskless security.

The intuition behind Merton's result is straightforward. The absence of a firm-specific risk component in the Sharpe-Lintner-Mossin CAPM comes about because such risk can be eliminated (through diversification) and is, therefore, not priced, However, in Merton's framework, in which investors invest only in those securities of which they are "aware," complete diversification is not attainable. The effect of this incomplete diversification on expected returns is greater the greater the firm's specific risk and the greater the weight of the security in the investor's portfolio—measured by market value per shareholder.

For widely held stocks, the effect of Merton's nonmarket risk factors on expected returns is likely to be insignificant. However, for firms with few shareholders, these factors can be shown to have a significant impact on stock price. This suggests that managers of firms with few shareholders have an incentive to undertake activities that expand the investor base of the firm's shares. Merton suggests that one of the ways in which managers can increase the size of the firm's investor base is to have the firm's shares listed on a national exchange. According to his model, the increase in the firm's investor base reduces the firm's cost of capital and increases the market value of its shares. It is in this spirit that we propose to test this prediction of Merton (1987) using evidence from NYSE listings during the 1980s.

II. Sample Selection and Data Sources

The initial sample of new listings includes all 308 U.S.-domiciled OTC firms that applied for and subsequently obtained an original listing on the NYSE over the nine and one-half-year period from August 1980 through December 1989. To be included in the final sample, an announcement date concerning the firm's application to list must be available. Additionally, we exclude nine firms whose listing announcement or listing took place during the month of October 1987. The final sample includes 273 firms.

There are two dates of interest in this study, the date on which the application is filed (i.e., the announcement date) and the date on which trading on the exchange begins (i.e., the listing date).[5] These dates are obtained from the NYSE's *Weekly Bulletin*. To verify that the *Weekly Bulletin* was indeed the first published source of news regarding each listing, the *Wall Street Journal* was checked for such announcements. Of the 273 firms in the sample, there were 18 instances of an announcement in the *Wall Street Journal* preceding the announcement in the *Weekly Bulletin*. For these firms, the *Wall Street Journal* date is taken as the relevant announcement date.[6]

The sample represents 50 of the 83 total two-digit standard industrial classification (SIC) codes. Of the 273 firms in the sample, 188 are industrials, 77 are financials, and 8 are utilities. Some additional descriptive statistics are presented in Table I. The time series frequency distribution of exchange listings (Panel A) shows that the listings are not concentrated in any particular year. The frequency distribution of the number of years the firm's shares were traded in the OTC market prior to listing (Panel B) shows a reasonable balance between firms with a relatively long OTC trading history and those

[5] Sanger and McConnell (1986) report that over the period 1966 to 1977 no firms that formally applied for an application to list on the NYSE were rejected.

[6] For these firms, the *Wall Street Journal* announcement typically appeared during the week prior to appearance of the announcement in the *Bulletin*.

Table I

Descriptive Statistics of 273 NASDAQ Stocks that Listed on the NYSE over the Period 1980 to 1989

The number of shares outstanding and share price used to calculate market value of equity are taken from CRSP at the month-end prior to the listing announcement.

Panel A: Frequency Distribution of Sample Exchange Listings by Year

Year	Firms	Percentage of Total
1980	13	4.8
1981	30	11.0
1982	27	9.9
1983	18	6.6
1984	22	8.1
1985	22	8.1
1986	30	11.0
1987	29	10.6
1988	50	18.3
1989	32	11.7
	273	.100

Panel B: Frequency Distribution of Years Traded in OTC Market Prior to Listing

Years	Firms	Percentage of Total
< 1	15	5.5
1–2	34	12.5
2–3	36	13.3
3–4	25	9.2
4–5	15	5.5
5–6	11	4.1
6–7	11	4.1
7–8	8	3.0
8–9	23	8.5
9–10	25	9.2
> 10	70	25.6
	273	100

Panel C: Market Value and Price of Common Stock at Time of Listing Announcement

	Mean	Median	Minimum	Maximum
Market value of equity (in millions of $)	348	181	20	6055
Shares outstanding (in millions)	13.8	9.2	1.4	108.9
Share price ($)	37.42	19.63	3.00	4325

with a relatively short OTC trading history. For example, 31 percent of the shares had traded in the OTC market for three years or less while 26 percent had traded for more than ten years. Finally, Panel C indicates that exchange listing is not confined to either very small or very large firms nor to very high or very low priced stocks.

Security returns are obtained from the Center for Research in Security Prices' (CRSP) *1990 Daily Returns Files*. Weekly returns are used in the analysis because of the uncertainty in the timing of the event under consideration. While the *Weekly Bulletin* is published each Friday, the exact day it is received by subscribers is uncertain. Thus, the event interval cannot be narrowed to a single day. Furthermore, earlier studies of new listings indicate that the price effect associated with listing takes place over an interval longer than a day or even a week.[7]

To proxy for changes in investor recognition, the number of registered shareholders for each security is collected prior to the listing announcement and subsequent to listing. The number of registered shareholders prior to listing is obtained from the listing application filed with the NYSE. The number of registered shareholders subsequent to listing is obtained from the corporate 10-K statement for the year-end following listing.[8] Where necessary, these data are augmented with data from Moody's *OTC*, *Industrial*, *Bank & Finance*, and *Public Utility* manuals.[9] The average interval between the pre- and postlisting observations of registered shareholders is eight months with a minimum of one month and a maximum of fourteen months. We also examine changes in the number of institutional shareholders surrounding listing. These data are obtained from Standard & Poor's *Security Owners Stock Guide*, which reports these figures on a monthly basis. The number of institutional shareholders prior to listing is taken from the *Stock Guide* for the month immediately prior to the listing announcement. The number of institutional shareholders following listing is taken from the *Stock Guide* three months after listing.

