

**PRE-LISTING PRICING EFFICIENCY AND
STOCK PRICE REACTION TO LISTING:
SOME ADDITIONAL EVIDENCE**

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Abstract

Prior empirical studies provide evidence that stock price reactions to listing are more favorable for stocks that have higher prospects for listing gains. These studies focus on the listing gains of liquidity and informational value. Our study examines another dimension of listing gain, namely, improved pricing efficiency. We hypothesize that low efficiency stocks in the pre-listing period would earn higher abnormal returns than high efficiency stocks. Contrary to the predictable hypothesis, our empirical findings indicate that high efficiency stocks show favorable reactions to listing, while low efficiency stocks show no reactions.

INTRODUCTION

Prior studies suggest that a firm seeks exchange listing to improve liquidity/marketability for its stock, to provide an upward revision of its future performance, and to enhance pricing efficiency for its stock. Consequently, stockholders reactions to listing would depend on the prospects for these listing benefits. Empirical studies by Grammatikos and Papaioannou [13, 14], Edelman and Baker [7] and Baker and Edleman [1, 2] provide evidence that the prospects for listing benefits, measured by the prelisting attributes of stocks, affect stockholders' reactions to listings. For example, Grammatikos and Papaioannou [13], Edelman and Baker [7] and Baker and Edleman [1] find that stockholders respond more favorably to stocks with low pre-listing liquidity than to stocks with high pre-listing liquidity. Grammatikos and Papaioannou [14] and Baker and Edelman [1, 2] observe that stock-holders' reactions to listings are more favorable for firms that have poor performance in the pre-listing period than for firms that have better performance in the pre-listing period. However, no earlier studies have examined how pre-listing pricing efficiency of stocks affects stockholders' reactions to listing. If listing improves pricing efficiency, then stocks that are less efficiently priced in the pre-listing period are expected to benefit more from listing than stocks that are more efficiently priced.

The main purpose of this study is to examine the impact of pre-listing stock price efficiency on stockholders' reactions to listing on the New York Stock Exchange (NYSE). This study, therefore, adds another dimension to the empirical literature by explaining the valuation effects of listings in terms of the benefit of pricing efficiency.

Our results suggest that pre-listing pricing efficiency affects stockholders' reactions to listing, but in an unpredictable way. We find that high efficiency stocks show favorable reactions to listing, while low efficiency stocks earn normal returns. The regression results also show that there is a positive relationship between stock price reactions to listing and pre-listing pricing efficiency.

The paper is organized in the following way. The next three sections provide discussions of the listing procedure on the NYSE, the literature review on listing, and the motivation for the current study. These are followed by a description of the sample and methodology, empirical results, and conclusions.

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LITERATURE REVIEW

Listing Procedure On The NYSE

In order to obtain a listing on the NYSE, a firm must meet certain standards that include a minimum number of shares held by the public, a minimum market value for shares outstanding, a minimum pre-tax income, a minimum net tangible asset size etc. Before filing a formal application with the exchange, virtually all firms seek a confidential preliminary opinion from the exchange. This insures that the firm will be approved for listing once a formal application is filed. The application for listing is officially reported in the *NYSE Weekly Bulletin*, published on the first Friday following the day of formal application. Thus, investors become aware of a firm's intention to get listed during the application week. Approximately four weeks after the formal application is filed, the exchange renders a decision which is reported in the following Friday's *Weekly Bulletin*. The firm must also register with the Securities and Exchange Commission (*SEC*) before actual listing takes place. The typical time lag from formal application to listing is roughly two months.

Therefore, there are three relevant dates associated with listing: The application Friday, the approval Friday, and the listing day. The application Friday would be the benchmark date when market respond to listing news since almost all listing applications are approved by the exchange.

