Journal of Financial and Strategic Decisions
Volume 11 Number 2 Fall 1998

DIFFERENTIAL INFORMATION HYPOTHESIS, FIRM NEGLECT AND THE SMALL FIRM SIZE EFFECT

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Abstract

The finance literature presents the size effect as an anomaly. The same literature also suggests that small stocks are generally neglected by financial analysts. This paper extends the previous literature by investigating three issues: (1) whether size effect (January and non-January) persists during the sampling period (1986-1990), (2) whether there is a relationship between the documented size effect and analysts' neglect of smaller firms (as a proxy of differential information among small and large stocks), and (3) whether individual investors can still benefit from financial analysts neglect of small stocks. Regression analysis on a monthly basis supports the existence of size effect in January, but only for portfolios of large stocks. Interestingly, the size-January effect is often dominated by neglect effect; i.e., large firms that are less popular among financial analysts are found to earn higher return premiums than other more popular large firms. The results also show that individual investors could still earn higher returns on stocks that are less pursued by financial analysts during the 1986-1990 period.

INTRODUCTION

The finance literature on market efficiency presents the size effect as an anomaly in which small firms stocks tend to earn higher returns than large firms stocks even after adjusting for the higher risks associated with small stocks. Several research papers attempted to explain this phenomenon but to no avail. In presence of this unexplained anomaly, the question remains whether other variables were not accounted for in prior analysis.

In this context, several studies tried to explain the size effect proposing several hypotheses. These explanations include return measurement error [Roll, 1981], tax-loss selling effect [Reinganum, 1983], transaction costs [Lustig and Leinbach, 1983; Schultz, 1983; and Stoll and Whaley, 1983], macro economic risk factors in an APT framework [Chen and Hsieh, 1985], skewness preference [Booth and Smith, 1987], share price level [Kross, 1985; and Bhardwaj and Brooks, 1992a], and the differential information effect [Barry and Brown, 1984; and Elfakhani and Zabos, 1992]. None of these studies, however, provided a complete explanation of the firm size effect.

This paper proposes an alternative explanation for the documented size effect. It postulates that small firms suffer from excessive lack of public information and therefore are neglected. Neglect is defined as professional informed investors expressing less, or no, interests in some stocks, particularly small stocks. Neglect occurs when there is less professional analysis available on the stock, and therefore less public information. As such, small (uninformed) investors require additional returns for holding small-neglected stocks.

Thus, we examine the linear relationship between the size effect and the differential information among small and large stocks as symbolized by analysts' neglect. Analysts' neglect is measured twice, (1) by the number of financial analysts pursuing information and making forecasts about the stock, and (2) by a dummy interaction variable that relates size effect to firm neglect. Our methodology differs from that of Bhardwaj and Brooks (1992b) in at least three ways: First we study month to month variation in the size-neglect group, second we provide a

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The first author acknowledges partial financial support from the Board of Governors and the Dean of the College of Commerce, University of Saskatchewan. The second author recognizes the financial support of Indiana State University in getting research data. The authors gratefully acknowledge the contribution of I/B/E/S Inc. for providing forecast data as a broad academic program to encourage earnings expectations research. The authors also thank the participants of the seventh annual meeting of the Academy of Financial Services for helpful comments. All remaining errors are the authors'.

broader examination of these size-neglect groups (10 versus 4), and third we avoid any cross-sectional heteroscedasticity or any autocorrelation that may have existed in their two-stage regression.

In this context, we inspect the existence of size effect by using White's time series cross-sectional regression corrected for heteroscedasticity and autocorrelation.

Our results support the existence of size effect in January, but only for portfolios of large stocks. Interestingly, the size-January effect is often dominated by neglect effect; i.e., large firms that are less popular among financial analysts are found to earn higher return premiums than other more popular large firms. This finding suggests that the market discounts stocks of larger firms when neglected by financial analysts. The results also show that individual investors could still earn higher returns on stocks that are less pursued by financial analysts during the 1986-1990 period.

The rest of the paper is organized as follows. Next section reviews previous literature on the subject. Section II presents the research design, hypotheses to be tested, and data sources. Section III describes the results, followed by conclusions in section IV.

LITERATURE REVIEW

Banz (1981) finds that risk-adjusted stock returns are a monotone decreasing function of firm size. This finding implies that CAPM is misspecified. Following this evidence, some studies focus on the interaction between size effect and other anomalies, e.g., P/E ratio effect.[1] Other studies emphasize the magnitude of the size effect.[2] These studies, however, fail to explain size effect month-to-month instability (for example, in January), or its existence. Other studies referred to earlier also attempt to explain the size effect, but no hypothesis provided a satisfactory explanation of the firm size effect.

Of these hypotheses, the differential information effect seems the most acceptable theory. Using the period of listing (as a proxy for information availability), Barry and Brown (1984) find no evidence of an independent size effect.

Another proxy for differential information is the neglected-firm effect. Under this hypothesis, firms neglected by analysts' investors, financial analysts, and other investment agencies suffer from lack of information or asymmetric information [Arbel and Strebel, 1983]. Thus, neglected stocks should earn substantially higher returns to compensate for this gap of equal access to firm information. This notion is reinforced by Ajinkya and Gift (1985) in that there may be a connection between analysts' forecasts, firm size, and stock returns.