Finally, to control for the effects of changes in liquidity, bid and ask quotes are collected for each stock prior to and following listing.[10] For stocks listed after December 1982, bid and ask quotes are collected for each trading day over the month prior to the listing announcement and over the month following listing. For stocks listed prior to January 1983, bid and ask quotes are collected for each trading day over the month prior to the listing announcement, however, postlisting (NYSE) bid and ask quotes are available to us only on a semiannual basis. Closing bid and ask quotes for estimating bid-ask spreads prior to listing on the NYSE are obtained from CRSP. Closing bid and ask quotes for estimating bid-ask spreads following listing are

[7] In addition to Sanger and McConnell, Ying et al. (1977) document continued abnormal returns in the month following the month of the announcement.

[8] Admittedly, more timely data on the number of shareholders following listing would be useful. However, to our knowledge, none exist.

[9] In some cases, the listing application or 10-K statement is not available to us. In other cases, the date of record reported by Moody's is more timely than that of the listing application or the 10-K. For either of these two cases, the number of shareholders reported in the Moody's manual is used.

[10] An alternative measure of liquidity is trading volume. Unfortunately, NASDAQ volume is recorded differently from NYSE volume, and there is no precise (or even approximate) algorithm for converting one definition to the other (see, e.g, Atkins and Dyl (1992)). For this reason, trading volume is not used in this study.

obtained from *Stock Quotations on the NYSE*, published by Francis Emory Fitch.

III. Abnormal Returns, Number of Shareholders, and Bid-Ask Spreads Surrounding Listing

A. The Effect of Listing on Stock Price

To document the return patterns surrounding the listing announcement as well as to obtain residuals for hypothesis testing, the event study methodology pioneered by Fama et al. (1969) is used to measure the stock price effects of exchange listing.[11] In discussing announcement-period abnormal returns, we focus on the those generated with market model parameters estimated over a 104-week postlisting period using the CRSP equally weighted NYSE/AMEX index as a proxy for the market portfolio.

A.1. The Value of Listing During the 1980s

Panel A of Table II summarizes cross-sectional average abnormal returns for the 105 event weeks surrounding the week in which the announcement of a formal application to list first appears in the *Weekly Bulletin*. This table reveals several patterns that are consistent with previous studies of exchange listings.

First, abnormal returns prior to the listing announcement are predominantly positive, suggesting that firms decide to list following a period of exceptional performance. The cumulative average abnormal return of 25 percent over the 52-week period prior to the listing application announcement is similar in magnitude to that found by Sanger and McConnell (1986).

Second, consistent with the hypothesis that listing increases share value, abnormal returns during the announcement week are positive and significant. The average abnormal return during the announcement week is $+1.7$ percent ($z = 4.87$) with a maximum of 24.8 percent and a minimum of -11.4 percent.

Third, abnormal returns continue to be positive and statistically significant following the week of the listing application announcement. This result appears to be inconsistent with the semi-strong form of the market efficiency hypothesis, but it is consistent with the findings of Sanger and McConnell (1986) and is their motive for demarcating the gross listing effect interval.[12]

[11] Because the statistical techniques that we apply are widely used in stock market studies, they are not discussed here. For a detailed description of the various methodologies used in this study see Sanger and McConnell (1986).

[12] A possible explanation for the positive abnormal returns following the announcement week might be the continued emergence of more favorable news items about the firm. However, to the extent that such news items commonly occur for companies around their application to list, this should be captured, on average, at the time of the application announcement. Thus, this argument suggests that the market takes longer to fully assimilate the implications of listing than an informationally efficient market should require. Moreover, that the post-announcement drift persists after excluding those firms with potentially confounding announcements during this interval, is inconsistent with this argument (see Section IV.E.1).

Table II

Average Abnormal Returns of 273 NASDAQ Stocks that Listed on the NYSE over the Period 1980 to 1989

Abnormal returns are market model adjusted returns using market model parameters estimated over a 104-week postlisting period with the CRSP equally weighted index as a proxy for the market portfolio.

Event Week	Average Abnormal Return	z-Statistic	Cumulative Abnormal Return	Percentage Nonnegative
Panel A: Abnormal Returns Surrounding the Week of the NYSE Listing Application Announcement				
−52	0.004	0.91	0.004	52
−10	0.006	1.76	0.204	51
−4	0.007	2.56[a]	0.238	54
−3	0.009	2.41[a]	0.246	50
−2	0.003	0.91	0.249	45
−1	0.002	0.39	0.251	46
0	0.017	4.87[b]	0.267	56
1	0.007	1.86	0.274	48
2	0.009	3.00[b]	0.283	52
3	0.014	3.80[b]	0.296	57
4	0.007	1.71	0.303	52
10	−0.001	−0.14	0.296	48
52	−0.001	−0.39	0.329	46
Panel B: Abnormal Returns Surrounding the Week in which the Stock Began Trading on the NYSE				
−52	0.007	1.77	0.007	51
−10	0.005	1.00	0.208	47
−4	0.009	2.53[a]	0.241	51
−3	0.010	2.59[b]	0.251	54
−2	0.001	3.30[b]	0.262	51
−1	0.011	3.04[b]	0.272	56
0	0.011	3.01[b]	0.282	55
1	−0.004	−0.97	0.279	48
2	−0.004	−1.48	0.275	45
3	−0.002	−0.52	0.273	47
4	0.000	−0.07	0.273	45
10	0.001	−0.06	0.273	48
52	−0.002	−0.09	0.294	48

[a] Indicates significance at the 0.05 level.
[b] Indicates significance at the 0.01 level.

