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The Relation Between Common Stock Returns Trading Activity and Market Value

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ABSTRACT

This study examines the relation between common stock returns, trading activity and market value. Our results indicate that although firm size and trading activity are highly correlated, differences in trading activity are not the underlying reason for the firm size anomaly, the finding of systematic differences in risk adjusted returns across stocks of firms of different size.

RECENT EMPIRICAL RESEARCH has revealed systematic differences in risk adjusted returns for common stocks of firms of different sizes as measured by the market value of outstanding common stock (see Banz [1] and Reinganum [5]). Roll [7], in a recent paper, has suggested that the firm size anomaly may result from errors in risk measurement. In particular, Roll suggested that because small firms trade less frequently than large firms, risk measures obtained from daily or weekly returns data may seriously underestimate the risk associated with holding a portfolio of small firms. In response to Roll's conjecture, Reinganum [6] examined the risk adjusted returns of portfolios formed on the basis of firm size, using both the Scholes-Williams [8] and the Dimson [2] aggregated coefficient method of estimating portfolio betas, and found that regardless of the beta estimation technique employed, differences in estimated betas were insufficient to account for differences observed in the returns of size ranked portfolios.

If Reinganum's [6] finding is correct that the firm size effect is not attributable to a misassessment of risk and if smaller firms trade less frequently than do larger firms, then firm size may merely proxy for trading activity.[1] Thus, the observed firm size effect may be explained in terms of a liquidity premium associated with inactively traded shares. The purpose of this paper is to determine whether or not the firm size anomaly is explicable in terms of differences in the trading activity of common stocks.

A liquidity premium would provide a logically appealing explanation for the firm size effect. Tinic [11], Demsetz [3] and others have argued that transactions costs vary inversely with trading activity (as measured by average number of

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[1] The values of lagged coefficients estimated by Reinganum [6] in constructing aggregated coefficients beta, suggests that nontrading is a much more serious problem for small firms than large firms.

shares traded).[2] Since in equilibrium the risk adjusted expected returns net of transactions costs should be equated across all securities, an inverse relationship between transactions costs and trading activity provides an economic justification for a liquidity premium for inactively traded shares. The higher risk adjusted returns observed for small firms may simply reflect higher transactions costs associated with inactively traded firms.[3]

In this paper we examine the relation between common stock returns, trading activity and firm size. If firm size serves merely as a proxy for trading activity and there is a liquidity premium for inactively traded shares, then there should be an inverse relationship between returns and trading activity. Further, if differences in trading activity fully explain the firm size effect, then no relationship should exist between returns and firm size, when trading activity is held constant. On the other hand, failure to find a relationship between common stock returns and trading activity would be inconsistent with the existence of a liquidity premium.

A direct examination of the relationship between firm size and trading activity can also be used to determine whether the firm size effect results from a misassessment of risk. Without directly examining the relationship among stock returns, size and trading activity, one is forced to test the joint hypothesis that the technique used to estimate beta when infrequent trading exists is appropriate and that excess returns and firm size are related.[4] However, even if errors in beta estimates are systematically related to trading activity, by examining the size effect while holding trading activity constant, one can determine whether the size effect is attributable to differences in trading activity. The persistence of a firm size effect when differences in trading activity are controlled would provide direct evidence that the firm size effect does not result entirely from a misassessment of risk caused by infrequent trading.

We find that trading activity and firm size are highly correlated. However, no significant difference in mean daily risk adjusted returns is observed between portfolios of the most actively traded firms (as measured by average daily trading volume or number of days traded) and portfolios of the least actively traded firms. Moreover, holding trading activity constant mean daily returns and risk adjusted returns appear to be related to firm size.

The paper is organized as follows: The data base used and sample selection

[2] Tinic [11] and Demsetz [3] find a negative and statistically significant relationship between bid/ask spreads and trading activity. The size of the spread, they argue, is directly related to the cost of the broker/dealer providing liquidity services.