The neglect hypothesis is further tested by Arbel (1985). Using the coefficient of variation of the financial analysts' forecasts and the number of institutions holding the stock, Arbel reports a strong January effect associated with neglected firms. On the other hand, Dowen and Bauman (1986) argue that the size effect dominates neglect (defined as institutional popularity when stocks are less widely held by institutions). Nevertheless, Amihud and Mendelson (1986 and 1991) report a confounded size-neglected firm effect; i.e., stocks with low liquidity, as measured by bid-ask spreads, are usually small and less researched, and therefore earn abnormal returns. However, they could not explain the interaction that exists between size effect and January.

More recently, Bhardwaj and Brooks (1992b) test the neglected firm effect (proxied by the number of financial analysts following the stock at the end of each year). They find that the neglect effect is strong in January; however, it is weakened after controlling for share price. Outside January (all 11 months lumped together), they show that there is a strong neglect effect in the lowest-price group in the 1977-82 period, and in the highest-price group during 1983-88. Thus, neither the neglect effect nor the share price effect is stable over all the sampling periods. Bhardwaj and Brooks also report a confounded size-neglect effect in January, which results in a no clear dominance of either effect. Also, they do not completely rule out an independent neglect effect.

In brief, the literature predicts there maybe a possible relationship between firm neglect and size effect. Therefore, there maybe profit opportunities for individual investors to seek by pursuing news about financial analysts' neglect of small stocks.

RESEARCH METHODOLOGY

The testing methodology is implemented in taking two steps. First, a test of the firm size effect is conducted to verify the superior performance of small stocks in January and non-January months. This step is tested using the conventional pooled time series regression analysis (in line with Fama and MacBeth [1973]). Second, analysts' neglect effect is tested as a possible explanation of the size effect, and as an inducement to individual investors to benefit from this strategy.

The Proposed Hypotheses

Findings by Jaffe et al. (1989) and Ritter and Chopra (1989) show that the size effect is restricted to January. Using our methodology, the null Hypothesis 1 is constructed to examine whether size-portfolios formed in January would display any different behavior from non-January months or from the overall sample.

Hypothesis 1: For each month of the year, there are no excess return premiums related to firm size.

The next step is to investigate whether the size effect is simply a proxy for the lack of information on small firms. At the same time, we test the ability of individual investors to realize return premiums one month following the reports of financial analysts' forecasts. For that purpose, the following hypotheses are formulated:

Hypothesis 2: After controlling for neglect by financial analysts, there are no excess return premiums related to size effect.

Hypothesis 3 combines the first two hypotheses to examine any seasonality in the joint size-neglect effects.

Hypothesis 3: After controlling for neglect by financial analysts, and regardless of what month of the year, there are no excess return premiums related to size effect.

The intuition behind the testable hypotheses is that one would suspect less publicized-small stocks to be more sensitive to negative information, and therefore would be more volatile. Thus, firms with fewer specialized analysts are expected to observe gradual market adjustment to unexpected corporate news (neglect effect), and therefore abnormal returns may be realized by *informed* investors.

Data Sources

The sample includes all firms trading on the New York (NYSE) or American Stock Exchanges (AMEX) that have the number of financial analysts following the sampled stocks reported on the *Institutional Brokers Estimate System Tape* (*IBES*). Data on stock prices, returns, and number of shares outstanding are obtained from the *Centre for Research in Security Prices* (*CRSP*) tape. Following other size studies (e.g., Fama and French [1992]), financial institutions such as banks and insurance companies are considered to have their returns generating behavior influenced by regulations, and therefore can confound the size effect. Thus, these firms are separated from the sample for future research. The sampling period in this study is five years, extending from January 1, 1986, to December 31, 1990.[3] However, we exclude October 1987 from the sample to avoid any noise caused by the stock market crash.[4]

All remaining *CRSP* firms are ranked in ascending order based on their market values. The monthly market value of the firm ($Size_t$) is defined as the number of shares outstanding multiplied by month-end share price. Shares outstanding are considered the same from one month to another until a change occurs. At the beginning of each month, we form ten portfolios, with portfolio 1 has the 10% smallest stocks, and portfolio 10 makes up the 10% largest stocks.[5]

The monthly mean return ($R_{t,ip}$) and the 90-day risk-free rate for the month (RF_t) are used to calculate the mean risk premium for each stock (R_t - RF_t) for each stock in portfolio p ($p=1, ..., 10$). As a result of merging these data bases, the final number of sampled firms is 972, and the sample points are 47,629 observations in 59 months (1986-1990). To simplify the hypothesis testing procedure, the overall mean of the monthly risk premiums is calculated for each of the ten portfolios.

