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Cost of Transacting and Expected Returns in the Nasdaq Market

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ABSTRACT

This article empirically examines the liquidity premium predicted by the Amihud and Mendelson (1986) model using Nasdaq data over the 1973–1990 period. The results support the model and are much stronger than for the New York Stock Exchange (NYSE), as reported by Chen and Kan (1989) and Eleswarapu and Reinganum (1993). I conjecture that the stronger evidence on the Nasdaq is due to the dealers' inside spreads on the Nasdaq being a better proxy for the actual cost of transacting than the quoted spreads on the NYSE, since the Nasdaq dealers do not face competition from limit orders or floor traders.

THIS ARTICLE EMPIRICALLY EXAMINES the equilibrium relation between the cost of transacting (demanding liquidity) and expected returns using data for Nasdaq stocks. Amihud and Mendelson (1986) (hereafter A&M) in a theoretical model show that investors need to be compensated with higher returns for holding stocks with larger bid-ask spreads. Although intuitively appealing, the empirical support has been weak in studies involving New York Stock Exchange (NYSE) data.[1]

Chen and Kan (1989) and Eleswarapu and Reinganum (1993) find that the initial empirical findings of Amihud and Mendelson (1986, 1989) are affected by their restrictive data selection criterion and methodology. In particular, Chen and Kan (1989) criticize the use of the pooled cross-section and time series regressions. Instead, they advocate the use of Fama and Macbeth (1973) type cross-sectional regressions. They show that overall the liquidity premium is not statistically distinguishable from zero with such a design. In addition, Eleswarapu and Reinganum (hereafter E&R) argue that the A&M criterion of requiring eleven complete years of data induces a selection bias. With the use of a modified sample selection, they find that liquidity is priced only in the January months.

There are several reasons why examining the relation between the cost of transacting and expected returns using the Nasdaq stock market data is of interest. First, there are likely differences in the accuracy with which the

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[1] With the exception of Brennan and Subrahmanyam (1996) who use a different measure of liquidity based on the market depth.

transaction costs can be measured on the Nasdaq and NYSE, due to the differences in their market structure. The inside quotes on the Nasdaq are likely to be a better proxy for the actual cost of transacting. On the NYSE, the quoted spreads are only representative in nature, with many of the transactions actually occurring inside the quotes.[2] For instance, they do not reflect "hidden" limit orders that would better the quotes. (The relevance of these hidden limit orders is stressed in McInish and Wood (1995) who find that 51 percent of the limit orders that would better the standing quotes are not incorporated.) Also, a market order can be crossed with floor traders or another market order that arrives simultaneously. Thus, the posted quotes on the NYSE do not give an accurate estimate of the cost of transacting. In fact, Petersen and Fialkowski (1994) estimate the correlation between the effective and posted spreads to be only 10 percent.

The inside bid and ask prices for Nasdaq stocks are likely to be better estimates of actual cost of a two-way trade, since the dealers do not face competition from public limit orders or floor traders. In fact, Huang and Stoll (1996) provide evidence that the probability of trade occurring inside the spreads is much higher on the NYSE than on the Nasdaq (especially for smaller trades). However, as Christie, Harris, and Schultz (1994) point out, for larger orders on the Nasdaq, the broker can obtain a price improvement by negotiating with the dealer directly. Thus it is acknowledged that using quoted spreads could imply that I am concentrating on the cost of transacting for smaller trades. An alternative would be to focus on the market depth as is done by Brennan and Subrahmanyam (1996).

Secondly, from a purely statistical point of view, Nasdaq stock data might provide a better opportunity to test the hypothesized relation due to the fact that there is a larger variance in the spreads of the Nasdaq stocks as compared to NYSE stocks. That is, there is more statistical power.

Thirdly, evidence of a significant liquidity premium on the Nasdaq has some potential policy implications for the firms. Huang and Stoll (1996) show that, after controlling for various firm characteristics, the cost of transacting is higher on the Nasdaq than for a comparable firm on the NYSE. Relatedly, Christie and Schultz (1994) suggest that Nasdaq dealers collude to "inflate" the quoted spreads. Any evidence that quoted spreads on the Nasdaq impact the long-run price determination would imply that firms are in fact bearing the costs (increase in cost of capital) of actions such as "collusion" that result in higher spreads. This would naturally raise the question as to why firms that are eligible to be listed on the NYSE choose to remain on the Nasdaq market.

Finally, in the previous tests (except Brennan and Subrahmanyam (1996)) of the A&M model using NYSE data, bid and ask spreads for a firm are measured by taking the average of the spreads of two days—beginning and end of the year. This obviously does not capture the variation of the spread for a partic-

[2] Several recent studies (Blume and Goldstein (1992), McInish and Wood (1995), and Petersen and Fialkowski (1994)) reiterate this point of distinguishing between the posted spreads and the actual cost of transacting.

ular firm within the year. This may be of concern given the findings by Fortin, Grube, and Joy (1989) of a seasonality in monthly spreads. This study uses daily spreads for Nasdaq stocks from 1973 onward.