Stock Price Reaction And Listing Benefits

A number of studies have examined stock price reactions to listing on stock exchanges. Ule [26], Merjos [19, 20, 21], Van Horne [27], Furst [11], Goulet [12], Ying et al. [28] and Sanger and McConnell [23] find positive abnormal stock returns prior to listing and negative abnormal stock returns following listing. Sanger and McConnell [23] attribute the run-up in stock prices before the announcement of a formal application (application Friday) to insiders' actions and to the exceptional performance of the firms who decide to have their stocks listed. Ying et al. [28] suggest that the positive abnormal returns between formal application and actual listing may be due to emergence of more favorable news about the firm involved. The negative stock price behavior in the post-listing period still remains an unresolved issue. In order to explain the post-listing decline in stock prices, McConnell and Sanger [18] investigate several possible explanations such as outlier effects, original trading locale of the newly listed stocks, issuance of new stocks, dumping of stocks by insiders, correction of an overreactions. They, however, cannot provide a full explanation. In any event, the positive stock returns between application Friday and actual listing and the negative stock returns following listing are not consistent with the semi-strong version of market efficiency. In an efficient market, the informational value of listing should be reflected in stock prices when news about the intention to seek listing becomes public which is in the week of the application Friday.

The positive abnormal stock returns prior to listing and especially around application Friday indicate that listing offers certain benefits to the firm. A firm seeks listing to improve liquidity for its stocks, to provide positive information about its future prospects and to enhance pricing efficiency for its stocks.

Stock exchanges provide superior liquidity in that the cost of immediately trading listed stocks is lower than that of *OTC* stocks. The cost of liquidity is frequently measured by the bid-ask spread. Marsh and Rock [16] offer two possible explanations for narrower spreads on the exchanges. First, exchange investors, through limit order systems, can trade within the spread. In the *OTC* market, in contrast, trades take place only at the market makers' posted quotes. Second, buyers and sellers can interact directly on the floor of the exchange and readily negotiate a price between the bid and ask. In the *OTC* market, investors have no institutionalized mechanism for effecting the spread.

Empirical research on the liquidity gain of listing provides mixed results. Dubofsky and Groth [6], Fraser and Groth [10], Cooper et al. [5] and Sanger and McConnell [23] report that organized exchanges do not enhance liquidity of stocks. Grammatikos and Papaioannou [13], Hui and Heubel [16], Marsh and Rock [17] and Hasbrouck and Schwartz [15], on the other hand, conclude that organized exchanges provide a more liquid market for the trading of stocks.

Aside from improved liquidity, listing provides information about the future prospects of the firm. Management's decision to seek exchange listing and the independent evaluation of the firm's quality by the stock exchanges provide indications that the firm will prosper in the future. Grammatikos and Papaioannou [14] note

that a rational and responsible management will not pursue listing unless it feels confident that the firm can satisfy the continuous standards in the foreseeable future. The decision to list, therefore, carries significant information content.

Another motivation for listing is to improve pricing efficiency for the firm's stocks. Stock market efficiency implies that stock prices at any time fully reflect all available information.¹ Investors of listed stocks are expected to receive full and timely information about the firm and its operations. With the amendment of the Securities and Exchange Act in 1964 (which extended the disclosure requirement for the *OTC* stocks) and the introduction of NASDAQ, the pricing efficiency advantage of listed stocks might have diminished.

MOTIVATION FOR THE CURRENT STUDY

The motivation for the current study stems from prior empirical works by Grammatikos and Papaioannou [13, 14], Edelman and Baker [7] and Baker and Edelman [1, 2] who examine stock price reactions to listing on the basis of listing benefits. Specifically, these studies use certain pre-listing attributes of the firm that measure the prospects for listing gains and investigate whether stock price reactions to listing depend on these attributes. Stocks that expect to gain more from the proposed listing show more favorable reactions than stocks that expect to gain less.

The listing gains examined by these studies are liquidity and informational value about the firm's future prospects. Grammatikos and Papaioannou [13], Edelman and Baker [7] and Baker and Edelman [1] examine the liquidity benefit and conclude that stocks that are already highly liquid show little reaction to listing. This is because exchange listing provides little liquidity benefit to stocks that are highly liquid before listing. Along the same line of reasoning, Grammatikos and Papaioannou [14] and Baker and Edelman [1, 2] propose that listing conveys little information about a firm's favorable future prospects if the firm is already performing favorably in the pre-listing period. The low performers, on the other hand, can convey favorable information about their future performance more effectively through listing.