In Panel B, abnormal returns are centered on the week in which the stock began trading on the NYSE. Consistent with prior studies, the positive and significant abnormal returns following the listing announcement end precisely at the week of listing. However, unlike prior studies, abnormal returns are not significantly negative over the first few weeks following listing. Like

Sanger and McConnell, we compute abnormal returns over the period encompassing the announcement week through the week of listing. The average cumulative abnormal return over this interval of 5.8 percent ($z = 7.45$), with a maximum of 50.8 percent and a minimum of -22.4 percent, is consistent with the results of Sanger and McConnell for both their pre- and post-NASDAQ samples. Apparently, listing during the 1980s is accompanied by a permanent increase in stock price.[13]

B. Changes in Investor Recognition

We use the change in the number of registered shareholders from pre- to postlisting periods to proxy for changes in Merton's investor recognition factor. Panel A of Table III reports cross-sectional descriptive statistics for the number of shareholders prior to the listing application and subsequent to listing. Consistent with the predictions of the "investor recognition" hypothesis, and the findings of Cowan et al. (1992), the average number of shareholders is greater following the listing announcement than before. On average, listing firms experience a 19 percent increase in the number of registered shareholders. By way of comparison, Cowan et al. report a 3 percent annual increase in the average number of shareholders for a sample of NASDAQ firms that are eligible to list their shares on the NYSE but choose not to.[14] That 63 percent of our sample firms experience an increase in the number of shareholders suggests that the average increase is not driven by a few large outliers. For purposes of comparison, we examine the year-to-year change in number of shareholders for a sample of NASDAQ and NYSE stocks during the period 1980 to 1989. In contrast to our sample of listing firms, on average, only 41 percent of all NASDAQ firms and 36 percent of all NYSE firms experience an increase in registered shareholders for any given year.[15]

It could be that the publicity associated with listing reaches some investors who were previously unaware of the security. If so, this would be consistent with Merton's incomplete information argument. However, it is unlikely that these firms were overlooked by more sophisticated institutional investors.

[13] Most empirical analyses of this type involve certain methodological choices that are, to some degree, arbitrary. Because these choices have been shown to affect results, an extensive analysis is conducted to determine the extent to which the residual estimates of Table II are sensitive to variations in the empirical methodology employed. We find that the results are robust with respect to the choice of performance benchmark (e.g., mean, market, market model), proxy for the market portfolio (e.g., CRSP's equally weighted and value-weighted indices), interval for estimating market model parameters, (e.g., pre- and post-listing periods), and a test statistic for assessing significance (e.g., t-test, rank test). For example, the initial and gross listing effect are 1.7 ($z = 4.80$) and 5.9 percent ($z = 7.35$), respectively, when the CRSP value-weighted index is used as a proxy for the market portfolio.

[14] The control sample of Cowan et al. (1992) contains approximately 313 stocks each year over the period 1973 to 1990.

[15] The sample includes all firms on the COMPUSTAT Industrial, Research, and OTC tapes (excluding firms that listed on the NYSE) for which data on the number of shareholders is available on a year-to-year basis. This mechanism results in roughly 23,000 "firm-years" for NYSE stocks and 7,700 "firm-years" for NASDAQ stocks.

Table III

Average Number of Individual and Institutional Shareholders Before and After Listing on the NYSE for 273 NASDAQ Stocks that Listed on the NYSE over the period 1980 to 1989

The number of individual shareholders prior to listing is taken from the NYSE listing application. The number of individual shareholders following listing is taken from the corporate 10-K for the year-end following listing. The number of institutional shareholders prior to listing is taken from the *Stock Price Guide* for the month prior to the listing application. The number of institutional shareholders following listing is taken from the *Stock Price Guide* for the third month following listing. Medians are reported in parentheses below the means.

	Full Sample	Non-NMS Sample	NMS Sample
Panel A: Average Number of Individual Shareholders			
Prior to listing	4,750	3,852	5,194
	(2,279)	(2,568)	(2,200)
Following listing	5,022	4,179	5,438
	(2,600)	(2,959)	(2,411)
Percentage of firms with increase in number of shareholders	63	69	62
Percentage unchanged	4	2	4
Percentage of firms with decrease in number of shareholders	33	29	34
Panel B: Average Number of Institutional Shareholders			
Prior to listing	49	25	61
	(32)	(18)	(44)
Following listing	54	30	66
	(37)	(23)	(50)
Percentage of firms with increase in institutional shareholders	69	70	68
Percentage unchanged	8	11	7
Percentage of firms with decrease in institutional shareholders	23	19	25

Merton argues that the existence of prudent-investing laws and traditions can also rule out investment by some investors. For example, some pension funds are prohibited from investing in nonlisted securities. Thus, it is of interest to examine changes in the number of institutional shareholders surrounding listing. Panel B of Table III reports cross-sectional descriptive statistics for the number of institutional shareholders prior to the listing application and subsequent to listing. Consistent with the existence of prudent-investing constraints, listing firms, on average, experience a 27 percent increase in the number of institutional shareholders. Furthermore, that 69 percent of our sample firms experience an increase in the number of institutional shareholders suggests that the average increase is not the result of a few large outliers. As before, for purposes of comparison, we examine the year-to-year change in the number of institutional shareholders for a sample of NASDAQ and NYSE stocks during the period 1980 to 1990. In contrast to our sample of listing firms, on average, 59 percent of all NASDAQ firms and 62 percent of all NYSE firms experience an increase in institutional shareholders for any given year.[16]

C. Changes in the Bid-Ask Spread

Both absolute and relative bid-ask spreads are used in this study. Relative spreads are the appropriate measure of transaction cost and are, therefore, used in regressions to control for changes in liquidity. However, to verify that changes in relative spreads are not due solely to changes in price, changes in absolute spreads are also examined. A security's prelisting spread is taken to be the average absolute (or relative) end-of-day spread over the month prior to the listing announcement. For stocks listed from January 1983 onward (203 firms), a security's postlisting spread is taken to be the average absolute (or relative) end-of-day spread over the month following listing. For stocks that listed prior to 1983 (70 firms), bid and ask quotes are available only on a semiannual basis. For these stocks, the postlisting spread is taken to be the bid-ask spread at the end of the nearest available trading day following listing.[17]