Testing the Hypotheses

We test Hypothesis 1 using the conventional pooled time series cross-sectional regression. The regression model examines the relationship between size and return premiums after controlling for January:

Model 1

$$Y_{t,\,i\,p} = a + b_1\, Size_{\,t-1,\,i\,p} + b_2\, D_{t-1} + b_3\, (Size_{\,t-1,\,i\,p} \times D_{t-1})$$

where:

$Y_{t,i\,p}$	= natural log of one plus monthly return premiums of stock i in portfolio *p* (*p=1, ..., 10*) for month *t* (*t=1, ...,59*). Return premiums are defined as $Y_{t,ip} = R_{t,ip} - RF_t$, where $R_{t,ip}$ is the return on stock *i* in portfolio *p* during month *t*, RF_t is the 90-day risk free rate for the same month.
D_{t-1}	= lagged dummy variable equals to 0 for all eleven months of the year except January, and 1 for January.
$Size_{\,t-1,\,i\,p} \times D_{t-1}$	= lagged interaction dummy variable that is equal to 0 for all eleven months of the year except January, and the product of $size_{\,t-1,\,i\,p}$ and D_{t-1} for January.

where the market value of firm *i* assigned to portfolio *p* in month *t-1* ($Size_{\,t-1,\,i\,p}$) is calculated as the number of shares outstanding multiplied by month-end share price.

The lag operator on the explanatory variables is used because portfolios are formulated at the beginning of each month, and are then liquidated at the end of month t when returns are actually realized. It must be noted that in January the coefficient for size is the sum of b_1 and b_3. A significant total coefficient ($b_1 + b_3$) would support the notion that return premiums are high for small stocks in January.

The following regression with the proposed explanatory variables being lagged one month (as in Model 1) is run in order to indirectly test the neglect effect as to create profit opportunities to individual investors, thus testing Hypothesis 2:

Model 2

$$Y_{t,\,i\,p} = a + b_1 Size_{\,t-1,\,i\,p} + b_2 N_{\,t-1,i\,p} + b_3 I_{\,t-1,i\,p} + \varepsilon_t$$

where:

$Y_{t,\,i\,p}$	= natural logarithm of one plus monthly return premiums of stock *i* in portfolio *p* for month *t* (*t=1, ...,59*) as defined earlier in Model 1.
$Size_{\,t-1,\,i\,p}$	= lagged monthly natural logarithm of market value of stock *i* for the previous month *t-1*.
$N_{\,t-1,\,i\,p}$	= lagged monthly number of financial analysts tracing stock *i*.
$I_{\,t-1,\,i\,p}$	= lagged interaction dummy variable. The dummy variable is equal to 0 if the number of financial analysts specializing in stock *i* during the previous month ($N_{\,t-1,\,i\,p}$) is *larger* than the median, and is equal to firm size ($Size_{\,t-1,\,i\,p}$) otherwise.

In Model 2, neglect effect is tested twice; first, by the number of financial analysts ($N_{\,t-1,\,i\,p}$), and second by the interaction term ($I_{\,t-1,\,i\,p}$) that connects size effect to firm neglect. We run the regression Model 2 twice. The first run includes all data. The second regression is performed, this time after grouping the data by size, in order to examine whether there is any seasonal interaction between size effect and the number of financial analysts pursuing the stock.

The interaction between size and seasonality is also reexamined using regression Model 2. For that purpose, the sample is reclassified by the month of the year. For example, January includes data from January of each year of the sampling period, 1986-1990.

Implications of the Proposed Model

Under the proposed models, and given the specified dummy variables, the hypothesized signs of the regression coefficients in Model 2 are: $b_2<0$ (if the neglect effect exists and significant), and $b_3<0$ (if the size effect is restricted to neglected firms). Statistically significant coefficient estimates on the number of financial analysts would confirm the notion that stock performance relates to information availability. Note that if differential information exists among large and small firms, the size effect in Model 2 should disappear. In this case, b_1 must have positive sign. The constant term, a, would capture factors other than neglect effect.

Econometric Concerns

Since the regression data is time series and cross-sectional, heteroscedasticity and autocorrelation can present some serious problems. When heteroscedasticity exists, the estimators may diverge. White's (1980) heteroscedasticity-consistent covariance matrix estimates are used to correct the estimates for any unknown form of heteroscedasticity. This technique also picks up a mis-specified mean or any correlation between the error term and independent variables. Since the residual effect of stock trading is unlikely to disappear and therefore it may affect later trading, autocorrelation can also be a problem. Furthermore, to improve parsimony and avoid collinearity, Akaike's (1969) Final Prediction Error (FPE), also called Amemiya Prediction Criterion, and Schwarz's (1978) Criterion (SC) are used to find the best descriptive model.[6] The lower FPE or the higher SC, the more parsimonious the model. Moreover, a violation of normality may make the regression analysis unreliable. Hence, normality is tested measuring skewness and kurtosis, and by conducting Kolmogorov (D normal statistics) and non-parametric sign rank tests.[7]

FINDINGS AND INTERPRETATIONS

Table 1 reports descriptive statistics for each of the ten-size portfolios. In particular, the table shows the portfolio mean and median return premiums (portfolio return - risk free rate), and portfolio total risk (σ). The results show that the mean return premiums are negative for all ten portfolios. In fact, only 23,019 of the 47,629 sample points have monthly returns higher than monthly risk-free rates (which is about 48.33% of the total sample). Of the 24,610 observations that had negative *premiums*, 22,371 had negative *returns* (less than zero) over the sampling period. This pattern can be partially explained by the observation that 54% of return premiums were negative after the October 1987 crash. Moreover, the table reveals that the smallest stocks (portfolios 1-5) had the most negative mean (and median) premiums, while the largest stocks (portfolios 6, 8, 9, and 10) had least negative (or even positive) return premiums over the entire sampling period. This evidence suggests that, contrary to the prediction of the size-effect literature, smaller stocks underperformed larger stocks during our sampling period (1986-1990). Also, smaller stocks had higher average total risk than larger stocks.