The article is organized as follows. Section I describes the data and the portfolio formation methodology, and Section II presents the empirical results. I find that there is a positive and significant liquidity premium for Nasdaq stocks, with the result being robust to different methodologies and model specifications. The liquidity premium is higher during the January months. Unlike E&R, however, I find that it is statistically significant even in the non-January months. The final section concludes and summarizes the results.

I. Data and Methodology

The cross-sectional relation between monthly returns and relative bid-ask spreads is tested using Nasdaq stock data over the 1973–1990 period. The primary data consist of daily returns and bid and ask prices of Nasdaq stocks from the tapes provided by the Center for Research in Security Prices (CRSP). The data are pieced together from two different sources—the 1987 and the 1990 tapes. Until 1987, CRSP reported the actual daily closing bid and ask prices for all Nasdaq stocks. In subsequent years the tapes contain only the daily high and low for the National Market System (NMS) stocks. However, the spread data for these stocks are available on a supplementary tape. So for this study I use the 1987 Nasdaq tape in conjunction with the NMS data from the supplementary tape for the 1988–1990 period.

Monthly returns for each stock are computed by compounding the daily returns in each month. Similarly, for each stock the spread in a month is calculated by averaging the daily relative bid-ask spreads, where the relative spread of a day is the dollar bid-ask spread divided by the average of the closing bid and ask prices for the day. Also, the size of a firm in December is the average of the daily size over that particular month. The size of a firm on a particular day is the market value of equity.

The return-spread relation is tested using 49 equally-weighted portfolios. Stocks are placed into portfolios based on their estimated beta and average spread. I assign stocks to spread-based portfolios each year using the average of the stock's spread during January and December in the prior year. Once the stocks are assigned to a portfolio, the portfolio spread is updated every month using the previous month's spreads. Following E&R,[3] the exact portfolio formation procedure requires at least three years of complete data for a stock. Using the data over a three-year portfolio formation period, betas of individual stocks are estimated using market model regressions of monthly excess re-

[3] E&R point out the potential biases with the methodology used by A&M which requires that a firm survive over an entire eleven-year period. This would clearly induce a survivorship bias and would systematically exclude smaller firms. The latter issue would be particularly significant for Nasdaq firms since many of them disappear within an eleven-year period (see, for example, Seguin and Smoller (1995)).

turns (over the corresponding one-month Treasury bill return). The market index is the equally-weighted portfolio of all Nasdaq stocks.

Stocks are ranked and divided into seven equal groups based on their average spread in the last year of the three-year period. Each of these seven groups is then divided further into seven equal subgroups by ranking the stocks according to their estimated beta coefficients. Thus, there are 49 test portfolios with approximately equal numbers of stocks. The monthly returns of these portfolios during the following year (test year) are used to examine the cross-sectional relations. Note that the assignment of a stock to a particular beta/spread portfolio in a given test year depends on 1) the stock's average spread in the previous year, and 2) the stock's beta estimated with 36 months of preceding returns. A potential survivorship bias is avoided by including firms that disappear within a test year. The monthly portfolio returns in the test year are computed by averaging the excess returns of the stocks in each of the 49 portfolios every month. This portfolio formation procedure is repeated at the end of each year resulting in 15 test-year periods (1976–1990). The number of firms included in each test period ranges from 675 to 2,161 with a median number of 1,767.

Unconditional portfolio betas are computed using the monthly portfolio returns during the test-period years giving 180 months of portfolio return data (similar to Fama and French (1992)). Table I presents descriptive statistics for the 49 portfolios representing the average values over the 15 test-year periods. Portfolio spreads range from 1.87 percent to 32.53 percent, while betas vary between 0.46 and 1.38. High spread stocks tend to be high beta stocks. Also, as pointed out earlier, the observed variation in the portfolio spreads for the Nasdaq stocks is much higher than the comparable figures for NYSE (0.454 percent to 3.53 percent as reported in E&R). This should imply that one would have more statistical power in rejecting the null hypothesis using the Nasdaq stock data.

The average market value of a firm's equity in a particular portfolio is presented in the third cell of the table. It is calculated by averaging the market value of equity of the firms in the portfolio in December in the year preceding each test year. The average equity values range from $4 million to $1.27 billion. The bottom cell shows the average price observed at the end of the year preceding each test year. These prices range between $1.49 and $36.40. It may be observed that the high spread stocks tend to have smaller market capitalizations and lower prices.