Table IV reports cross-sectional descriptive statistics for absolute and relative bid-ask spreads for the overall sample, the non-National Market System (NMS) sample, and the NMS sample before the listing announcement and after listing. Consistent with the predictions of the "superior liquidity" hypothesis and the findings of Klemkosky and Conroy (1985), average absolute and relative bid-ask spreads are smaller following listing than before. On average, listing stocks experience a 5 percent reduction in their absolute bid-ask spread and a 7 percent reduction in their relative bid-ask spread from before to after listing. That 59 percent of the sample firms experience a reduction in absolute spread indicates that the observed decrease in the relative bid-ask spread is not due solely to either increases in price or to a few large outliers. Additionally, an analysis of the time series of cross-sectional average absolute and relative bid-ask spreads for the 40 trading days surrounding listing indicates that the average change in spread occurs precisely at listing. Finally, it is likely that our comparison of pre- and postlisting spreads understates the true change in "market" spread for listing firms. For NASDAQ securities, we observe the "inside" quote or the highest bid price and lowest ask price among all NASDAQ dealers. Because the inside quote is the price at which investors conduct trades, it is sometimes called the "market" spread. Alternatively, for NYSE securities we observe the specialist

[16] The sample includes 100 NASDAQ firms and 100 NYSE firms randomly selected from *Standard and Poor's Security Owners Guide*. The number of institutional shareholders is adjusted to reflect changes in the number of institutions from which Standard and Poor collects its data.

[17] In the case of a stock split prior to listing, only post-split bid and ask quotes are used in estimating the OTC market bid-ask spread. In the case of a stock split following listing, only pre-split bid and ask quotes are used in estimating the NYSE bid-ask spread.

Table IV

Average Absolute and Relative Bid-Ask Spreads Before and After Listing on the NYSE for 273 NASDAQ Stocks that Listed on the NYSE over the period 1980–1989

The average absolute and relative bid-ask spread prior to listing is computed from end-of-day quotes over the month prior to the listing application. The absolute and relative bid-ask spread following listing is computed from end-of-day quotes over the month following listing. Medians are reported in parentheses below the means.

	Full Sample	Non-NMS Sample	NMS Sample
Panel A: Average Absolute Spread			
Prior to listing	0.351 (0.295)	0.398 (0.340)	0.328 (0.263)
Following listing	0.267 (0.250)	0.316 (0.272)	0.243 (0.233)
Percentage of firms with decrease in average absolute bid-ask spread	59	58	60
Percentage unchanged	1	2	0
Percentage of firms with increase in average absolute bid-ask spread	40	40	40
Panel B: Average Relative Spread			
Prior to listing	0.020 (0.017)	0.022 (0.019)	0.019 (0.015)
Following listing	0.015 (0.013)	0.017 (0.015)	0.014 (0.012)
Percentage of firms with decrease in relative bid-ask spread	65	63	67
Percentage unchanged	1	1	0
Percentage of firms with increase in relative bid-ask spread	34	36	33

quote. Because the specialist quote is often dominated by public limit orders, it is an upward biased measure of the "market" spread. This may, in part, explain why 40 percent (34 percent) of the overall sample of listing stocks appear to experience an increase in absolute (relative) bid-ask spreads following listing.

IV. Testing the Investor Recognition and Liquidity Hypothesis

The previous empirical results indicate that, on average, listing firms experience a positive stock price response to the listing announcement and that listing is accompanied by an increase in the number of the firm's shareholders and a reduction in the stock's bid-ask spread. While these findings are consistent with both the investor recognition hypothesis (i.e,. Merton's model) and the superior liquidity hypothesis (i.e., Amihud and

Mendelson's model), more direct evidence can be obtained by conducting a cross-sectional regression of listing-period abnormal returns on proxies for the asset-pricing factors of these models.

A. Listing Returns and Investor Recognition

Because Merton's asset pricing relations are derived from the partial derivatives of expected returns with respect to each of four variables, the effect of investor recognition must be evaluated while holding the other variables constant. From equations (1) and (2), the magnitude of the effect of a change in the number of shareholders on expected returns depends upon the level of firm-specific risk and the relative market value of the firm's shares. Our test uses proxies for each of these factors. More specifically, we regress listing-period abnormal returns on the following proxy for the change in Merton's λ—the shadow cost of incomplete information:

$$\Delta\lambda_J = \frac{Resvar_j * Mktval_j}{NYSEHolders_j} - \frac{Resvar_j * Mktval_j}{OTCHolders_j}, \tag{3}$$

where $Resvar_j$, $Mktval_j$, $OTCHolders_j$, and $NYSHolders_j$ are the residual variance, relative market value, number of OTC shareholders, and number of NYSE shareholders for security j, respectively. Our estimates of residual variance are obtained from the market model estimated over the 104-week post-listing period. A firm's relative market value is taken to be the market value of its common stock during the month prior to the listing announcement divided by the level of the S&P 500 Index during that month. In words, $\Delta\lambda_j$ represents one divided by the change in the number of shareholders from pre- to post-listing periods scaled by the level of firm-specific risk and the relative market value of the security. A significantly negative relation between listing period abnormal returns and changes in λ can be interpreted as support for Merton's model. To insure that the estimates obtained are not biased by the omission of relevant regressors, several alternative specifications are considered as well.