TABLE 1
Descriptive Statistics for Return Premiums on the Ten Portfolios Classified Based on Firm Size

Numbers in parentheses are p-values. The Sampling Period is 59 Months (1986-1990).

Portfolio	Sample Size	Mean Return Premium	Median Return Premium	Total Risk (σ)
1	4792	-2.5926	-1.9217	14.6528
2	4759	-1.7795	-0.6966	14.0124
3	4762	-1.6955	-0.6563	13.5208
4	4760	-0.9659	-0.4443	12.0484
5	4752	-0.8172	-0.0489	11.4546
6	4777	-0.6744	0.0284	11.1147
7	4765	-1.0601	-0.2624	11.1641
8	4757	-0.7265	-0.0118	10.1417
9	4764	-0.6443	0.0352	10.1667
10	4741	-0.6520	0.4528	10.4523

Note: The total sample includes 47,629 observations, of which 24,610 observations have monthly returns lower than monthly risk-free rates (this represents about 51.67% of the total sample). Of these 24,610 Observations, 22,731 have negative returns during the entire sampling period. Portfolios 1-5 have proportionally more negative return premiums compared to portfolios 6, 8, 9, and 10.

TABLE 2
Descriptive Statistics for Return Premiums on Twelve Portfolios Classified According to the Month of the Year

Numbers in parentheses are p-values. The Sampling Period is 59 Months (1986-1990).

Month of the Year	Sample Size	Mean Return Premium	Median Return Premium	Total Risk (σ)
January	3550	1.2147	1.1620	13.3034
February	4144	1.1546	2.3340	12.1237
March	4152	2.8221	2.4514	9.4686
April	4133	0.5164	0.3354	9.6529
May	4132	-1.6229	-1.4023	9.5874
June	4107	1.6522	2.1156	10.7222
July	4060	-0.5468	0.1210	10.9247
August	4055	-2.0461	-1.0881	11.5088
September	4052	-2.2619	-1.5110	11.1622
October	3222	-4.5338	-3.7464	10.2938
November	4019	-8.8380	-3.6811	17.3120
December	4003	-2.1374	-1.7223	11.0753

Note: The total sample includes 47,629 Observations. Most return premiums are positive in January, February, March, April, and June, and are highest in March and June. Most return premiums are negative in the remaining months especially in November.

TABLE 3
The Monthly Balanced Portfolios: Mean Average of Firm Size (in Thousands) and Number of Financial Specialists for Ten Portfolios Classified Based on Firm Size

Market Values of Firm Size are in Thousands. The Sampling Period is 59 Months (1986-1990).

Portfolio	Average Market Value of the Firm	Minimum, Average, and Maximum Number of Financial Analysts Pursuing the Stock	$\rho_{Size, Fin. Analysts}$(*p-value*)
1	59511	1 < 1.94 < 12	0.2069* (0.01)
2	142307	1 < 2.77 < 14	0.1079* (0.01)
3	267854	1 < 3.54 < 12	0.2092* (0.01)
4	459842	1 < 4.61 < 14	0.2571* (0.01)
5	707040	1 < 5.74 < 18	0.2252* (0.01)
6	1079129	1 < 6.68 < 19	0.1661* (0.01)
7	1577152	1 < 7.48 < 22	0.2159* (0.01)
8	2382076	1 < 8.87 < 26	0.2136* (0.01)
9	4065364	1 < 9.94 < 25	0.2003* (0.01)
10	12936158	1 < 11.30 < 23	0.3118* (0.01)

*Significant at the 5 percent level
**Significant at the 10 percent level

Table 2 is similar to Table 1 except that the portfolios are now classified by month rather than by firm size. The results disclose that return premiums are positive in five months of the first half-year (January, February, March, April, and June), with March and June enjoying the largest positive premiums. The second half of the year experiences negative premiums that peak in November.

Table 3 reports the mean for each size-portfolio, and maximum, minimum and average number of financial analysts interested in the stock for each size category. It also displays the Pearson's correlation between size and number of financial analysts' forecasts. The table reveals that smaller firms (portfolio 1) had a mean size of less than $60 million. The largest group (portfolio 10) had an average size of about $13 billion. Consistent with the prediction of this paper, there are more financial analysts reporting on larger than smaller stocks. This observation is confirmed by the statistically significant correlation between size and the number of forecasts.