II. Empirical Results

A. Fama-Macbeth type Cross-Sectional Regressions

The relation between expected returns and spreads for the 49 portfolios is initially tested with the Fama and MacBeth type cross-sectional regressions as done in Chen and Kan (1989) and E&R. I use beta and log(size) as the control variables in the regressions. Thus, excess returns of the portfolios are regressed on the beta, spread and log(size) each month. To be consistent with

Table I

Average Relative Bid-Ask Spread, Betas, Market Value of Equity and Price per Share for the 49 Portfolios of Nasdaq Firms

The portfolios are formed each year preceding the test year by ranking stocks into seven equal groups, based on their spread, and then dividing them into seven equal subgroups according to their estimated beta coefficients. The number of firms included in each test year ranges from 675 to 2,161. Each cell contains four entries. The top number is the relative bid-ask spread of the portfolio in percent. The portfolio spread is the average spread of the stocks in the year preceding the test year. The second number is the estimated portfolio beta computed with 180 months of portfolio return data (1976–1990). The third number is the market value of equity in millions of dollars, where the equity value of the firm is computed in December in the year preceding the test year. The bottom number is market price per share as of the end of the year preceding each test year. Portfolio spreads, market value of equity, and price are averaged over the 15 years, 1976–1990.

	Spread, [Beta], (Equity Value), Price							
	Beta group							
Spread Group	Lowest	2	3	4	5	6	Highest	Mean
Lowest	1.872 [0.533] (1278) 36.40	1.912 [0.581] (1263) 33.58	1.959 [0.663] (345) 29.58	1.955 [0.749] (322) 49.49	2.030 [0.802] (278) 26.60	2.093 [1.012] (252) 24.02	2.215 [1.235] (187) 19.62	2.005 [0.796] (561) 31.33
2	3.430 [0.516] (103) 25.75	3.429 [0.653] (97) 21.07	3.426 [0.768] (87) 19.34	3.445 [0.896] (93) 20.00	3.471 [0.984] (80) 16.36	3.439 [1.090] (65) 14.85	3.461 [1.337] (64) 12.95	3.443 [0.892] (84) 18.62
3	4.862 [0.531] (52) 19.35	4.821 [0.569] (51) 18.50	4.859 [0.788] (51) 15.49	4.882 [0.878] (56) 14.77	4.830 [1.033] (45) 12.68	4.852 [1.120] (39) 10.77	4.835 [1.382] (35) 9.45	4.849 [0.900] (47) 14.43
4	6.657 [0.461] (43) 16.85	6.632 [0.647] (36) 14.94	6.632 [0.791] (32) 13.63	6.681 [0.918] (28) 11.90	6.663 [1.044] (27) 10.06	6.627 [1.101] (23) 9.25	6.643 [1.336] (22) 6.99	6.643 [0.900] (30) 11.95
5	9.345 [0.573] (27) 13.17	9.333 [0.581] (28) 12.74	9.394 [0.830] (20) 9.93	9.349 [0.859] (17) 8.44	9.378 [1.069] (15) 7.08	9.365 [1.231] (13) 5.55	9.410 [1.335] (13) 4.93	9.368 [0.925] (19) 8.83
6	14.151 [0.621] (13) 7.65	14.167 [0.663] (15) 7.41	14.140 [0.815] (13) 6.49	14.226 [1.035] (9) 5.08	14.338 [1.100] (8) 4.48	14.147 [1.196] (9) 3.99	14.236 [1.371] (8) 3.00	14.201 [0.972] (11) 5.44
Highest	32.533 [0.691] (6) 3.49	31.341 [0.682] (5) 2.83	29.420 [0.741] (23) 2.93	30.262 [0.905] (5) 2.81	29.525 [1.053] (4) 2.06	29.665 [1.102] (4) 1.79	31.675 [1.271] (4) 1.49	30.632 [0.921] (8) 2.49
Mean	10.407 [0.561] (271) 17.53	10.233 [0.625] (214) 15.87	9.976 [0.771] (82) 13.92	10.115 [0.891] (76) 16.07	10.029 [1.012] (65) 11.33	10.027 [1.122] (58) 10.03	10.353 [1.324] (48) 8.35	10.163 [0.901] (109) 13.30

A&M and E&R studies of NYSE stocks, I initially compute portfolio spreads using the average relative spreads of the stocks in the year preceding each test year. The firm's average spread is computed by averaging the spread in the January and December months. (Of course, as reported later in the article, I repeat the analysis using portfolio spreads updated every month.) The average size of a portfolio is measured in December in the year preceding each test year. The time series averages of the coefficients from these monthly regressions and the corresponding standard errors are reported in Table II.

There is a positive and significant liquidity premium over all the months put together in the test period 1976–1990. This result for Nasdaq stocks contrasts with Chen and Kan (1989) and E&R who find that liquidity does not appear to be priced for NYSE stocks when examined over the entire year (twelve months). Apparently, the predictions of the A&M model hold in the Nasdaq market. This may be due to the fact that quoted spreads are a better proxy for the cost of transacting on the Nasdaq market as compared to the NYSE. As argued earlier in the article, in the Nasdaq market system the dealers do not compete with public limit orders, floor traders or other market orders, as is the case on the NYSE. For that reason, the results using the Nasdaq data are more likely to address the issue of whether the cost of transacting (and demanding liquidity) has long-term pricing implications.