We begin our analysis by considering first the relation between listing-period abnormal returns and the change in Merton's λ from pre- to postlisting periods. In particular, we estimate the following regression

$$AR_j = B_0 + B_1\,\Delta\lambda_j + E_j, \tag{4}$$

where AR is the listing-period abnormal return and $\Delta\lambda_j$ is the change in λ for security j. Table V reports the coefficients of the regression using both the initial and gross measures of listing-period excess returns as the dependent variable. Panel A reports the results using the initial period excess return and Panel B reports those using the gross listing-period excess return. Consistent with the investor recognition hypothesis and the predictions of Merton's model, the coefficient of $\Delta\lambda$ is negative and significant for both

Table V

Regressions of Listing Announcement Abnormal Returns on Proxies for the Asset-Pricing Factors of Merton (1987) and Amihud and Mendelson (1986)

Coefficient estimates for regressions of announcement period abnormal returns on proxies for the asset pricing factors of Merton (1987) and Amihud and Mendelson (1986). $\Delta\lambda$ is the change in shadow cost of incomplete information from pre- to postlisting periods and is estimated from the following equation

$$\Delta\lambda_J = \frac{Resvar_j * Mktval_j}{NYSEHolders_j} - \frac{Resvar_j * Mktval_j}{OTCHolders_j}$$

where $Resvar_j$, $Mktval_j$, $OTCHolders_j$, and $NYSHolders_j$ are the residual variance, relative market value, prelisting number of shareholders, and postlisting number of shareholders for security j, respectively. Estimates of residual variance are obtained using the market model. A firm's relative market value is taken to be the market value of its common stock prior to the listing announcement divided by the countemporaneous level of the S & P 500 Index. The number of shareholders prior to listing is taken from the NYSE listing application. The number of shareholders following listing is taken from the corporate 10-K for the year-end following listing. $\hat{\Delta}\lambda$ is the predicted change in λ obtained from regressing the observed change in λ on prelisting value of λ. $\Delta Spread$ is the change in absolute spread from pre- to postlisting periods divided by the prelisting share price. $\Delta DumSpread$ is an indicator variable equal to the direction of change in absolute spread. NMS is an indicator variable equal to 1 if part of the NMS, 0 otherwise, IND is an indicator variable equal to 1 if firm is industrial, 0 otherwise. t-statistics are reported in parentheses below the coefficient.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Dependent Variable is the Abnormal Return during the Listing Announcement Week								
Intercept	0.012	0.012	0.011	0.013	0.004	0.001	0.002	0.003
	(3.56)	(3.43)	(3.14)	(2.34)	(0.60)	(0.21)	(0.36)	(0.47)
$\Delta\lambda$	−10.60	−9.18	−10.12	−10.10	−9.42	−9.05	−13.39	
	(−3.82)	(−3.38)	(−3.66)	(−3.65)	(−3.37)	(−2.80)	(−3.66)	
$\hat{\Delta}\lambda$								−10.59
								(−2.74)
$\Delta Spread$		−0.012						
		(−1.49)						
$\Delta DumSpread$			−0.007	−0.007	−0.007	−0.009	−0.005	−0.007
			(−2.19)	(−2.19)	(−2.11)	(−2.37)	(−1.76)	(−2.15)

Table V—*Continued*

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Dependent Variable is the Abnormal Return during the Listing Announcement Week								
NMS				−0.003				
				(−0.42)				
IND					0.012	0.011	0.006	0.011
					(1.59)	(0.140)	(1.11)	(1.57)
R-square	0.05	0.06	0.07	0.07	0.08	0.07	0.08	0.06
Panel B: Dependent Variable is the Cumulative Abnormal Return from the Announcement Week through Listing Week								
Intercept	0.048	0.047	0.046	0.046	0.032	0.000	0.024	0.031
	(6.94)	(6.87)	(6.55)	(3.98)	(2.65)	(0.01)	(2.51)	(2.53)
$\Delta\lambda$	−22.61	−19.94	−21.82	−21.81	−20.49	−16.49	−30.45	
	(−4.11)	(−3.72)	(−3.97)	(−3.96)	(−3.69)	(−2.89)	(−4.65)	
$\hat{\Delta}\lambda$								−18.64
								(−2.48)
Δ*Spread*		−0.016						
		(−1.02)						
Δ*DumSpread*			−0.012	−0.012	−0.012	−0.008	−0.010	−0.012
			(−1.80)	(−1.80)	(−1.73)	(−1.07)	(−1.89)	(−1.81)
NMS				−0.001				
				(−0.04)				
IND					0.021	0.044	0.023	0.023
					(1.47)	(2.63)	(1.93)	(1.59)
R-square	0.06	0.06	0.07	0.07	0.08	0.12	0.13	0.05

regressions. From column 1 of Panel A, the estimated coefficient is -10.6 ($t = -3.82$), and from Panel B the coefficient is -22.6 ($t = -4.11$).

B. Listing Returns and Bid-Ask Spreads

As Amihud and Mendelson (1989) note, there are a number of studies that predict a relation between Merton's asset pricing factors and the size of the bid-ask spread. For instance, Demsetz (1968) finds that in the cross-section of securities a larger number of shareholders is associated with a smaller bid-ask spread. Furthermore, both inventory and adverse selection models of the bid-ask spread predict a positive relation between firm-specific risk and the size of the bid-ask spread. Finally, Stoll and Whaley (1983) report that the bid-ask spread is negatively related to firm size. The results of Table IV indicate that, on average, exchange listing is associated with a decline in the security's bid-ask spread. Thus, it could be that Merton's λ is merely a proxy for changes in the bid-ask spread. While the correlation between these variables, 0.103 ($p = 0.094$), is not large, failure to include both variables in the regression may result in biased coefficient estimates.