TABLE 4

Regression Analysis Tests of the Relationship Between Portfolio Return Premiums and Size After Controlling for January For Each of the Ten Portfolios Formed Based on Firm Size

The Regression Model (1) Tests Hypothesis 1 for Each of the Ten Portfolios Formed Based on Firm Size. The Model is: $Y_{p,i\,p} = a + b_1\,Size_{t-1,i\,p} + b_2\,D_{t-1} + b_3\,(Size_{t-1,i\,p} \times D_{t-1})$. $Y_{t,i\,p}$ is the Premium of Stock Return Over the monthly 90-Day Risk-Free Rate. $Size_{t-1,i\,p}$ is the Lagged Total Market Value of the Firm. D_{t-1} is a Lagged Dummy Variable equals to 0 for the Eleven Month of The Year and 1 for January. The Interaction Term ($Size_{t-1,i\,p}$, $\times D_{t-1}$) equals to 0 for each month of the year except January, and is equal to size in January. DW is Durbin-Watson Statistics. Rho is the First Order Autocorrelation. FPE is the Akaike's (1969) Final Prediction Error Measure and SC is the Schwarz's (1978) Measure for Error Prediction. The Sampling Period is 59 Months (1986-1990).

Portfolio	Constant (T-Value)	$Size_{t-1}$ (T-Value)	D_{t-1} (T-Value)	($D_{t-1}XSize_{t-1}$) (T-Value)	F-Value	R^2 Adjusted	DW (Rho)	FPE SC
Overall	-1.403 (-22.20*)	0.002X10^{-8} (2.23*)	2.721 (10.53*)	-0.006X10^{-8} (-1.35)	52.04*	0.003	1.96* (0.02)	143 4.97
1	-2.697 (-4.58*)	-0.158X10^{-8} (-0.18)	0.704 (0.28)	3.717X10^{-8} (0.91)	4.04*	0.002	1.93* (0.03)	214 5.37
2	2.939 (3.52*)	-3.523X10^{-8} (-6.04*)	2.982 (0.76)	0.726X10^{-8} (0.25)	22.60*	0.013	1.90* (0.05)	194 5.27
3	1.641 (2.13*)	-1.328X10^{-8} (-4.77*)	9.566 (2.41*)	-2.567X10^{-8} (-1.58)	17.42*	0.010	1.94* (0.03)	181 5.21
4	3.934 (5.11*)	-1.117X10^{-8} (-6.94*)	5.910 (1.74**)	-0.625X10^{-8} (-0.77)	26.15*	0.016	2.03* (-0.02)	143 4.97
5	4.968 (6.37*)	-0.846X10^{-8} (-7.80*)	2.035 (0.74)	0.091X10^{-8} (0.22)	27.00*	0.016	1.99* (0.01)	129 4.87
6	5.209 (6.61*)	-0.556X10^{-8} (-7.82*)	4.348 (1.34)	-0.268X10^{-8} (-0.86)	24.48*	0.015	2.00* (-0.01)	122 4.81
7	2.701 (3.66*)	-0.248X10^{-8} (-5.56*)	2.959 (1.12)	-0.057X10^{-8} (-0.33)	13.99*	0.008	2.07* (-0.03)	124 4.82
8	3.476 (4.80*)	-0.182X10^{-8} (-6.14*)	4.512 (1.43)	-0.110X10^{-8} (-0.81)	18.73*	0.011	2.06* (-0.03)	102 4.63
9	3.108 (4.92*)	-0.094X10^{-8} (-6.13*)	7.146 (2.31*)	-0.158X10^{-8} (-2.01*)	20.82*	0.012	2.09* (-0.05)	102 4.63
10	-0.578 (-2.52*)	-0.002X10^{-8} (-1.69**)	3.688 (3.97*)	-0.007X10^{-8} (-1.03)	9.63*	0.005	2.03* (-0.01)	109 4.69

*Significant at the 5 percent level
**Significant at the 10 percent level

Model 1 is tested and the results are reported in Table 4. Over the entire sample (first panel), the interaction term has a negative sign and its magnitude exceeds the size parameter. This result implies that there is a joint size-January effect; however, this relation is statistically insignificant.[8] Trading in January, as measured by the dummy variable, D_{t-1}, presents high positive return over the entire sampling period that is significant at the 5 percent level.[9]

When testing for each size-portfolio separately, the results indicate that the size effect is present in almost all size-portfolios. In addition, the interaction term ($D_{t-1}*size_{t-1,ip}$) supports a joint size-January effect in the five largest portfolios (rather than the smallest) and for portfolios 3 and 4 only. One implication is that smaller stocks in the largest stock portfolios achieve higher return premiums than larger stocks in the same portfolios.

TABLE 5
Multiple Regression Analysis Tests of the Relationship Between Portfolio Return Premium and Size in Presence of Number of Financial Analysts For Each the Ten Portfolios Based on Firm Size

The Regression Model (2)Tests Hypothesis 2 for Each of the Ten Portfolios Formed Based on Firm Size. The Model is: $Y_{t,ip} = a + b_1\ Size_{t-1,ip} + b_2\ N_{t-1,ip} + b_3\ It\text{-}1,ip$. Return Premium, $Y_{t,ip}$, is the Premium of Stock Return Over the monthly 90-Day Risk-Free Rate. $Size_{t-1,ip}$ is the Lagged Total Market Value of the Firm. $N_{t-1,ip}$ is the Lagged Number of Financial Analysts tracing the Stock. $I_{t-1,ip}$ is a Lagged Interaction Dummy Variable Equals to 0 When the Number of Financial Analysts Pursuing the Stock is Larger than the Median, and is Equal to Size otherwise. DW is Durbin-Watson Statistics. Rho is the First Order Autocorrelation. FPE is the Akaike's (1969) Final Prediction Error Measure and SC is the Schwarz's (1978) Measure for Error Prediction. The Sampling Period is 59 Months (1986-1990).

