THE NEGLECTED AND SMALL FIRM EFFECTS

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Abstract

This paper addresses the empirical question of whether the differential attention which companies receive affects the capital asset pricing process. The degree of attention was measured by research concentration rankings based on the number of analysts regularly following the firm's securities. The results suggest: (i) that there is a "neglected firm effect" in terms of superior performance for less researched companies and (ii) that the neglected firm effect persists over and above the small firm effect; namely, the excess returns are not fully attributable to size. The ex-post capital asset pricing model is unable to account for the differences in return across security research rankings. Several possible explanations for the results are considered but not tested.

I. *Introduction*

Information structure is not monolithic across financial assets. This is clearly demonstrated by the divergent concentration of security research whereby some companies receive intensive and continuous attention by analysts while others get virtually no regular coverage at all [9]. Consequently, the amount and quality of information available to investors differ across securities.

This paper addresses the empirical question of whether the differential attention which companies receive affects the capital asset pricing process. Capital asset pricing relates to payoff characteristics distributed over different states of the world. Investors who perceive the same distribution of returns for a set of risky assets will price them exactly the same. However, the perceived ex-ante distribution of returns may be affected by security research. More intensive analysts' research, as applied to individual companies, may have two effects: a reduced gap between the expected ex-ante returns and their actual values (better mean forecasts), and a narrower ex-ante returns distribution (a smaller variance) generated by removal of some of the noise due to lack of information.

The level of analysts' attention, of course, may reflect more fundamental variables which affect security returns, such as company size, the number of active traders, or the frequency of transactions. Verrecchia [21] argues that the number of active traders affects market efficiency, while Goldman and Sosin [12] focus on transaction frequencies Recent evidence also suggests the existence of a "small firm effect:" small firms seem to have larger average returns than large firms — even after the usual adjustment for risk [3, 18, 19].

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The potential impact of security research within the mean variance framework is discussed in Section II. The basic hypothesis is that the capital asset pricing model (CAPM) can capture the effect of differences in security research concentration. Other more specific empirical hypotheses relating to various relevant aspects of the problem are discussed. The empirical methodology is presented in Section III. Two measures of security research concentration are used as proxies for the level of analysts' attention. The effect of security research on risk and return is examined using iso-beta portfolio excess returns. The relationship between firm size and analysts' coverage is discussed, and size is controlled for by calculating excess returns for iso-firm size portfolios across research concentration groups. Given recent evidence provided by Roll [19] indicating that risk measures of thinly traded stocks are downward biased, special attention is given to the possibility of serial correlation in the neglected security returns. This can cause a downward bias in the systematic risk estimates and, therefore, an upward bias in the risk adjusted returns.

The results presented in Section IV indicate (a) a neglected firm effect in terms of superior performance for less researched companies, after the usual correction for systematic risk, and (b) that the neglected firm effect is found to persist over and above the small firm effect, namely, the excess returns are not fully attributable to size. In interpreting the results consideration is given to the possibility that the CAPM is mis-specified [2,7]. Several alternative explanations for the neglected firm effect are suggested but not tested. Conclusions are summarized in Section V.

II. *The Effect of Security Research*

Consider a potential set of messages about possible events. Information structure is defined as the matrix of conditional probabilities, describing the probability of an event given a particular message. The output of a security analyst's research may be regarded as a message containing an implicit, if not explicit, probability distribution of possible future earnings for the company in question. In order for a message to have value to an investor, it must alter the probability distribution of expected returns in a manner which increases the expected utility of the investment decision. The evidence suggests that analysts' forecasts have value, since they provide superior estimates of future earnings relative to what investors can generate on their own [4, 6]. As shown by Givoly and Lakonishok [11] and others, analysts' forecasts convey information which affects stock prices. This implies that the forecasts facilitate a more continuous adjustment of prices to the available information, that is, smaller jumps in ex-post returns [17]. It is reasonable to assume, therefore, that analysts' forecasts also narrow the distribution of expected returns.