[3] Stoll and Whaley [9] examine the relationship between transactions costs and the small firm effect. They find that transactions costs (measured in terms of year-end bid-ask spreads and commission fees) are higher for the smallest listed firms (trading costs of 6.77 percent versus 2.87 percent for the largest firms).

[4] A direct examination of trading activity permits an evaluation of the appropriateness of techniques used to estimate beta when infrequent trading is present. In particular, Scholes and Williams' correction for nonsynchronous trading assumes daily but not continuous trading. Dimson's methodology, on the other hand, does not require daily trading. However, the choice of the appropriate lead and lag structure to employ in estimating the aggregated betas does require an assumption regarding the frequency of trading. Moreover, a recent study by Fowler and Rorke [4] suggests that Dimson's methodology may not produce consistent estimates of beta.

procedure are described in Section 2. The empirical results are presented in Section 3 and our conclusions constitute Section 4.

2. Data and Sample Selection

Daily common stock returns and trading volume information for the NYSE and AMEX firms examined in this study were obtained from the Data Resources Incorporated (DRI) securities file.[5] The value weighted market index used was obtained from the 1980 version of the CRSP daily returns file.

Due to the cost of obtaining stock returns and trading information from DRI, all NYSE and AMEX traded firms for the period 1975 to 1981 could not be included in the sample. Instead, 500 issues were selected for each of the four years; 1975, 1977, 1978 and 1979.[6] Since our primary purpose is to examine the size effect and its relationship to trading activity, a stratified random sample was employed to ensure that an equal number of firms from each size decile was included in the sample. Each year all firms with common stocks traded on the NYSE and AMEX were ranked based on the aggregate market value of their outstanding common stock. This ranking was divided into deciles (each decile containing about 250 issues).[7] 50 firms were selected at random from each decile yielding a total sample of 500 stocks for each year.

For each firm contained in our sample two measures of trading activity were calculated: (1) Average daily trading volume (measured in number of shares traded),[8] and (2) Number of trading days (measured by the number of days per year a trade in the stock was recorded). The number of trading days is a measure of trading activity that avoids possible distortion due to infrequent but large block transactions. The rankings of firms based on these two measures of trading activity are highly correlated and our results are invariant with respect to the measure employed.[9]

3. Portfolio Results

For each of 4 sample years 3 sets of 10 equally weighted portfolios were constructed. For the first set of portfolios, firms were ranked on the basis of market value at the beginning of each year and assigned to a portfolio based on

[5] DRI obtains this information from Telstat Inc., which supplies price and trading information to the *Wall Street Journal* and other financial publications. DRI files contain price information for NYSE and AMEX firms from 1970 to 1981. However, price data prior to 1975 are not verified by DRI for accuracy and therefore were not included in the sample.

[6] These years were selected randomly.

[7] The market value of common stock for all NYSE-AMEX firms was obtained from the *Compustat Industrial File* as of December 31 of the year immediately preceding the year analyzed.

[8] In addition to computing the average daily trading volume for each firm, the average dollar volume of trading was also computed. The rankings of firms based on these two measures were highly correlated (the yearly rank correlations ranged from .86 to .94).

[9] The stability of trading activity rankings within each year were examined to determine whether our results might be affected by the use of contemporaneous (i.e., trading activity calculated over the same period as mean returns are calculated) as opposed to historical trading activity measures. Rankings based on January and December trading volume were compared to each other as well as to rankings based on trading for the entire year. The rank correlations all exceeded .87 indicating considerable stability in the rankings.

their market value ranking. The second set of portfolios was constructed by ranking firms on the basis of average daily trading volume during the year and assigning firms to portfolios based on their trading volume ranking. The third set of portfolios was constructed by ranking firms on the basis of the number of days the firm's stock traded during the year and assigning firms to portfolios based on this ranking.