Portfolio	Constant (T-Value)	$Size_{t-1,ip}$ (T-Value)	$Nt_{t-1,ip}$ (T-Value)	$I_{t-1,ip}$ (T-Value)	F-Value	R^2 Adj.	DW (Rho)	FPE SC
Overall	-1.520 (-12.07*)	0.0002X10^{-8} (0.20)	0.046 (2.80*)	0.023X10^{-8} (2.47*)	6.03*	0.000	1.96* (0.02)	144 4.97
1	-2.232 (-3.51*)	0.087X10^{-8} (0.10)	-0.253 (-1.67**)	0.103X10^{-8} (2.93*)	1.47	0.000	1.93* (0.04)	215 5.37
2	3.645 (4.08*)	-3.717X10^{-8} (-6.39*)	-0.124 (-0.94)	0.142X10^{-8} (1.73**)	15.34*	0.009	1.90* (0.05)	195 5.28
3	2.619 (3.27*)	-1.555X10^{-8} (-5.27*)	-0.167 (-1.53)	0.171X10^{-8} (1.98*)	14.19*	0.008	1.95* (0.03)	181 5.21
4	4.837 (5.83*)	-1.135X10^{-8} (-6.14*)	-0.126 (-1.08)	-0.0004X10^{-8} (-0.00)	18.97*	0.011	2.02* (-0.01)	144 4.97
5	5.406 (6.96*)	-0.841X10^{-8} (-7.71*)	-0.056 (-0.83)	0.010X10^{-8} (0.94)	21.55*	0.013	1.98* (0.01)	130 4.87
6	5.458 (6.41*)	-0.600X10^{-8} (-8.23*)	0.009 (0.12)	0.061X10^{-8} (1.87**)	23.73*	0.014	2.00* (0.00)	122 4.81
7	3.29 (3.97*)	-0.239X10^{-8} (-5.19*)	-0.081 (-1.03)	0.007X10^{-8} (0.24)	11.07*	0.006	2.07* (-0.03)	124 4.83
8	4.176 (5.00*)	-0.187X10^{-8} (-6.26*)	-0.040 (-0.64)	-0.033X10^{-8} (-1.32)	15.22*	0.009	2.06* (-0.03)	102 4.63
9	3.787 (4.95*)	-0.106X10^{-8} (-6.73*)	-0.012 (-0.22)	-0.009X10^{-8} (-0.59)	17.57*	0.010	2.10* (-0.05)	102 4.63
10	0.867 (1.31*)	-0.002X10^{-8} (-1.27)	-0.113 (-1.88**)	-0.017X10^{-8} (-0.95)	2.90**	0.001	2.03* (-0.02)	109 4.70

*Significant at the 5 percent level
**Significant at the 10 percent level

The association between return premiums, size and number of financial analysts interested in the stock is examined in the regression Model 2. The results of the full regression model are shown in Table 5 for the entire sample and each size-portfolio (thus testing Hypothesis 2), and in Table 6 for each month of the year (thus testing Hypothesis 3).

Table 5 reveals that the results of the full model (Model 2) for all data support neither the size effect nor the neglect effect. Thus, the null Hypothesis 2 cannot be rejected. Table 5 also shows that when testing each size-portfolio separately, the size parameter is now statistically significant in the presence of the two neglect effect variables. The only exceptions are portfolios 1 and 10. Portfolio 1 displays an inverse size effect (i.e., larger firms earn higher premiums). Portfolio 10 exhibits a size effect; however, it is statistically insignificant. The table also indicates that the neglect variable behaves as hypothesized in nearly all portfolios (except portfolio 6). Yet, the latter finding is not always statistically significant. Nevertheless, in both portfolios (1 and 10) the neglect effect (measured by the number of financial analysts pursuing the stock, $N_{t-1,\, i\, p}$) is relatively dominant (significant only at the 10 percent level). This result defies Dowen and Bauman's (1986) conclusions. Furthermore, there is a joint size-neglect effect (represented by the dummy variable $I_{t-1,\, i\, p}$) for larger size-portfolios 4, 8, 9, and 10. The joint effect in larger portfolios suggests that investors would higher return premiums on larger, but neglected, firms. This result is consistent with Amihud and Mendelson's (1991) and Bhardwaj and Brooks (1992b) conclusions. The interaction parameter in the remaining size-portfolios is positive. The latter finding also advocates a larger firms-neglect effect.