The other issue that E&R raise is the evidence of a seasonality in the liquidity premium on the NYSE. They show that the point estimates for the liquidity premium are actually negative in the non-January months. Even in the case of Nasdaq, a seasonal effect is apparent with point estimates being higher in January. However, unlike E&R, from the regression of returns on the spread, beta, and size in the other months, a statistically significant and positive liquidity effect on expected returns is observed here. This result suggests that it would be hasty to conclude that liquidity is not priced in the other eleven months.

As pointed out earlier, for Nasdaq stocks we have the benefit of a long series of monthly spreads. All previous articles that have examined the A&M model estimate the average spreads using two observations per year. As a further refinement, I repeat the analysis as above but update the portfolio spreads every month. That is, in the cross-sectional regressions, portfolio spreads are updated every month by using the relative spread of the stocks in the month preceding each month of the test years. The results in Table III again show that stocks with larger spreads are in fact associated with higher expected returns, when all the months are aggregated together.

It is possible that the January versus non-January results in Table II are biased due to an errors-in-variable problem, since those regressions do not account for the possible monthly variations in spreads. This potential problem is mitigated here as I recompute the portfolio spreads every month. We can see that there is a significant positive liquidity premium in the non-January months as well as in January. Thus the results I obtain for the Nasdaq appear quite fundamentally different from those for the NYSE.

The coefficient of the spread variable is generally around 0.035, which implies a one percent increase in the spread raises the expected monthly

Table II

Estimates of Coefficients (Standard Errors) for Fama-Macbeth Type Regressions of Excess Returns for the 49 Portfolios of Nasdaq Firms with Annually Updated Spreads, 1976–1990

Assignment of a stock to a particular beta/spread portfolio in a given test year depends on two criteria: 1) the average spread in the previous year, and 2) a stock's beta estimated with 36 months of preceding returns. In the cross-sectional regression, the portfolio spread (S_{pt}) is computed from the average of the firm's spread in January and December months of the preceding year. The Size (equity value) is the value in December in the year preceding each test year. The portfolio beta (β_{pt}) is the unconditional beta; that is, it is computed using the monthly portfolio returns from all the test period years. The cross-sectional regression is fit in each month, t, of the test-period years. The coefficients are the time-series means with corresponding standard errors.

(A): $R_{pt} = a_0 + a_1\beta_{pt} + e_{pt}$

(B): $R_{pt} = b_0 + b_1 S_{pt} + e_{pt}$

(C): $R_{pt} = c_0 + c_1\beta_{pt} + c_2 S_{pt} + e_{pt}$

(D): $R_{pt} = d_0 + d_1 \text{Log(Size)} + e_{pt}$

(E): $R_{pt} = e_0 + e_1\beta_{pt} + e_2 S_{pt} + e_3 \text{Log(Size)} + e_{pt}$

Variable	(A)	(B)	(C)	(D)	(E)
All Months					
Beta	−0.0021		−0.0031		−0.0026
	(0.0047)		(0.0047)		(0.0049)
Avg. Spread		0.0256	0.0258		0.0394
		(0.0129)	(0.0133)		(0.0129)
Log(Size)				−0.0013	0.0004
				(0.0007)	(0.0007)
N	180	180	180	180	180
January					
Beta	0.0739		0.0679		0.0633
	(0.0204)		(0.0208)		(0.0215)
Avg. Spread		0.2435	0.2263		0.1749
		(0.0641)	(0.0657)		(0.0822)
Log(Size)				−0.0166	−0.0048
				(0.0029)	(0.0029)
N	15	15	15	15	15
Non-January					
Beta	−0.0090		−0.0095		−0.0086
	(0.0045)		(0.0045)		(0.0047)
Avg. Spread		0.0058	0.0076		0.0271
		(0.0117)	(0.0123)		(0.0116)
Log(Size)				0.0001	0.0008
				(0.0007)	(0.0007)
N	165	165	165	165	165

return by only 0.035 percent. This may be considered to be too small to have any significant economic implications. But the expected return would increase by one percent only when the average investor's holding period is one month.