Table 1 summarizes the characteristics of the market value portfolios. As column 2 indicates, firms in the smallest size ranked portfolio have a substantially higher mean daily return (.13 percent) than firms in the largest size ranked portfolio (.053 percent).[10] The difference between the mean daily return of the largest firms and smallest firms is significant at the .01 level.[11] Risk adjusted returns, using the OLS beta estimates contained in column 4, were also calculated. The mean risk adjusted return for the smallest size portfolio is significantly larger (at the .01 level) than the mean risk adjusted return for the largest size portfolio.[12] Our findings are consistent with a firm size effect as found by Banz [2] and Reinganum [5].

Table 1 reveals an obvious positive association between mean daily trading volume and firm size as well as between the number of firms in the portfolio trading daily and firm size; for example, more than half of the stocks in the five smallest firm size portfolios did not trade daily. The relationship between trading activity and firm size suggests, therefore, that the firm size effect may result from differences in the trading frequency of size ranked portfolios.

The relationship between trading activity and firm size may explain the firm size effect because of a liquidity premium or, as Roll conjectures, because of a downward bias in the beta estimates of small firms resulting from infrequent trading. If the firm size effect results from bias in beta estimates, use of an estimating procedure which results in consistent estimates of those parameters should resolve the small firm anomaly. In a manner similar to Reinganum [6],

[10] The mean return was calculated by combining the portfolio returns series for each of the four years and then taking the arithmetic mean. The other descriptive statistics presented in Table 1 were also calculated based on returns for the four year period.

[11] The test statistic used is distributed F(1, 1003) and is computed as

$$(n-2)\frac{(\bar{x}_1-\bar{x}_s)^2}{(\sigma_1^2+\sigma_s^2-2\operatorname{cov}(x_1, x_s))}$$

where the subscripts 1, s refer to the largest and smallest size portfolios respectively. The calculated F is 7.83. For each of the 4 years the smallest size portfolio had a statistically significant higher mean daily return than the largest size portfolio (at the .01 level).

[12] Risk adjusted returns were calculated by subtracting from the daily return series the OLS estimate of beta times the return on the market portfolio. Formally, if the data are consistent with the CAPM then:

$$E(R_1)-E(R_{10})-(\hat{\beta}_1-\hat{\beta}_{10})E(R_m-R_f)=0$$

Where R_1 and R_{10} refer to the daily return of the largest and smallest portfolio and $\hat{\beta}_1$, $\hat{\beta}_0$ are the betas estimated for portfolios 1 and 10 respectively. Instead of using $R_m - R_f$ as the market risk premium, the return on the market portfolio was used. To the extent that R_m overstates the market risk premium, the test is biased against rejecting the hypothesis of no difference in the risk adjusted returns. The test statistic described in footnote 11 was used to test the difference in the mean risk adjusted returns.

Table 1

Portfolios Constructed on the Basis of Firm Size

(1) Portfolio (Deciles)	(2) Mean Daily Return	(3) σ_p/σ_m[1]	(4) OLS Beta[2]	(5) Aggregated Beta	(6) Median Size[3]	(7) Trading Volume[4]	(8) Avg. # of Firms Not Trading Daily[5]
1 (Largest)	.053%	1.13	.98 (99.19)	.97	$1,457	50,108	5
2	.073%	1.13	.94 (99.10)	1.15	$ 567	24,980	7.25
3	.091%	1.16	.94 (69.93)	1.22	$ 272	18,918	11.5
4	.112%	1.31	1.03 (55.14)	1.29	$ 128	14,658	18
5	.121%	1.37	1.06 (50.99)	1.39	$ 85	10,945	23.5
6	.129%	1.38	.95 (37.32)	1.40	$ 46	6,534	32.25
7	.119%	1.32	.87 (33.26)	1.49	$ 28	5,879	38.79
8	.128%	1.35	.80 (27.13)	1.38	$ 16	2,526	42.75
9	.132%	1.37	.72 (22.28)	1.30	$ 9	1,866	46.25
10 (Smallest)	.134%	1.42	.61 (17.09)	1.23	$ 3	1,073	50

[1] The ratio of the standard deviation of portfolio returns, σ_p, and the standard deviation of the returns on the market portfolio, σ_m.