To control for the effects of changes in the bid-ask spread, we estimate the regression

$$AR_j = B_0 + B_1 \Delta\lambda_j + B_2 \Delta Spread_j + E_j, \tag{5}$$

where AR_j and $\Delta\lambda_j$ are as previously defined and $\Delta Spread_j$ is the percent change in the relative bid-ask spread for security j.[18]

The specification in equation (5) does, however, create an estimation problem. In particular, a security's relative bid-ask spread is calculated as

$$RelativeSpread_t = \frac{Ask_t - Bid_t}{(Ask_t + Bid_t)/2}. \tag{6}$$

By inspection, the relative spread can change over time either because of a change in the absolute spread $(Ask_t - Bid_t)$ or because of a change in price $[(Ask_t + Bid_t)/2]$. To the extent that the level of postlisting prices reflects abnormal returns realized during the listing period, there is a relationship between the change in the relative bid-ask spread and the listing-period excess return, which, in turn, means that the independent variable is correlated with the error term. To address this problem, we use the standard instrumental variable technique to estimate equation (5). Specifically, we define the instrumental variable for $\Delta Spread_j$ to be the change in absolute bid-ask spread divided by the prelisting stock price.

Coefficient estimates for the regression are reported in column 2 of Table V. Consistent with the predictions of Merton's model, the coefficient of $\Delta\lambda$ is still negative and significant for each of the regressions. In particular, the estimated coefficients are -9.2 ($t = -3.38$) and -19.9 ($t = -3.72$) for the

[18] The percentage change in relative spread is used in an attempt to capture the concavity of Amihud and Mendelson's (1986) return-spread relation.

regression using the initial and gross listing abnormal returns, respectively. While both the magnitude and the significance are somewhat lower than in the regression without $\Delta Spread$, these results indicate that the effect of investor recognition on the listing period return is distinct from the effect of liquidity as measured by the bid-ask spread.[19] Consistent with the superior liquidity hypothesis and the predictions of Amihud and Mendelson's model, the coefficient of $\Delta Spread$ is negative in both regressions. It is, however, not significant at a traditionally acceptable level for either regression.

While the results to this point provide strong support for Merton's investor recognition factor, the evidence concerning Amihud and Mendelson's liquidity factor is somewhat weaker. Our failure to find stronger support for liquidity could be due to a number of factors. First, it is possible that our proxy fails to capture adequately the functional form of the Amihud and Mendelson model. Second, the use of an unbounded variable for the change in spread allows potentially large measurement errors to exert considerable influence on the coefficient estimates. Finally, due to the inherent discreteness of the bid-ask spread, a continuous proxy for changes in the bid-ask spread may not be appropriate.[20] For these reasons, we replace our continuous proxy for the change in liquidity with a dummy variable, which is assigned the value -1 for securities that experience a decrease in absolute spread, 0 for securities that have no change in absolute spread, and 1 for securities with an increase in absolute spread and estimate the regression

$$AR_j = B_0 + B_1 \Delta \lambda_j + B_2 \Delta DumSpread_j + E_j. \tag{7}$$

From column 3, the coefficient estimates of our discrete proxy for the liquidity factor are -0.007 ($t = -2.19$) for the regression using the initial listing effect and -0.012 ($t = -1.80$) for the regression using the gross listing effect, respectively. Thus, the discrete measure of the change in spread appears to better capture the liquidity effect than the continuous measure. Again, the magnitude and significance of the coefficients of $\Delta \lambda$ remain almost unchanged.

C. Listing Returns, Investor Recognition, Bid-Ask Spreads, and the NMS

A frequently encountered hypothesis regarding the value of a major exchange listing is that the superior liquidity services provided by the exchange

[19] Merton's λ may proxy for some aspect of liquidity that is not captured by the bid-ask spread. Schreiber and Schwartz (1985) define three forms of liquidity: price volatility, adverse price movement, and market liquidity. While the bid-ask spread serves as a proxy for market liquidity, adverse price movement is, to a large extent, determined by a security's demand elasticity. To the extent that Merton's λ reflects elasticity of demand, it may proxy for the adverse price movement aspect of liquidity.

[20] To insure that the results are not due to our use of semiannual bid and ask quotes prior to 1983, we omit the pre-1983 events from the sample and re-estimate the cross-sectional regressions. The results are similar to those reported in Table V (copies of the results are available from the authors).

stimulates demand for the firm's stock, which gives rise to a permanent increase in stock price. Sanger and McConnell (1986) argue that, to the extent that NASDAQ has improved the liquidity of stocks traded in the OTC market, the value of exchange listing should be lower following the introduction of NASDAQ.[21] Consistent with this hypothesis, they find that the listing effect is significantly smaller following the introduction of NASDAQ than before.

Many believe that the NMS, introduced in April of 1982, has further enhanced the trading environment of the OTC market.[22] Since our sample contains both non-NMS (90) and NMS (183) firms, it is of interest to compare the listing announcement effect for these two samples to determine whether the NMS has had any effect on the stock price reaction to listing. Given the positive abnormal returns following the listing announcement, the appropriate interval for comparing stock returns is not clear. Therefore, we perform tests over two different return intervals. In particular, excess returns are computed over intervals encompassing the announcement week (i.e., the initial listing effect) and the announcement week through the listing week (i.e., the gross listing effect) for both non-NMS and NMS samples.

For the non-NMS sample, the initial listing effect is 1.9 percent ($z = 2.92$) and the gross listing effect is 6.0 percent ($z = 3.98$). For the NMS sample, the returns are very similar. The initial listing effect is 1.6 percent ($z = 3.94$) and the gross listing effect is 5.7 percent ($z = 6.31$). Turning to the results of the two sample tests, the difference between the initial and gross listing effects of the non-NMS and NMS samples are 0.3 ($z = 1.06$) and 0.3 percent ($z = 1.45$), respectively. Thus, any apparent differences in the effect of listing on stock price is not statistically significant.