Table III

Estimates of Coefficients (Standard Errors) for Fama-Macbeth Type Regressions of Excess Returns for the 49 Portfolios of Nasdaq Firms with Monthly Updated Spreads, 1976–1990

Assignment of a stock to a particular beta/spread portfolio in a given test year depends on two criteria: 1) the average spread in the previous year, and 2) a stock's beta estimated with 36 months of preceding returns. In the cross-sectional regression, the portfolio spread (S_{pt}) is computed from the firm's spread in the month preceding each month of the test year. The Size (equity value) is the value in December in the year preceding each test year. The portfolio beta (β_{pt}) is the unconditional beta; that is, it is computed using the monthly portfolio returns from all the test period years. The cross-sectional regression is fit in each month, t, of the test-period years. The coefficients are the time-series means with corresponding standard errors.

$$\text{(A):} \quad R_{pt} = a_0 + a_1\beta_{pt} + e_{pt}$$

$$\text{(B):} \quad R_{pt} = b_0 + b_1 S_{pt} + e_{pt}$$

$$\text{(C):} \quad R_{pt} = c_0 + c_1\beta_{pt} + c_2 S_{pt} + e_{pt}$$

$$\text{(D):} \quad R_{pt} = d_0 + d_1 \text{ Log(Size)} + e_{pt}$$

$$\text{(E):} \quad R_{pt} = e_0 + e_1\beta_{pt} + e_2 S_{pt} + e_3 \text{ Log(Size)} + e_{pt}$$

Variable	(A)	(B)	(C)	(D)	(E)
All Months					
Beta	−0.0021		−0.0022		−0.0023
	(0.0047)		(0.0048)		(0.0049)
Spread		0.0282	0.0289		0.0355
		(0.0124)	(0.0128)		(0.0135)
Log(Size)				−0.0013	0.0003
				(0.0007)	(0.0007)
N	180	180	180	180	180
January					
Beta	0.0739		0.0686		0.0627
	(0.0204)		(0.0209)		(0.0216)
Spread		0.2231	0.2079		0.1434
		(0.0544)	(0.0567)		(0.0634)
Log(Size)				−0.0166	−0.0057
				(0.0029)	(0.0023)
N	15	15	15	15	15
Non-January					
Beta	−0.0090		−0.0087		−0.0086
	(0.0045)		(0.0046)		(0.0047)
Spread		0.0105	0.0127		0.0257
		(0.0117)	(0.0123)		(0.0134)
Log(Size)				0.0001	0.0008
				(0.0007)	(0.0007)
N	165	165	165	165	165

In fact, a coefficient of 0.035 implies an average holding period of 29 months (1/0.035) for the Nasdaq stocks. In the context of A&M's model, investors with expected holding periods longer than 29 months will hold the high spread

Table IV

Tests of Seasonality and Time-Variation of Spreads

The average spreads are calculated using the spreads of the 49 portfolios of Nasdaq firms with monthly updated spreads from 1976–1990. The monthly averages are obtained by averaging the portfolio spreads each month across the 49 portfolios and the various years 1976–1990. Similarly, the yearly averages are calculated by averaging across all the portfolios and the months in a particular year.

Panel A: Monthly Average		Panel B: Yearly Average	
Month	Average Spread (%)	Year	Average Spread (%)
January	9.855	1976	11.926
February	9.578	1977	13.372
March	9.483	1978	11.210
April	9.532	1979	11.654
May	9.502	1980	11.610
June	9.427	1981	9.060
July	9.188	1982	7.761
August	9.249	1983	8.821
September	9.345	1984	8.910
October	9.868	1985	9.414
November	10.243	1986	9.493
December	10.324	1987	10.822
		1988	8.531
		1989	7.837
		1990	5.279

stocks, while the relatively smaller spread stocks will be held by investors with shorter investment horizons. Interestingly, the liquidity premium is higher in January with a point estimate of 0.143. This implies that the average holding period is about 7 months for an investor to be compensated fully for the cost of transacting. This is consistent with increased trading activity for the smaller stocks around the turn of the year for tax-loss purposes.

As was noted earlier, the high spread stocks tend to have very low prices. This raises the potential question whether the results are actually driven by a low-price effect. To test for this, I reestimate the full model in Table III by leaving out the highest spread portfolios, i.e., I estimate the cross-sectional regressions with only 42 portfolios. The coefficient of spread is 0.0529 with a corresponding t-statistic of 2.23. That is, the point estimate of the liquidity premium is actually higher after leaving out the high-spread stocks. Perhaps, this is due to the concave relation predicted by A&M.

Overall, the above results suggest that point estimates of the liquidity premium are much higher in January as compared to the rest of the year. Is it because the spreads are substantially higher at the turn of the year? Table IV, Panel A addresses this question by showing the average spread each month. There does not seem to be much variation, even though the percentage spreads are slightly higher in December.

Table V

Estimates of Coefficients (Standard Errors) of the Seemingly Unrelated Regressions (SUR) of Monthly Excess Returns of 10 Spread-Based Portfolios, 1974–1990

Assignment of a stock to a particular spread portfolio in a given test year depends on the average spread in the previous year. The portfolio spread (S_{pt}) in the regressions is estimated from the firms' spread in the month preceding each month of the test years. The size (equity value) is the value in December in the year preceding each test year. The portfolio beta (β_{pt}) is the unconditional beta; that is, it is computed using the monthly portfolio returns from all the test period years. *Jan** is a dummy variable used to indicate the January months. In each of the regressions, it is a system of ten equations with 204 time-series observations each, which are simultaneously fit using Zellner's (1962) SUR technique. The coefficients and standard errors account for the cross-portfolio correlation of the contemporaneous residuals.