[2] t statistics are in parentheses;

[3] Calculated by obtaining the median firm size (in millions of dollars) in each portfolio for each year and then averaging over the four years;

[4] Calculated by computing the average number of shares traded per day for each portfolio and then taking the average of this series over the four-year period;

[5] Calculated by determining the number of firms not trading daily in each year and then computing the average over 4 years.

portfolio betas were computed using the aggregated coefficients techniques proposed by Dimson [2].[13] Aggregated betas (computed using 10 lagged and 5 leading market returns) for the size ranked portfolios are presented in column 5 of Table 1. A comparison of the OLS beta estimates to the aggregated beta estimates indicates that use of the aggregated coefficient method results in a substantial increase in the estimated betas, particularly for the smallest size portfolios. To determine whether the difference in aggregated betas between the largest and smallest firm portfolios (−.265) is sufficient to explain the difference in mean returns (−.081 percent), risk adjusted returns using aggregated beta estimates were calculated for each portfolio. Risk adjusted returns were calculated by subtracting from the daily return series the aggregated beta estimates times the return on the market portfolio. If the difference in betas fully explains the difference in returns, the difference in mean risk adjusted returns of the largest and smallest firms will be insignificantly different from zero. However, the mean difference in risk adjusted returns is −.065 percent which is significantly different from zero at the .05 level.[14]

To summarize, trading activity and firm size appear to be highly correlated. The average daily trading volume and number of trading days of firms in each portfolio indicate that smaller firms trade substantially less frequently than do larger firms. However, the bias in beta estimates induced by infrequent trading does not appear large enough to explain the difference between the mean daily return of large and small firms.

If differences in trading activity are the cause of the return differences associated with firm size due to the existence of a liquidity premium, then an inverse relationship between mean daily returns and trading activity should be observed. Mean daily returns for portfolios formed on the basis of trading volume and trading day rankings are contained in Tables 2 and 3 respectively. In contrast to the inverse relationship observed between returns and firm size, there is no significant difference between the mean returns of the highest and lowest trading activity portfolios, nor is there any evidence of an inverse relationship between trading activity and mean daily returns.[15]

[13] Aggregated betas were obtained by estimating;

$$R_{p,t} = \alpha_0 + \textstyle\sum_{k=-n}^{+n} \beta_{pk} R_{m,t+k} + w_{p,t}$$

where

$$\begin{aligned} R_{p,t} &= \text{Return on portfolio } p \text{ at time } t \\ R_{m,t+k} &= \text{Return on the market index at time } t+k,\ k = (-10 \cdots +5) \\ w_{p,t} &= \text{Error term.} \end{aligned}$$

The aggregated beta is equal to the sum of the estimated slope coefficients.

$$\hat{\beta}_{p,k},\ k = (-10 \cdots +5)$$

[14] The test statistic described in footnote 11 was used to test the difference in mean risk adjusted returns. The F statistic is 6.63.

[15] Using the test procedures described in footnotes 11 and 12, the difference in mean returns or risk adjusted returns between the highest and lowest trading volume (or trading days) portfolios (using either OLS or aggregated beta estimates) were not found to be significantly different from zero at the .10 level.

Table 2

Portfolios Constructed on the Basis of Trading Volume Rankings

(1) Portfolio	(2) Mean Daily Return	(3) σ_p/σ_m^1	(4) OLS Beta[2]	(5) Aggregated Beta[3]	(6) Average Trading Volume[4]
1 (Highest)	.095%	2.27	1.23 (63.43)	1.27	56983
2	.104%	2.09	1.13 (53.38)	1.43	29138
3	.109%	1.97	1.08 (49.54)	1.43	16299
4	.125%	1.88	1.03 (46.14)	1.34	9640
5	.110%	1.85	.97 (40.01)	1.43	6005
6	.119%	1.81	.93 (36.63)	1.41	4631
7	.103%	1.40	.79 (34.20)	1.33	2645
8	.111%	1.24	.64 (25.55)	1.15	1710
9	.122%	1.43	.64 (22.82)	1.28	728
10 (Lowest)	.094%	1.21	.47 (17.03)	1.03	625

[1] The ratio of the standard deviation of the trading volume ranked portfolios to the standard deviation of the return on the market portfolio.