While the two sample tests suggest that the introduction of the NMS has had little effect on the value of listing, it is of interest to determine whether the NMS has had any bearing on the value of listing after controlling for changes in investor recognition and bid-ask spreads. We estimate the regression

$$AR_j = B_0 + B_1 \Delta \lambda_j + B_2 \Delta DumSpread_j + B_3 NMS_j + E_j, \tag{8}$$

where $NMS_j = 1$ if firm j is part of the NMS and 0 otherwise and $\Delta DumSpread$ is assigned the value -1, 0, or 1, as described above. The coefficient estimates and levels of significance for this regression are reported in column 4 of Table V. Consistent with our two sample test for differences in

[21] The NASDAQ system, introduced in February of 1971, allows instantaneous communication of bid and ask quotations among OTC dealers and brokers. Prior to NASDAQ, the bid and ask quotations of OTC dealers were available only on a daily basis. Since NASDAQ allows dealers to update their quotations in response to changes in information on a more timely basis, it has imparted some of the qualities of a central market to the OTC market.

[22] For example, Seguin (1991) argues that the real-time transaction reporting for NMS securities allows dealers to identify information-based trading more accurately, which should result in narrower bid-ask spreads. Consistent with this hypothesis, Seguin reports that the average bid-ask spread of stocks is lower following inclusion in the NMS.

the listing effect for NMS and non-NMS firms, the estimated coefficient for the NMS indicator variable is negative but is not significantly different from zero in either regression. More importantly, the magnitude and significance of the coefficients of $\Delta\lambda$ and $\Delta DumSpread$ remain almost unchanged.

D. Industrial and Nonindustrial Firms

Because the distinction between industrial and nonindustrial firms has been shown to affect abnormal return relations in other studies, it is of interest to test whether this distinction shows up in the listing effect as well. To capture potential differences in the listing effect for industrial and nonindustrial firms, we include an indicator variable to the model and estimate

$$AR_j = B_0 + B_1\,\Delta\lambda_j + B_2\,\Delta DumSpread_j + B_3 IND_j + E_j, \tag{9}$$

where $IND_j = 1$ if security j is an industrial firm and 0 otherwise.[23] From column 5 of Table V, it appears that industrial firms benefit more from listing than do nonindustrial firms. More specifically, the estimated coefficient of the industrial indicator variable is 0.012 ($t = 1.59$) for the regression using the initial listing effect and 0.021 ($t = 1.47$) for the regression using the gross listing effect. Again, the magnitude and significance of the coefficients of $\Delta\lambda$ and $\Delta DumSpread$ remain largely unaffected.

E. Sensitivity Analysis

E.1. Confounding Announcements

In any empirical analysis that applies the event-study methodology, there is a concern as to whether other significant information is released to the market during the period over which abnormal returns are measured. If this other information causes abnormal returns and is correlated with the regression variables, it could produce relationships similar to those found in Table V. For example, if firms frequently announce dividend increases following their listing application, it could give rise to both positive abnormal returns and increases in the number of shareholders and, thus, produce an apparent relationship between listing-period abnormal returns and $\Delta\lambda$. To control for the possible effects of other information, the *Dow Jones News Wire* and the *Wall Street Journal* were searched for announcements regarding earnings, dividend changes, equity offerings, share repurchases, mergers and acquisitions, and stock splits. We are concerned with contaminating announcements over two intervals. Over the interval that we identify as the application week, there were 28 earnings announcements, 5 dividend changes, 6 stock splits, 10 equity offerings, 0 share repurchases, and 5 mergers or acquisitions. Over the

[23] A firm is considered a financial if its four-digit SIC code is greater than 6,000 and less than 6,790, a utility if its four-digit SIC code is greater than 4,900 and less than 4,933, and an industrial otherwise. Of the 273 firms in the sample, 188 are industrial, 77 are financial, and 8 are utilities.

interval encompassing the application week through the week of listing, there were 97 earnings announcements, 18 dividend changes, 8 stock splits, 12 equity offerings, 1 share repurchase, and 18 mergers or acquisitions. Excluding firms with these announcements resulted in a final sample of 225 observations for tests based on the initial listing effect and 140 observations for tests based on the gross listing effect.

Before assessing the effect of these exclusions on the cross-sectional regressions, we repeat the abnormal returns analysis of Table I. The abnormal returns of the uncontaminated samples are very simialr to those of the full sample. In particular, the initial abnormal return is 1.4 percent ($z = 2.73$) and the gross abnormal return is 4.2 percent ($z = 3.97$). Turning to the regressions, the estimated coefficients for the uncontaminated samples are reported in column 6 of Table V. Despite the smaller samples, the results are very similar to those reported in column 5 and lead to the same general conclusions. In particular, in both Panel A and Panel B, the coefficient of $\Delta\lambda$ is negative and statistically significant. Thus, the results are not sensitive to the exclusion of stocks with concurrent (and possibly confounding) announcements.

E.2. Influential Observations

Because the regressions in Table V have low R-squares, it is important to examine their robustness with respect to highly influential observations. To do so, we estimate the regression of column 5 excluding the 10 percent of the observations with the highest Cook's D values.[24] This measure reflects the combined impact of the differences in the estimated regression coefficients when the ith observation is deleted. The results, reported in column 7 of Table V, are very similar to those reported in column 5 and lead to the same conclusions. Thus, the results are insensitive to the exclusion of "outlier" observations.

F. A Question of Causation

As is the case with many empirical investigations, there is the question of causation. While the results of Table V are consistent with the investor-recognition hypothesis and the predictions of Merton (1987), they are also consistent with an alternative hypothesis in which cause and effect are reversed. In particular, it could be that listing-period abnormal returns attract new shareholders. To address this issue, we replace $\Delta\lambda$ with an instrumental variable that is uncontaminated by listing-period abnormal returns. More specifically, a simple prediction model is employed in which $\Delta\lambda$ is regressed on the prelisting values of λ. This model is based on the premise that those firms with the greatest potential for a change in λ will be those that realize the greatest change.[25] Next, we replace $\Delta\lambda$ with the predicted value from the

[24] For a more detailed description of this measure see Neter, Wasserman, and Kutner (1985).