(A): $R_{pt} = \alpha + \gamma_1 S_{pt} + \beta_p R_{mt} + \eta_{pt}$

(B): $R_{pt} = \alpha + \gamma_1 S_{pt} + \gamma_2 \text{ Log(Size)}_{pt} + \beta_p R_{mt} + \eta_{pt}$

(C): $R_{pt} = \alpha + \gamma_1 S_{pt} + \gamma_2 \text{ Jan*} S_{pt} + \beta_p R_{mt} + \eta_{pt}$

(D): $R_{pt} = \alpha + \gamma_1 S_{pt} + \gamma_2 \text{ Log(Size)}_{pt} + \gamma_3 \text{ Jan*} S_{pt} + \gamma_4 \text{ Jan*Log(Size)}_{pt} + \beta_p R_{mt} + \eta_{pt}$

Variable	(A)	(B)	(C)	(D)
Constant	0.0043	0.0042	0.0041	0.0043
	(0.0009)	(0.0009)	(0.0009)	(0.0009)
Spread	0.0284	0.0284	0.0252	0.0227
	(0.0073)	(0.0073)	(0.0073)	(0.0072)
Log(size)		0.0010		0.0032
		(0.0015)		(0.0017)
Jan*spread			0.0549	0.0585
			(0.0122)	(0.0122)
Jan*log(size)				−0.0217
				(0.0058)

A related issue is whether the quoted spreads change over time. It is reasonable that an investor is concerned about the future liquidity (spreads) when he/she wants to sell. If the spreads change through time, then current quoted spreads will be a poor proxy for liquidity. Table IV, Panel B shows that there is, in fact, substantial variation in the spreads on a yearly basis. I formally address the question of how well does the portfolio spread this year predict the average spread of next year by regressing $\text{Spread}_{p,t}$ on $\text{Spread}_{p,t-1}$, where the average spread is measured for each of the 49 portfolios in each test year. This regression has an R-square of 0.835, suggesting that portfolio spreads are good predictors of future spreads, even when there are variations in the average levels of spreads over time.

B. Seemingly Unrelated Regressions

The above analysis using the two-step Fama and Macbeth type regressions has a potential errors-in-variables problem. That is, errors in computing the

Table VI

Pearson Correlation Coefficients of the Portfolio Characteristics of the Nasdaq Stocks, 1976–1990

The correlations are computed using the data for the 49 portfolios formed on the basis of the firm's average spread in the preceding year and the firm's beta in the preceding three years. The sample requires the availability of the necessary data on both the Center for Research in Security Prices (CRSP) and COMPUSTAT files. Portfolio beta is computed using the monthly time-series data over the period 1976–1990. The average portfolio spread, Book/Market, and the Market Capitalization are obtained from the year preceding each test year. The book value of the firm is fiscal year-end value from the COMPUSTAT files.

Variable	Beta	Average Spread	Market Capitalization	Log(Book/Market)
Beta	1.000	0.046	−0.142	−0.444
Average spread		1.000	−0.162	0.438
Market capitalization			1.000	−0.080
Log(book/market)				1.000

betas would affect the inference on the spread variable in the second stage. Hence, I use Zellner's (1962) Seemingly Unrelated Regression (SUR) model, where the cross-sectional relation between portfolio spread and average return is tested while the portfolio betas are simultaneously estimated. This is equivalent to testing the hypothesis of whether the portfolio returns not explained by the capital asset pricing model (CAPM) are cross-sectionally explained by the spreads. The second advantage is that we account for the cross-portfolio correlation of the contemporaneous residuals.

With this approach, we can use more years of data since we do not have to compute betas in the first stage. Each year, starting in 1973, I group all the stocks into ten portfolios based on their average spreads during the year. The monthly returns of these portfolios in the following year are used for the SUR model. That is, we have a system of ten equations with each portfolio having 17 test-years (1974–1990) of monthly returns. As was done earlier, the portfolio spreads are updated in each month of the test-years using the portfolio spread from the preceding month. Thus, the spread-effect over all months of the test-years is studied using the following SUR model:

$$R_{pt} = \alpha + \gamma_1 S_{pt} + \beta_p R_{mt} + \eta_{pt}$$

$$t = 1, \ldots, 204, \quad \text{and} \quad p = 1, \ldots, 10. \qquad (1)$$

where:

R_{pt} = Excess return on portfolio p in month t.

S_{pt} = Average spread of stocks in portfolio p at the beginning of month t.

R_{mt} = Excess return on the market index in month t.

η_{pt} = Residual term for each portfolio in month t.