None of these studies, however, analyze stock market reactions to listing in terms of the pre-listing pricing efficiency. Although prior empirical findings of positive stock returns between application Friday and actual listing and the negative stock returns after listing are inconsistent with the efficient market hypothesis, they do not suggest that stock market reactions to listing vary by the prospects for pricing-efficiency gain. It is not known whether stockholders' reactions to listing depend on the pre-listing pricing efficiency. Along the same line of reasoning used for liquidity and information about future prospects, we argue that stocks that are more efficiently priced prior to listing have little to gain from listing. As a result, these stocks would show little reactions to listing.

In light of the preceding discussion, the predictable hypothesis for this study is stated as follows: Stock price reactions to listing are higher for low efficiency stocks in the pre-listing period than for high efficiency stocks.

SAMPLE AND METHODOLOGY

Sample

We identify an initial sample of 1032 firms from the *NYSE Fact Book* that have moved from the *OTC* market to the NYSE. The sample period spans 1976 to 1987. We then screen this initial sample based on the following criteria:

1. Necessary daily stock returns and bid and ask prices before listing must be available on the *NASDAQ/OTC* tape.²
2. Necessary daily stock returns following listing must be available on the *CRSP* tape.
3. Necessary quarterly earnings per share (*EPS*) data must be available on the *Standard & Poor's Stock Reports*.

The final sample consists of 164 firms. The average asset size and average net income of these firms in the year before listing were \$599 million and \$18 million, respectively, which indicate that large and profitable firms get listed on the NYSE. The average sales of these firms were \$357 million, average long-term debt obligations were \$63 million, and average size of common equity was \$116 million.

Pre-Listing Pricing Efficiency

We use a weak-form test to determine pricing efficiency of the 164 stocks in the final sample for the pre-listing period. Weak-form theory assumes that the only information of interest in the price forming mechanism is past prices. It asserts that successive price changes will be independent, i.e., resemble a random walk. The examination of weak-form efficiency in this study includes the test of independence of stock price changes. Following the work of Fama [8], the serial correlation coefficient, computed in the following way, provides a measure of independence of stock price changes:

Equation 1

$$R_{jt} = a_j + b_j R_{j,t-1} + e_j$$

where $R_{j,t}$ is the stock return for firm j on day t . If independence is supported, b_j the serial correlation coefficient, should be close to zero. A large negative value and a large positive value of b_j , both indicate that the stocks are less efficiently priced. As a result, there would not be a monotonic relationship between b_j and stock price reactions to listing. To overcome this problem, the absolute value of b_j (hereafter, SC denotes absolute value of b_j), not the sign, is used as a measure of pricing efficiency. Common stocks with higher of SC are less efficiently priced and would presumably gain most from listing.

Following equation 1, we first estimate b_j for each of the 164 firms in our sample by regressing the daily stock returns on the one-day lagged daily stock returns. Daily stock returns from trading day $t=-360$ through trading day $t=-61$ (with respect to the day of listing, $t=0$) is used for the regression. The daily stock returns are obtained from the *NASDAQ/OTC* tape. We then drop the signs of the estimated b_j s and use their absolute values, SC s, for our analysis. Table 1 shows the distribution of SC for the sample of 164 firms. The most efficiently priced stocks have SC of less than 0.05. The least efficiently priced stocks have SC of more than 0.35. The median SC is 0.1529. After ranking the firms in decreasing order of SC , we use the median value of $SC=0.1529$ to separate low efficiency firms (high SC s, 82 firms) from high efficiency firms (low SC s, 82 firms). This arbitrary procedure of splitting the sample by the median value is used by a number of prior studies on exchange listing. For example, Edelman and Baker [7], Baker and Edelman [1] and Grammatikos and Papaioannou [13] have used the median spread to divide their samples into high liquidity and low liquidity firms. Baker and Edelman [1, 2] and Grammatikos and Papaioannou [14] have used the median value of profitability index to separate high performers from low performers. In the context of the present study, firms with SC s greater than the median SC are low efficiency firms, while firms with SC s lower than the median SC are high efficiency firms. If exchange listing improves pricing efficiency of stocks, the low efficiency firms would benefit more than the high efficiency firms.