To examine the impact of security research on the capital asset pricing process, we consider four, not necessarily mutually exclusive, possibilities in the context of the CAPM. The first possibility is that information structure, as represented by security research concentration, does not affect capital asset prices. In this case, the only effect would be on unsystematic risk, with the less researched securities manifesting greater unsystematic risk. Both systematic risk and return would be independent of the concentration of security research.

The second possibility is that the systematic risk coefficient captures the impact of differences in information structure. Security analysts might be said to provide information which alters the systematic risk β_i associated with the security's return, $\tilde{R}_{it}$:

$$\tilde{R}_{it} = R_{ft} + (\tilde{R}_{mt} - R_{ft})\beta_i + \tilde{\xi}_{it} \qquad (1)$$

where R_{ft} is the return on risk free security; $\tilde{R}_{mt}$, the return on the market portfolio; $\tilde{\xi}_{it}$, an error term with zero mean; and β_i depends among other factors on the concentration of security research. Both ex-ante and ex-post risk adjusted returns would be independent of security research.

The third possibility is that there are measurement errors associated with the beta coefficients. Security analysts might provide information about ex-ante systematic risk, which is not reflected in the ex-post $\hat{\beta}_i$. Lacking such information, investors are more uncertain about the appropriate ex-ante beta. Reflecting this uncertainty, they tend to make a larger certainty equivalent adjustment to ex-post betas when estimating ex-ante betas. Thus, the potential difference between ex-ante and ex-post risk coefficients tends to be greater, the less researched the security. In this case, the measurement error associated with the use of ex-post betas would be correspondingly larger for the more neglected stocks. Since measurement errors result in a downward bias [5, 8], the ex-post systematic risk of neglected stocks would understate the ex-ante risk. If so, the true beta could be expressed in terms of the ex-post $\hat{\beta}_i$ times a positive coefficient, $\gamma_i \geq 1$, reflecting the concentration of security research:

$$\tilde{R}_{it} = R_{ft} + (\tilde{R}_{mt} - R_{ft})\hat{\beta}_i\gamma_i + \tilde{\xi}_{it} \qquad (2)$$

According to (2), β_i would not be a direct function of research concentration, but returns would vary with security research. Neglected stocks with $\gamma > 1$ would have higher ex-post risk adjusted returns in up markets and lower returns in down markets, than closely followed stocks with $\gamma = 1$.

The fourth possibility is that the capital asset pricing model is inadequate; neither the ex-post nor the ex-ante mean variance model captures the effect of information structure. In this case, there might be a return premium $\eta_i \geq 0$, associated with the noisy information surrounding neglected securities, such that:

$$\tilde{R}_{it} = R_{ft} + (\tilde{R}_{mt} - R_{ft})\hat{\beta}_i + \eta_i + \tilde{\xi}_{it} \qquad (3)$$

where $\eta_i > 0$ for securities which are not followed by analysts. $\hat{\beta}_i$ would be independent of security research concentration. Required returns and therefore the average observed $\bar{R}_{it}$ would be greater for neglected securities, no matter what the state of the market. η_i would be the average excess return on neglected securities relative to that prescribed by the capital asset pricing model. In effect, η_i represents a possible return premium required to compensate investors for lack of information.

To discriminate between these four possibilities and also to check whether research concentration is not just a surrogate for firm size, the following hypotheses will be tested:

H1: The ex-post systematic risk coefficient varies with the concentration of security research.

H2: After adjusting for market performance and ex-post systematic risk, the returns of highly researched and neglected securities are the same.

H3: After adjusting for market performance and ex-post systematic risk, the returns are greater, the less researched the securities.

H4: After adjusting for firm size, H3 holds.

If the capital asset pricing process is independent of the security research concentration, then H1, H3 and H4 would be rejected, but not H2. On the other hand, if the mean variance model [equation (1)] captures the impact of security research H3 and H4 would be rejected, but not H1 and H2.

In the presence of measurement errors in the β_i of neglected securities [$\gamma > 1$ in equation (2)], H1 and H2 would be rejected. H3 would be consistent with the data in up markets but not in down markets, because the ex-post risk adjusted returns of neglected securities would be greater in up markets and lower in down markets than the corresponding returns of highly researched securities. If there is a return premium associated with lack of information [$\eta_i > 0$ for neglected securities in equation (3)], H1 and H2 would be rejected and the results would be consistent with H3 in both up and down markets.