Table VII

Tests of the Liquidity Premium and the Book to Market Effects for the Nasdaq Stocks

Panel A: Estimates of Coefficients (Standard Errors) for Fama-Macbeth Type Regressions of Excess Returns for the 49 Portfolios of Nasdaq Firms, 1976–1990

In Panel A, assignment of a stock to a particular beta/spread portfolio in a given test year depends on two criteria: 1) the average spread in the previous year, and 2) a stock's beta estimated with 36 months of preceding returns. In addition, the firm should have the book value data in the year preceding the test year. In the cross-sectional regression, the portfolio spread (S_{pt}) and the Book/Market ratio are obtained from the year preceding each test year. The portfolio beta (β_{pt}) is computed using the monthly portfolio returns from all the test period years. The Size (equity value) is the value in December in the year preceding each test year. The cross-sectional regression is fit in each month, t, of the test-period years. The coefficients are the time-series means with corresponding standard errors.

(A): $R_{pt} = a_0 + a_1\beta_{pt} + e_{pt}$

(B): $R_{pt} = b_0 + b_1 S_{pt} + e_{pt}$

(C): $R_{pt} = c_0 + c_1\beta_{pt} + c_2 S_{pt} + e_{pt}$

(D): $R_{pt} = d_0 + d_1\beta_{pt} + d_2 S_{pt} + d_3 \text{ Log(Size)} + e_{pt}$

(E): $R_{pt} = e_0 + e_1 \text{ Log(Book/Market)} + e_{pt}$

(F): $R_{pt} = f_0 + f_1\beta_{pt} + f_2 \text{ Log(Size)} + f_3 \text{ Log(Book/Market)} + e_{pt}$

(G): $R_{pt} = g_0 + g_1\beta_{pt} + g_2 S_{pt} g_3 \text{ Log(Size)} + g_4 \text{ Log(Book/Market)} + e_{pt}$

Variable	(A)	(B)	(C)	(D)	(E)	(F)	(G)
Beta	−0.0028		−0.0033	−0.0038		0.0025	0.0031
	(0.0049)		(0.0049)	(0.0050)		(0.0047)	(0.0048)
Spread		0.0301	0.0299	0.0307			0.0292
		(0.0136)	(0.0138)	(0.0136)			(0.0138)
Log(size)				−0.0007		−0.0012	−0.0001
				(0.0008)		(0.0008)	(0.0008)
Log(book/market)					0.0095	0.0066	0.0057
					(0.0031)	(0.0020)	(0.0021)
N	180	180	180	180	180	180	180

Note that it is a system of ten equations with 204 time-series observations each, which are simultaneously fit using Zellner's (1962) SUR technique. That is, the beta is estimated for each portfolio and simultaneously the cross-sectional relation between portfolio spreads and return (γ_1) is estimated. Under this technique, the coefficients and standard errors account for the cross-portfolio correlation of the contemporaneous residuals.

Table V shows the estimates of this specification. The coefficient of spread (0.0284) is highly significant with an asymptotic t-value of 3.90. When I add Log(Size) as a control variable, there is still a significant positive relation between portfolio spreads and average returns.

Next, the issue of the seasonality is dealt with using a dummy variable (Jan) indicating the January months. By including additional variables Jan*Spread and Jan*Log(Size), I examine whether the overall Spread variable is still priced. The results, reported in Table V, clearly indicate the persistence of a

Table VII—*Continued*

Panel B: Estimates of Coefficients (Standard Errors) of the Seemingly Unrelated Regressions (SUR) of Monthly Excess Returns of 10 Spread-Based Portfolios of Nasdaq Firms, 1974–1990

In Panel B, assignment of a stock to a particular spread portfolio in a given test year depends on the average spread in the previous year. An additional criterion is the availability of the book value data from the COMPUSTAT file in the preceding year. The Size (equity value) is the value in December in the year preceding each test year. The portfolio spread (S_{pt}) in the regressions is estimated from the firms' spread in the month preceding each month of the test years. The Book/Market ratio is obtained from the year preceding each test year. The portfolio beta (β_{pt}) is computed using the monthly returns from all the test period years. In each of the regressions, it is a system of ten equations with 204 time-series observations each, which are simultaneously fit using Zellner's (1962) SUR technique. The coefficients and standard errors account for the cross-portfolio correlation of the contemporaneous residuals.