[2] t statistics are in parentheses.

[3] Aggregated betas are calculated using a 10-day lag and 5-day lead structure.

[4] Calculated by obtaining the median average daily trading volume for each portfolio in each year and then averaging over the 4 years. Trading volume is measured in number of shares traded.

The lack of significant differences in the returns of trading volume or trading day portfolios suggests that a liquidity premium does not exist for inactively traded common stocks. Moreover, the existence of a firm size effect and the absence of a trading activity effect suggests that the firm size effect is not attributable to trading activity.

Additional evidence as to whether the firm size effect is attributable to infrequent trading can be obtained by examining whether the firm size effect exists among firms of roughly equivalent trading activity. To examine this question, firms were classified by both the market value and the average daily trading volume of their stock. The portfolio formation procedure employed is similar to the one employed by Reinganum [5] to examine the size and earnings-price anomalies. Twenty-five portfolios were formed based on the intersection of average daily trading volume quintiles and firm size quintiles. That is, inclusion in a portfolio was based jointly on the trading volume quintile and market value quintile to which the stock was assigned. The intersection of size and trading volume quintiles was used to obtain portfolios consisting of roughly equivalent trading activity and having the same magnitude of size differences as was used to document the size effect (in Table 1). The two-way classification based on quintiles rather than deciles was chosen because of the degree to which size and

Table 3

Portfolios Constructed on the Basis of Trading Day Rankings

(1) Portfolio	(2) Mean Daily Return	(3) σ_p/σ_m	(4) OLS Beta[2]	(5) Aggregated Beta	(6) Minimum-Maximum Days Not Traded for Firms in Portfolio[3]
1 (Highest)[1]	.082%	1.260	1.08 (91.30)	1.23	0
2	.160%	1.451	1.07 (44.52)	1.53	0,3
3	.122%	1.390	.96 (37.00)	1.47	1,10
4	.135%	1.303	.82 (30.19)	1.41	2,26
5	.147%	1.347	.74 (23.98)	1.41	5,68
6	.140%	1.208	.60 (20.68)	1.30	22,105
7 (Lowest)	.095%	1.026	3.8 (14.18)	.97	52,250

[1] Contains 200 firms that traded daily. The remaining portfolios (2 through 7) were formed by using each of the remaining 6 deciles to form equally weighted portfolios.

[2] t statistics are in parentheses.

[3] Represents the range of nontrading days for firms in each portfolio for the 4-year sample. The overlap in days not traded results from selecting a sample of firms each year and ranking firms by trading days each year. The minimum and maximum days not traded refers to the minimum and maximum days not traded for all 4 years.

trading volume are correlated. An insufficient number of firms are available for "off-diagonal" portfolios when decile rankings are used.

An alternative portfolio formation procedure would be to rank first on the basis of volume and then, within each volume quintile ranking, rank on the basis of size. This procedure would result in the same portfolios as our procedure, if, and only if, size and trading activity rankings are uncorrelated. If size and volume are correlated, as Table 1 indicates, this alternative procedure would result in the comparison of size classes which are different from those used to examine the size effect initially.[16] For this reason we examine portfolios formed on the basis of the intersection of size and volume rankings.

Portfolios were also formed on the basis of firm size and trading days. Because, in each year, approximately half of the 500 firms in our sample traded daily, no distinction could be made between the trading frequency of firms in the top two trading frequency quintiles. Therefore, only the third, fourth and fifth trading day quintiles (quintiles in which firms did not trade daily) were included in the analysis.