Table 6 shows that when we consider size and the neglect interaction term jointly in Model 2, the size effect disappears in January (consistent with Arbel, 1985), and in June, September and December. Most remaining months display an inverse size effect (i.e., larger stocks earn higher premiums than smaller stocks). March (and February to a lesser extent), however, still shows a clear evidence of a strong joint small size-neglect effect (i.e., small stocks that are neglected earn high premiums). An independent neglect effect (i.e., number of financial analysts as proxied by $N_{t-1,ip}$ in Model 2) is present only in March, April, and July. The same parameter does not have the correct hypothesized sign in the remaining months. The findings in Table 6 suggests there exist seasonal differences in size effect and neglect effect, thus rejecting Hypothesis 3.

Finally, the results for the full model (2) itself (in Tables 6 and 7) are significant in all size-portfolios except portfolio 1, and all months except February and April. This finding suggests that individual investors could still earn significant return premiums one month following the reports of financial analysts' forecasts, or the lack of it for that matter.

A final note is that the behavioral equations suggested by the aforementioned regression models have low, if any, predictive value. Extremely low coefficients of determination indicate that the least squares regression line is a poor data fit (i.e., unexplained variability is extremely high). However, the purpose of the regression analysis in this case is merely to verify a relation rather than to explain or predict the dependent variable. Thus, a high degree of absolute accuracy may not be critical. The parsimony of Model 2 (which includes size, neglect, and their interaction dummy variable) has been slightly improved over Model 1 (which has size and January as the independent variables).

CONCLUSIONS

This study examines the postulation that firm size acts as a mere proxy for neglect effect. In particular, the main question is whether the size effect documented in the early empirical literature can be consistently solely attributed (over time and in magnitude) to neglected small stocks having less public information (i.e., pursued less by financial analysts) available to uninformed (usually small) investors.

The sampled data is divided into ten size-portfolios. Return premiums during the sampling period (1986-1990) for all ten portfolios are negative. It also appears that, on average, return premiums are positive in the first half of the year, and negative in the second half.

The size effect was tested in January versus non-January months using the conventional time series cross-sectional regression (Model 1). We find a statistically significant size effect in almost all months of the year. However, for the 1986-1990 period, the January effect is rather identified with large stock portfolios.

Next, return premiums were regressed on the size variable after controlling for the number of financial analysts pursuing the stock, and a joint size-neglect interaction variable (Model 2). Our results show that the size effect does not exist separately. Instead, there is a joint size-firm neglect effect in 9 out of 10 size-portfolios. This finding is consistent with Amihud and Mendelson (1991) and is in contrast with Dowen and Bauman (1986). Interestingly, we find that neglected firms in the larger size-portfolios also earn higher premiums, and that smaller stocks earn excess premiums whether or not they are neglected by financial analysts. Finally, consistent with Arbel (1985), the joint size-January effect is dominated by the firm size- neglect interaction variable in most months including January.

Nevertheless, there is a joint small size-neglect effect in February and March. Further, the results for the full model (2) itself are significant in all size-portfolios except portfolio 1, and all months except February and April. This finding is of a particular interest to individual investors, since it suggests they could still earn significant return premiums one month following the reports of financial analysts' forecasts, or the lack of it.

TABLE 6
Multiple Regression Analysis Tests of the Relationship Between Portfolio Return Premium and Size in Presence of Number of Financial Analysts For Each Month of the Year

The Regression Model (2) Now Tests Hypothesis 3 for Each of the Twelve Portfolios Formed According to the Month of the Year. The Model is: $Y_{t,ip} = a + b_1\ Size_{t-1,ip} + b_2\ N_{t-1,ip} + b_3\ I_{t-1,ip}$. Return Premium, R_p, is the Premium of Stock Return Over the monthly 90-Day Risk-Free Rate. $Size_{t-1,ip}$ is the Lagged Total Market Value of the Firm. $N_{t-1,ip}$ is the Lagged Number of Financial Analysts tracing the Stock. $I_{t-1,ip}$ is a Lagged Interaction Dummy Variable Equals to 0 When the Number of Financial Analysts Pursuing the Stock is Larger than the Median, and is Equal to Size otherwise. DW is Durbin-Watson Statistics. Rho is the First Order Autocorrelation. FPE is the Akaike's (1969) Final Prediction Error Measure and SC is the Schwarz's (1978) Measure for Error Prediction. The Sampling Period is 59 Months (1986-1990).