(A): $R_{pt} = \alpha + \gamma_1 S_{pt} + \beta_p R_{mt} + \eta_{pt}$

(*B*): $R_{pt} = \alpha + \gamma_1 \text{Log(Size)}_{pt} + \beta_p R_{mt} + \eta_{pt}$

(C): $R_{pt} = \alpha + \gamma_1 S_{pt} + \gamma_2 \text{ Log(Size)}_{pt} + \beta_p R_{mt} + \eta_{pt}$

(D): $R_{pt} = \alpha + \gamma_1 \text{ Log(Book/Market)}_{pt} + \beta_p R_{mt} + \eta_{pt}$

(E): $R_{pt} = \alpha + \gamma_1 \text{ Log(Size)}_{pt} + \gamma_2 \text{ Log(Book/Market)}_{pt} + \beta_p R_{mt} + \eta_{pt}$

(F): $R_{pt} = \alpha + \gamma_1 S_{pt} + \gamma_2 \text{ Log(Size)}_{pt} + \gamma_3 \text{ Log(Book/Market)}_{pt} + \beta_p R_{mt} + \eta_{pt}$

Variable	(A)	(B)	(C)	(D)	(E)	(F)
Constant	−0.0017	0.0025	−0.0106	0.0020	−0.0030	−0.0132
	(0.0009)	(0.0047)	(0.0058)	(0.0005)	(0.0051)	(0.0059)
Spread	0.0249		0.0309			0.0273
	(0.0075)		(0.0084)			(0.0086)
Log(size)		−0.0001	0.0008		0.0005	0.0012
		(0.0005)	(0.0005)		(0.0005)	(0.0006)
Log(book/market)				0.0028	0.0033	0.0024
				(0.0010)	(0.0012)	(0.0012)

significant spread effect even after removing the January influences! Of course, the point estimates for the spread variable are bigger in the January months. Also, as observed in several other studies, I find the coefficient of Log(Size) is significantly negative only in the January months.

C. Book / Market effect versus Liquidity Premium

A number of researchers such as Fama and French (1992) argue that the Book/Market ratio acts as a risk factor or at a minimum predicts expected returns. So far, I have not taken this variable into account. The relative spread could be related to this variable, with both of them proxying "distressed firms." Another interesting question is whether the Fama-French factors are actually a liquidity premium in disguise. Some papers such as Kothari, Shanken, and Sloan (1995) suggest liquidity as a possible explanation of the Book/Market effect. All this points to studying the incremental information of both these variables.

Thus, I repeat all the previous analyses so as to include log(Book/Market) as an explanatory variable. Of course, this implies that I need to form all my portfolios again with the additional criterion that the firm (and the book value data) should be available on the COMPUSTAT Annual Industrial Research tapes. The book value is the fiscal year-end value from the COMPUSTAT file, and the corresponding market value is the year-end value from the CRSP tapes. Repeating all the portfolio formation techniques followed earlier for the Fama-Macbeth type regressions results in a substantially smaller sample. Now, the median number of firms in a particular test year is 1,359, with the highest and the lowest number being 1,685 and 518, respectively. There is a 23 percent drop in the sample size, which is likely to reduce the statistical power of all the tests. In addition, the possible biases arising from the sample selection are not clear.

Before studying the issue of the liquidity premium versus the book/market effect, it may be worthwhile to look at the correlation coefficients of all the portfolio characteristics. Table VI shows the Pearson Correlation coefficients of the different variables. We can observe that the average spread, beta, and log(book/market) are all very highly correlated, i.e., they will act as proxies for each other. Therefore, trying to gauge the incremental contribution of each variable (statistically) may be difficult because of the high standard errors.

Table VII, Panel A shows the results of the Fama-Macbeth type cross-sectional results. In the full model (G), both spread and log(book/market) are highly significant, despite the fact that they are highly correlated! This suggests that there are two distinct effects—a liquidity premium and a book/market effect that is not explained by any of the other variables. That is, the observed book/market effect is not simply a liquidity premium in disguise.

Next, I repeat the portfolio formation procedures and the analysis to conduct the Seemingly Unrelated Regressions (SUR), with the additional criterion of the availability of the book value data in the year preceding each test year. Panel B of Table VII shows the results. Again, in the full model (F), both the spread and log(book/market) are priced.

Thus, overall the significance of the liquidity premium appears across various methodologies and use of other control variables. Also, there is a remarkable consistency of the point estimates of the spread variable. This can be seen in each of the different tables (II, III, V, and VII). In all cases, the values range between 0.028 and 0.035. This suggests that the results are robust to the estimation methods.

III. Concluding Remarks

This article empirically examines the liquidity premium predicted by the Amihud and Mendelson (1986) model using Nasdaq data over the 1973–1990 period. The results seem to strongly support the model: stocks with a larger spread yield a higher average return. This result contrasts with Chen and Kan (1989) and Eleswarapu and Reinganum (1993) who show that for the NYSE, evidence of a liquidity premium is weak.

In addition, I show that for Nasdaq stocks, although the spread effect is stronger (larger point estimates) in the January months, liquidity is also priced in the non-January months. Thus, the conclusions drawn by Eleswarapu and Reinganum (1993) appear true only for the NYSE stocks. I conjecture that the differences in the results are due to what quoted spreads represent in each market. In particular, the dealers' inside spreads on the Nasdaq are likely to better proxy the actual cost of transacting as compared to the specialist's representative quotes on the NYSE.

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