The total number of firms in the size/volume and the size/trading day portfolios

[16] Finding a less pronounced size effect using this alternative procedure might result for one of two reasons: (1) the portfolios compared consist of firms with smaller differences in market values than the portfolios compared in Table 1 or (2) trading activity and not size is the source of the size anomaly. Our procedure avoids this ambiguity, while permitting one to examine the effect of size and volume independently.

is shown in Table 4. The number of firms in the size/trading day portfolios is in parentheses.

Tables 5A and 5B contain the mean daily returns for the twenty-five size/volume intersection portfolios and the mean daily returns for the size/trading day portfolios respectively. By reading across a particular row, the effect of firm

Table 4

Number of Firms in Size/Volume and Size/Trading Days Portfolios

Frequency \ Size	Largest 1	2	3	4	Smallest 5
Highest 1	254	96	36	12	2
2	116	137	99	44	4
3	14	112	128	107	39
	(28)	(108)	(140)	(96)	(28)
4	7	43	110	139	101
	(16)	(48)	(108)	(147)	(80)
Lowest 5	9	12	27	98	254
	(20)	(12)	(16)	(76)	(276)

Table 5

Mean Daily Return and Standard Deviation of Returns for Portfolios Formed by the Intersection of Size and Trading Activity[1]

A) Size and Trading Volume Portfolios

Trading Volume \ Size	Largest 1	2	3	4	Smallest 5
Highest 1	.0644	.1144	.1598	.0379	.1077
	(.0083)	(.0147)	(.0174)	(.0359)	(.0123)
2	.0739	.0940	.1500	.1978	.2424
	(.0083)	(.0088)	(.0117)	(.1530)	(.0580)
3	.0600	.1121	.1131	.1195	.2272
	(.0086)	(.0092)	(.0095)	(.0120)	(.0200)
4	.1121	.0665	.1047	.1170	.1510
	(.0145)	(.0066)	(.0079)	(.0089)	(.0127)
Lowest 5	.0524	.0947	.0882	.1219	.1071
	(.0143)	(.0119)	(.0120)	(.0087)	(.0080)

B) Size and Trading Days Portfolios

Trading Days \ Size	Largest 1	2	3	4	Smallest 5
Highest 3	.1283	.1090	.1322	.1225	.1459
	(.0104)	(.0085)	(.0097)	(.0117)	(.0218)
4	.1087	.1155	.1294	.1355	.1794
	(.0120)	(.0089)	(.0083)	(.0088)	(.0142)
Lowest 5	.0591	.0995	.0894	.1305	.1182
	(.0104)	(.0155)	(.0119)	(.0080)	(.0076)

[1] Returns are in percent, standard deviations of portfolio returns are in parentheses.

size can be observed while trading activity is held roughly constant. Similarly, by reading down each column the effect of trading activity can be observed while controlling for firm size.[17]

Examination of the results in Table 5 reveals that the smallest firms in each trading volume or trading day quintile have higher mean daily returns than the largest firms in each trading group. Moreover, a pattern of increasing mean daily returns as firm size declines is observable in most of the trading volume and trading day rows. On the other hand, no pattern in the daily returns is evident within each size quintile (column).

To test simultaneously whether the mean returns of the smallest firm size portfolios (reported in column 5 of Table 5), are equal to the mean returns on the largest size portfolios (reported in column 1 of Table 5), a test procedure similar to the one discussed in Reinganum [5] was employed.[18] Since the computed F statistic is 8.53, significantly different from zero at the .01 level, one can reject the null hypothesis of no firm size effect within each trading volume portfolio.[19] Similar conclusions are reached concerning the size effect within the trading day quintiles. The computed F statistic for the size effect is 3.95, which is significant at the .01 level, indicating the existence of a size effect within the trading day quintiles.[20]

[17] In addition to examining the relationship among returns, size and trading activity through the portfolio formation procedure described in the text, a pooled cross-section time series regression was used to estimate the relationship among monthly returns for firm size portfolios, aggregated beta (estimated for each portfolio for each year), the natural logarithm of the median firm size in each portfolio (for each year) and the natural logarithm of the average monthly trading volume for each portfolio. The coefficient on the size variable was negative and statistically significant at the .01 level, and the coefficient on the volume variable was *positive* and significant at .05 level. The risk measure was not found to be statistically significant. The findings of a positive coefficient for the volume variable together with the results reported in Table 5A and 5B provide strong evidence that neither a liquidity premium nor any other volume effect is responsible for the firm size anomaly.