Month of the Year	Constant (T-Value)	$Size_{t-1,ip}$ (T-Value)	$N_{t-1,ip}$ (T-Value)	$I_{t-1,ip}$ (T-Value)	F-Value	R^2 Adjusted	DW (Rho)	FPE SC
January	-0.159 (-0.29)	$-0.011X10^{-8}$ (-1.89^{**})	0.223 (2.96^{*})	$0.083X10^{-8}$ (2.21^{*})	5.56^{*}	0.004	1.99^{*} (0.00)	177 5.18
February	0.982 (2.39^{*})	$-0.005X10^{-8}$ (-1.51)	0.065 (0.95)	$-0.016X10^{-8}$ (-1.33)	1.28	0.000	2.24 (-0.12)	147 5.00
March	4.548 (12.73^{*})	$-0.009X10^{-8}$ (-3.16^{*})	-0.273 (-5.24^{*})	$-0.015X10^{-8}$ (-0.60)	20.64^{*}	0.014	1.91^{*} (0.05)	88 4.49
April	0.816 (2.22^{*})	$0.003X10^{-8}$ (1.27)	-0.077 (-1.54)	$0.026X10^{-8}$ (1.09)	1.42	0.000	2.00^{*} (0.00)	93 4.54
May	-2.294 (-6.36^{*})	$0.001X10^{-8}$ (0.54)	0.101 (2.27^{*})	$0.007X10^{-8}$ (0.31)	2.57^{**}	0.001	1.95^{*} (0.03)	92 4.53
June	0.081 (0.21)	$-0.013X10^{-8}$ (-2.47^{*})	0.252 (4.68^{*})	$0.095X10^{-8}$ (3.51^{*})	10.12^{*}	0.007	1.93^{*} (0.04)	114 4.75
July	-0.312 (-0.81)	$0.003X10^{-8}$ (1.14)	-0.070 (-1.47)	$0.059X10^{-8}$ (2.43^{*})	2.65^{**}	0.001	1.98^{*} (0.01)	119 4.79
August	-4.131 (-9.90^{*})	$0.009X10^{-8}$ (2.58^{*})	0.234 (4.67^{*})	$0.112X10^{-8}$ (3.37^{*})	16.87^{*}	0.012	2.14^{**} (-0.07)	131 4.88
September	-3.726 (-9.06^{*})	$-0.005X10^{-8}$ (-1.71^{**})	0.197 (4.02^{*})	$0.092X10^{-8}$ (3.41^{*})	6.75^{*}	0.004	2.35 (-0.18)	124 4.83
October	-5.622 (-13.45^{*})	$0.010X10^{-8}$ (1.74^{**})	0.071 (1.32)	$0.126X10^{-8}$ (4.67^{*})	10.10^{*}	0.008	1.94^{*} (0.03)	105 4.66
November	-11.692 (-18.99^{*})	$0.003X10^{-8}$ (0.83)	0.423 (5.88^{*})	$-0.021X10^{-8}$ (-0.46)	15.74^{*}	0.011	2.57 (-0.29)	297 5.69
December	-4.115 (-9.79^{*})	$-0.006X10^{-8}$ (-2.08^{*})	0.265 (4.96^{*})	$0.150X10^{-8}$ (5.47^{*})	14.59^{*}	0.010	1.85^{**} (0.07)	122 4.81

*Significant at the 5 percent level
**Significant at the 10 percent level

In summary, our results suggest that the size effect is neither consistent over all months, nor limited to small stock portfolios in January only. We also find some neglect effect; however, there is not enough evidence that firm neglect is the only determinant of size effect. Our conclusion may have been influenced by our choice of the proxy for neglect effect (i.e., by using the number of analysts' forecasts as a proxy for firm neglect), or by the choice of the sampling period (1986-1990) which had experienced both booming and turbulent times. Also, it must be noted that the observed effect may not be exploitable after transaction costs, including commissions and bid-ask bias that are common among thinly traded "neglected" company stocks.[10] Future research should investigate whether the results of this study are dependent on the sampling period.

Dealing with another efficiency-related issue, one should not be surprised by this paper's findings which are consistent with some of the previous studies and inconsistent with others. Hence, the implications to market efficiency remain open for future research.

ENDNOTES

1. For example, Reinganum (1981), Banz and Breen (1986) and Goodman and Peavy (1986) confirm that the reported P/E effect is a mere proxy for the size effect.

2. For evidence on the size-January joint effect, please refer to Keim (1983), Jaffe, Keim and Westerfield (1989), and Ritter and Chopra (1989).

3. We recognize that the sampling period coincides with a bullish market (of course with the exception of the October 1987 crash). Thus any drawn conclusions could be limited to this period. Generally speaking, the January, size, and firm neglect typically reflect over performance in bull markets. We contend that if size effect was subdued in a bullish market, then it would be unlikely to prevail in a bearish market.

4. From 1987 to the end of 1990, the market rebounded back to its pre-October 1987 level. Thus, the removal of October 1987 from the sample may have biased the results upward. However, the tests were repeated with October included. There were no discernable difference in the results.

5. Due to monthly rebalancing, and the fact that some stocks sometimes are delisted from the NYSE and AMEX, monthly portfolios will not necessarily have the same stocks over time.

6. For more details on all these tests, please refer to Judge et al. (1985), pages 453, 865-873.

7. The results show that return premiums are skewed to the left (negative skewness) and mostly have fat tails (kurtosis different from 3), especially for large-size portfolios. The D normality test, however, shows no violation of the normality distribution assumption. This result is relatively confirmed by the sign rank test for most portfolios.

8. The insignificance of the January effect in our sample may be due to the use of monthly data. Thus, shorter-term variations or anomalies might not be captured. Under these circumstances, the use of daily or transactional data can be more appropriate. However, this is beyond the scope of this paper.

9. In another test that is not reported here, we regress return premiums on size for each month of the year. We find evidence of size effect in January, February, March, June and July. However, size is statistically significant in March only. The results also show some significant positive relation between size and returns in May, August, October, and November. Thus, the size effect is not consistent over the year.

10. We thank Karen Eilers Lahey for suggesting this possible interpretation.

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