TABLE 1
Distribution Of Absolute Serial Correlation Coefficients (SC)

Absolute Serial Correlation Coefficients (SC)	Number of Firms
$SC \geq .35$	4
$.30 \leq SC < .35$	9
$.25 \leq SC < .30$	13
$.20 \leq SC < .25$	31
$.15 \leq SC < .20$	29
$.10 \leq SC < .15$	37
$.05 \leq SC < .10$	27
$SC < .05$	14
Total	164

Stock Price Reactions To Listing

Following Mikkelsen and Partch [22], stock price reactions around listing activities are measured by the prediction errors. The prediction error, PE , for firm j on day t is computed as follows:

Equation 2

$$PE_{jt} = R_{jt} - (\alpha_j + \beta_j R_{mt})$$

where R_{jt} is the return for security j on day t and R_{mt} is the return on the *CRSP* equally weighted index on day t . α_j and β_j are the estimated values of the market model parameters. The estimation period spans 300 days, from $t=-360$ to $t=-61$, with $t=0$ being the day of the listing reported in the *NYSE Fact Book*.

For a sample of N firms, the cumulative average prediction error ($ACPE$) from $t=T1$ to $t=T2$ is expressed as:

Equation 3

$$ACPE_{T1,T2} = \frac{1}{N} \left[\sum_{j=1}^N \left(\sum_{t=T1}^{T2} PE_{jt} \right) \right]$$

The test statistic for the $ACPE$ is given by:

Equation 4

$$Z = \frac{1}{\sqrt{N}} \left[\sum_{j=1}^N \left(\sum_{t=T1}^{T2} \frac{PE_{jt}}{S_{jt}} \right) \right]$$

where S_{jt} is the square root of the adjusted residual variance from the market model.

Regression Analysis

A regression analysis is employed to examine the association between abnormal stock returns associated with listing and prelisting pricing efficiency, liquidity, and earnings record (a proxy for informational value). Although the main focus of this study is pre-listing pricing efficiency, we include liquidity and earnings record in our regression analysis to control for their effects. The regression model is given below:

Equation 5

$$CPE_j = \beta_0 + \beta_1 SC_j + \beta_2 SP_j + \beta_3 E_j + \epsilon_j$$

where:

$CPE_j = \sum PE_{jt}$ from $t=T1$ to $t=T2$; measures stock price reaction to listing for firm j .

SC_j = absolute value of b_j estimated in equation 2; measures pre-listing pricing efficiency for firm j .

SP_j = average percent spread; measures pre-listing liquidity for firm j .³

E_j = average percent change of the four-quarter moving cumulative *EPS*; measures pre-listing earnings record for firm j .⁴

$\beta_i (i=0,1,2,3)$ are model parameters.

ϵ_j = model error term.

An examination of the estimated model parameters, $\beta_i (i=0,1,2,3)$, explains whether stockholders' reactions to listings depend on the pre-listing attributes, and, therefore, on the prospects for listing gains. The sign of estimated β_1 is likely to be positive because we expect that high $CPEs$ would be associated with high SCs (less efficiently priced stocks). In other words, stockholders will react more favorably if their stocks are less efficiently priced in

the pre-listing period. The sign of β_2 is likely to be positive because high *CPEs* would be associated with high *SPs* (less liquid stocks). We expect a negative sign for β_3 because it would indicate that firms with lower *Es* (low performers) earn higher *CPEs*.

EMPIRICAL RESULTS

Stock Price Reactions

We present abnormal stock returns associated with listing for both pre-listing and post-listing intervals. With $t=0$ being the day of listing, we use a pre-listing period from $t=-60$ to $t=0$ and a post-listing period from $t=+1$ to $t=+20$.⁵

Table 2 shows that the pre-listing *ACPE* for the total sample is 2.0 percent ($Z\text{-value}=2.41$). This finding of positive prelisting stock price reactions is consistent with those of prior empirical studies. The positive stock market reactions in the pre-listing period indicate that listing on stock exchanges provides benefits to the firm and its stockholders. One of the listing benefits is improved pricing efficiency. We hypothesized that stockholders' reactions would be more favorable for less efficiently priced stocks than for more efficiently priced stocks. Our empirical findings, however, suggest the contrary. We find that firms with low pre-listing pricing efficiency earn normal stock returns in the pre-listing period, while firms with high pre-listing pricing efficiency earn positive stock returns. From $t=-60$ to $t=0$, the *ACPE* is 0.1 percent ($Z\text{-value}=1.00$) for the low efficiency group, while 4.2 percent ($Z\text{-value}=2.59$) for the high efficiency group. The positive stock returns for the total sample, therefore, can be attributed to the positive stock returns to the high efficiency stocks.