[18] The test can be formulated within Zellner's seemingly unrelated regression framework (See Theil [10], p. 314). The F statistic employed is:

$$\left(n - \frac{K}{q}\right)(\mu' R' [R \Omega R']^{-1} R \mu)$$

where
n = number of observations
q = number of linear constraints (i.e., the number of return differences examined)
K = number of portfolio return series (25 for the size/volume portfolios)
μ = column vector of mean daily returns for each series
$R = K \times q$ matrix of full row rank
$\Omega = K \times K$ variance covariance matrix for the K portfolio return series. This matrix contains the sample variance and covariances for each of the return series.

[19] The test statistic reported in the text is computed excluding the portfolio based on the intersection of the highest trading volume and the smallest size quintiles. This portfolio was excluded because it contained stocks for only one year (all the remaining portfolios contained stocks for all years). Therefore, the test statistic reported in the text pertains to the difference in the remaining 8 portfolio returns. The F statistic has 4 and 1003 degrees of freedom. Including the intersection of the highest trading volume and smallest size quintiles does not affect our conclusions. The computed F statistic is 9.39.

[20] The difference in mean daily returns between trading day and trading volume quintiles holding size constant were also tested. For trading volume quintiles the differences were not found to be

Table 6

Difference in Risk Adjusted Returns Between the Largest and Smallest Firms in Each Volume Quintile

Trading Volume Quintile	Mean Difference in Daily Risk Adjusted Returns
1	−.04%
2	−.12%
3	−.14%
4	−.02%
5	−.03%

Risk adjusted returns for the size/volume and size/trading day portfolios were also examined. Betas were estimated for each of the size/volume and size/trading day portfolios using both an ordinary least squares technique as well as Dimson's aggregated coefficients technique. While the aggregated betas for the small firms were larger than the betas for the large firms, the difference is not large enough to fully explain the size effect. For example, the mean difference in risk adjusted returns (computed using aggregated coefficient estimates) between the largest and smallest size portfolios is significantly different from zero at the .01 level. Mean differences in risk adjusted returns are presented in Table 6.[21]

The results contained in Tables 5 and 6 indicate the persistence of a firm size effect among firms of approximately equal trading activity. As Table 6 indicates, small firms have higher risk adjusted returns than do larger firms within each of the trading volume quintiles. The persistence of a firm size effect among firms of similar trading activity is inconsistent with the existence of a liquidity premium as well as Roll's conjecture regarding the source of the firm size effect.

4. *Conclusion*

This paper explores the relationship among common stock returns, market capitalization and trading activity. In particular, the paper addresses the question of whether the firm size effect is explicable in terms of differences in trading activity between large and small firms because of either a liquidity premium associated with small firms or a misassessment of the risk of small firms. No evidence is found consistent with existence of a liquidity premium. Moreover, differences in trading activity do not appear to fully explain the existence of a firm size effect through bias in the estimation of beta.

Our results are consistent with the anomalous evidence presented by Banz and Reinganum regarding firm size. While differences in trading activity provide a theoretically appealing explanation for the firm size anomaly, the evidence presented in this paper does not support this hypothesis. The challenge remains,

statistically significant at the .01 level. For trading days the results were found to be significant at the .01 level. However, using the technique described in footnote 21, the differences in risk adjusted returns were found to be insignificantly different from zero.

[21] The difference in mean daily excess returns reported in Table 6 refer to the difference in risk adjusted returns between the largest and smallest size portfolios within each volume quintile (corresponding to portfolios in columns 1 and 5 of Table 5A). Using the test procedure outlined in footnote 18 we tested whether the differences were simultaneously less than zero.

therefore, to explain the small firm effect anomaly uncovered by recent researchers.

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