[25] The R-square of 0.54, for this model, suggests that it is possible for individuals to form reasonable expectations concerning $\Delta\lambda$, prior to listing.

above regression and estimate

$$AR_j = B_0 + B_1 \hat{\Delta} \lambda_j + B_2 \, \Delta DumSpread_j + B_3 IND_j + E_j, \tag{10}$$

where $\hat{\Delta}\lambda$ is the predicted value from the regression of $\Delta\lambda$ on the prelisting value of λ. The results, reported in column 8 of Table V, are very similar to those reported in columns 1 to 6. The estimated coefficients of $\hat{\Delta}\lambda$ are -10.6 ($t = -2.74$) and -18.6 ($t = -2.41$) for the regressions using the initial and gross listing abnormal returns and both are statistically significantly different from zero. While the significance levels of the coefficients are lower than those of previous regressions, these results indicate that the coefficient estimates for $\Delta\lambda$ are not due solely to changes in shareholders caused by listing-period abnormal returns.

G. Listing Returns and the Components of λ

Our proxy for the change in Merton's λ is composed of three factors: residual variance, relative market value, and the change in the number of shareholders from pre- to postlisting periods. A natural question is—how are the individual factors related to listing-period abnormal returns? In other words, is the change in the number of shareholders important to our estimate? To investigate this, we decompose λ into its individual components and estimate the regression

$$AR_j = B_0 + B_1 \, \Delta DumSpread_j + B_2 \, \Delta Holders_j + B_3 Mktval_j + B_4 Resvar_j + E_j \tag{11}$$

where AR_j, $\Delta DumSpread_j$, $Mktval_j$, and $Resvar_j$ are as previously defined, and $\Delta Holders_j$ is the ratio of OTC shareholders to NYSE shareholders for security j.

The coefficient estimates and levels of significance for the regression are reported in Table VI. Column 1 reports the results using the initial period excess return, and column 2 reports the results using the gross listing-period excess return. Several comments are in order. First, we continue to find support for Amihud and Mendelson (1986), as the coefficient of our discrete liquidity factor is negative and significant in both regressions. The estimated coefficient of $\Delta DumSpread$ is -0.007 ($t = -2.15$) for the regression using the initial listing effect and -0.010 ($t = -1.59$) for the regression using the gross listing effect. Second, the coefficient of our proxy for firm-specific risk is positive and significant in both regressions. Finally, the strongest relation in Table VI is that between listing period abnormal returns and the change in number of shareholders. More specifically, the estimated coefficient of $\Delta Holders$ is -0.052 ($t = -3.24$) for the regression using the initial listing effect and -0.144 ($t = -4.63$) for the regression using the gross listing effect. Thus, it appears that the change in the number of shareholders does contribute to the relationship between listing period abnormal returns and Merton's λ.

Table VI

Regressions of Listing Announcement Abnormal Returns on Proxies for the Asset-Pricing Factors of Merton (1987) and Amihud and Mendelson (1986)

Column 1 reports the coefficient estimates for the regression in which the dependent variable is the abnormal return during the announcement week. Column 2 reports the coefficient estimates for the regression in which the dependent variable is the cumulative abnormal return from announcement week through the listing week. The independent variables $Resvar_j$, $Mktval_j$, and $\Delta Holders_j$ are the residual variance, relative market value, and the change in number of shareholders for security j, respectively. Estimates of residual variance are obtained from the market model estimated over a 104-week postlisting period. A firm's relative market value is taken to be the market value of its common stock prior to the listing announcement divided by the contemporaneous level of the S&P 500 Index. The number of shareholders prior to listing is taken from the NYSE listing application. The number of shareholders following listing is taken from the corporate 10-K for the year-end following listing. $\Delta DumSpread$ is an indicator variable equal to the direction of change in absolute spread. t-statistics are reported in parentheses below the coefficients.

Variable	(1)	(2)
Intercept	0.053	0.170
	(3.32)	(5.41)
$\Delta DumSpread$	−0.007	−0.011
	(−2.15)	(−1.59)
$\Delta Holders$	−0.052	−0.146
	(−3.24)	(−4.64)
Relative market value	−0.002	−0.002
	(−1.46)	(−0.78)
Residual variance	3.590	5.939
	(2.84)	(2.50)
R-square	0.10	0.12

V. Summary and Conclusions

This paper documents the effect on share value of listing on the NYSE during the 1980s and reports the results of a joint test of Merton's (1987) investor recognition factor and Amihud and Mendelson's (1986) liquidity factor as explanations for the listing effect. Specifically, we investigate whether listing-period abnormal returns are associated with changes in the investor base and changes in bid-ask spreads in a manner that is consistent with the predictions of Merton (1987) and Amihud and Mendelson (1986).

We find that during the 1980s stocks, on average, earned abnormal returns of 5 to 6 percent in response to the announcement of listing on the NYSE and that the introduction of the NMS has had little effect on the stock price increase that accompanies listing on the NYSE. We also find that, on average, listing is associated with a 19 percent increase in the number of registered shareholders, a 27 percent increase in the number of institutional shareholders, a 5 percent reduction in absolute bid-ask spreads, and a 7 percent reduction in relative bid-ask spreads.

The cross-sectional regressions provide support for investor recognition as a source of value from exchange listing and, therefore, support for Merton's (1987) model: controlling for changes in bid-ask spreads, firms that experience the greatest increase in number of shareholders following listing exhibit the greatest increase in stock price in response to the listing announcement. The results also provide suport for superior liquidity as a source of value from exchange listing and, therefore, provide support for Amihud and Mendelson's (1986) model. Controlling for changes in the number of shareholders, firms that experience a reduction in bid-ask spreads following listing exhibit a greater increase in stock price in response to the listing announcement; however, the significance level of this relationship is sensitive to the manner in which changes in spread are measured.

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