The above findings, therefore, indicate that stockholders perceive the prospect for pricing efficiency gain to be less for low efficiency than for high efficiency stocks. Although, these stock return findings by pre-listing pricing efficiency contradict our predictable hypothesis, we cannot rule out other possibilities to explain the phenomena. One possible explanation can be drawn from an argument provided in the dividend literature. Bhattacharya [3] and Miller and Rock [23] argue the dividend-signalling model should apply to financially healthy firms, and not to financially-weak firms. Miller and Rock [23] state that in a world of rational expectations, dividends, for all their pleasant connotations, cannot turn a loser into a winner. Our present findings on exchange listing may also suggest the same phenomenon. Exchange listing provides information about the future pricing efficiency only to those stocks that are already efficiently priced. Exchange listing by low efficiency stocks may not give the market the impression that pricing efficiency will improve. As a result, low efficiency stocks do not react to exchange listing, while high efficiency stocks react positively to exchange listing.

The negative post-listing abnormal stock returns reported in Table 2 are also consistent with the findings by prior studies. From $t=+1$ to $t=+20$, the *ACPE* is -2.5 percent ($Z\text{-value}=-3.17$) for the total sample. We also find that the post-listing stock price behavior varies by the pre-listing pricing efficiency. In the post-listing period, stocks in the low efficiency group earn normal returns, whereas, stocks in the high efficiency group exhibit *ACPE* of -5.1 percent ($Z\text{-value}=-3.83$). The negative stock return of -5.1 percent for the high efficiency sample, therefore, wipes out the positive gain of 4.2 percent in the pre-listing period. Therefore, when stock returns are considered from $t=-60$ to $t=+20$, exchange listing does not benefit stockholders.

Regression Results

The results of regression equation 5 are presented in Table 3. Four regression models are used. The first two models use *CPEs* from the pre-listing interval, from $t=-60$ to $t=0$, while the following two models use *CPEs* from the post-listing period, from $t=+1$ to $t=+20$. The findings of the first two models indicate that only *SC* (pre-listing pricing efficiency) explains stock price reactions. The coefficient of *SC* is -0.3380 ($t=-2.17$, $F\text{-value}=4.72$). When *SD* (pre-listing liquidity) and *E* (pre-listing performance index) are added to the regression model, the F-value falls to 1.56 which is insignificant at the 5 percent level. The negative sign of the coefficient of *SC* indicates that stock with high pricing efficiency earn higher abnormal stock returns. This is consistent with our earlier findings reported in Table 2. The regression models for the post-listing *CPEs* suggest that none of the pre-listing attributes can explain the post-listing stock returns. None of the coefficients are significant at the 5 percent level. Therefore, the post-listing negative stock returns may be due to other reasons that are left for further research.

TABLE 2
The Cumulative Average Prediction Errors (ACPE) For Total
Sample, And For High And Low Pricing Efficiency Firms.
 $t=0$ Is The Day Of Listing. The z-values Are In Parentheses.

	Pre-Listing Interval ($t=-60$ to $t=0$)		Post-Listing Interval ($t=+1$ to $t=+20$)	
	ACPE	Percent Positive Returns	ACPE	Percent Positive Returns
Total Sample (N=164)	0.020 (2.41)*	57.3	-0.025 (-3.17)**	37.2
Low Efficiency (N=82)	0.001 (1.00)	53.7	-0.011 (-0.78)	42.7
High Efficiency (N=82)	0.042 (2.59)*	59.8	-0.051 (-3.83)**	31.7

*Significant at the 5 percent level.

**Significant at the 1 percent level.

TABLE 3
Regression Results, $N=164$.
The t-values Are In Parentheses

Dependent Variable	Intercept	Pricing Efficiency SC	Liquidity SC	Earnings Record E	F
$CPE_{t=-60 \text{ to } t=-1}$	0.074 (2.61)**	-0.338 (-2.17)*			4.72*
$CPE_{t=-60 \text{ to } t=-1}$	0.073 (0.07)	-0.338 (-2.15)*	-0.009 (-0.01)	-0.001 (-0.09)	1.56
$CPE_{t=+1 \text{ to } t=+20}$	-0.029 (-1.59)	0.029 (0.29)			0.08
$CPE_{t=+1 \text{ to } t=+20}$	-0.031 (-1.25)	0.034 (0.34)	0.328 (0.69)	-0.007 (-1.08)	0.59

*Significant at the 5 percent level.

**Significant at the 1 percent level.

CONCLUSIONS

The study attempts to improve our understanding of stock price behavior around listing activities. Prior studies indicate that stock price reactions to exchange listing should depend on the prospects for certain listing benefits. The higher the prospects the higher would be the stock price reactions. The prospects for the listing benefits are measured by certain prelisting attributes of the firm.

This paper examines whether stock price behavior around listing can be explained by the listing benefit of improved pricing efficiency. The prospect for improved pricing efficiency is measured by the pre-listing pricing

efficiency of stocks. Stocks that are already efficiently priced before listing are expected to gain very little from listing in the form of improved pricing efficiency. In other words, listing cannot improve pricing efficiency of stocks that are already efficiently priced. It implies that only low efficiency stocks have the prospects of improving their pricing efficiency through listing. We, therefore, hypothesize that low efficiency stocks would exhibit higher reactions to listing than high efficiency stocks. Our findings, however, indicate the contrary. We find that high efficiency stocks earn positive abnormal returns in the pre-listing interval, while low efficiency stocks earn normal returns. The regression analyses show that pre-listing pricing efficiency is the only variable that explains abnormal stock returns to listing. We find a positive relationship between abnormal stock returns and prelisting pricing efficiency. We do not detect any associations between abnormal stock returns and pre-listing attributes of liquidity and informational value.

Our findings provide some interesting insights. First, stock price behavior around exchange listing can be explained only by the pre-listing pricing efficiency. Listing benefits of liquidity and informational value do not influence stock returns. Second, high efficiency stocks exhibit positive reactions to listing. A possible explanation for this phenomenon is that only the high efficiency stocks give the investors the impression that pricing efficiency can be improved through listing. This finding implies that only firms that are efficiently priced should seek exchange listing to improve their pricing efficiency. Finally, the negative stock returns in the post-listing interval stills remain a puzzle. Because of the negative returns, the high efficiency stocks lose their pre-listing gains. Therefore, listing may not be beneficial to the stockholders when post-listing negative returns are considered.

ENDNOTES

1. For a discussion on market efficiency, see Fama [8].
2. A potential problem with using stock returns from the *NASDAQ/OTC* tape is that the estimated market model parameters can be biased due to non-synchronous trading problem in the *OTC* market. Scholes and Williams [25] suggested an alternative procedure to reduce the bias. However, Brown and Warner [4] conclude that Scholes and Williams' [25] alternative procedure can reduce the bias, but does not significantly affect the power of the tests in event studies.
3. Following Grammatikos and Papaioannou [13], Edelman and Baker [7] and Baker and Edelman [1], we measure SP_j over a 300-day pre-listing period (from trading day $t=-360$ through trading day $t=-61$, with $t=0$ being the day of listing):

Equation 6

$$SP_2 = \frac{1}{300} \sum_{t=-61}^{-360} \frac{P_{at} - P_{bt}}{\frac{P_{at} + P_{bt}}{2}}$$

where P_{at} is the asked price on day t , and P_{bt} is the bid price on day t . Stocks with low average percent spread are more liquid before listing; stocks with high average percent spread are less liquid before listing.

4. Following Grammatikos and Papaioannou [14] and Baker and Edelman [1, 2], we use a firm's profitability index, E , as a proxy for its earnings record or future performance. The profitability index is the reciprocal of the coefficient of variation for the growth rate of a firm's quarterly earnings per share (*EPS*). Specifically, E is an average percent change of the four-quarter moving cumulative *EPS* for twelve quarters before the year of listing divided by the standard deviation of the percent change of the quarterly *EPS*. Firms with high E s are high performers and firms with low E s are low performers. Listing provides more information about future prospects for low performers than for high performers.
5. Since the typical time lag between listing application and actual listing is two months, we expect that stock prices from $t=-360$ to $t=-61$ will reflect the impacts of the announcements of listing application, listing approval and actual listing.

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