Finally, if H3 cannot be rejected, but security research is merely a proxy for firm size, then H4 would be rejected. However, if both H3 and H4 cannot be rejected, this would be consistent with the existence of a neglected firm effect over and above any small firm effect.

III. *Methodology*

The sample of securities selected for the study consists of the S&P 500 Index companies. Twenty-five companies were eliminated due to missing data. While this sample is biased toward larger firms it is nevertheless adequately diverse in terms of analysts attention (see Table 1). Firms smaller than the S&P 500 companies are excluded to minimize the potential downward bias in the systematic risk estimates caused by serial correlation [19].

The degree of attention given to individual companies by analysts was measured by research concentration rankings (RCR) calculated from two independent sources. The first set was taken from the Drexel Burnham Lambert report [9]. Research rankings are based on the number of analysts regularly following listed companies, as compiled by the Nelson survey of more than 200 research sources, cross-checked with a detailed market research study of the information sources available to financial institutions [16]. At least two-thirds of the analysts with market influence were included. The research rankings were first expressed in terms of deciles; a rank of one indicating that a company is among the fifty most widely followed companies, while a rank of ten means it is among the fifty least followed firms. The tenth decile includes firms with market values close to a billion dollars which are not covered at all. To minimize possible measurement problems, the securities were divided into three research concentration groups: RCR1 comprising the decile rankings one through three, RCR2 the rankings four through seven, and RCR3 the rankings eight through ten.

To avoid possible measurement inaccuracy relating to analysts' coverage, and to further check the distribution of analysts' attention, an additional independent set of research rankings was derived from the Standard and Poor's *Earnings Forecaster* [20]. Recognizing that estimated future earnings plays an important role in investment decisions, the number of analysts reporting earnings forecasts for each company was taken as a measure of research concentration. A sample of forty-five major security analysts was used for assessing the analysts' coverage distribution for each of the years 1972-1976 inclusive. Again, in order to reduce measurement problems, three RCR groups were formed.[1] The two separate RCR sets — those derived from the Drexel Burnham Lambert reports and those from the Standard and Poor's reports, were cross tabulated to check for consistency. The test for no relationship between the two measures yields a Pearson χ^2 Statistic of 175.6, indicating a 0.99 probability that the two measures are associated. The second set of RCR groups was used in the rest of the study, because it provided more complete data over the five-year period of interest.

Monthly returns were computed for each of the S&P 500 stocks from data on the Compustat Tape over a ten-year period from 1967 to 1976. To take account of possible non-stationarity in the systematic risk coefficients, the stocks' characteristic lines were estimated over five successive ranges of five-year data from 1967 to 1971, by means of ordinary least squares using the following version of equation (1):

$$R_{it} - R_{ft} = \hat{\alpha}_i + \hat{\beta}_i (R_{mt} - R_{ft}) + \xi_{it} \tag{4}$$

where R_{it} is the actual monthly return for stock i during month t, R_{ft} is the risk free return on ninety-day Treasury Bills, R_{mt} is the actual monthly return on the S&P 500 Index, $\hat{\alpha}_i$ is the average excess return on the security associated with an excess return of zero on the market portfolio, and ξ_{it} is the error term.

To test for possible measurement bias in the beta coefficients introduced by non-synchronous trading [19], the serial correlation in the returns on each security was computed and compared across research concentration groups. Note that by using monthly rather than shorter interval returns and, as mentioned above, by restricting the sample to the S&P 500, the chance of beta bias was reduced *ab initio*.

Hypothesis 1 was tested for differences in systematic risk across research concentration groups over each of the five years from 1972 to 1976, by comparing the mean beta coefficients $\bar{\beta}_j$ estimated over the immediately proceeding sixty months for each of the RCR groups where j = 1, 2, 3:

$$\bar{\beta}_j = \frac{1}{N_j} \sum_{i=1}^{N_j} \beta_i \tag{5}$$

and N_j is the number of securities in research category j. For completeness, differences in unsystematic risk were tested for by calculating the corresponding average residual returns $\bar{S}_j$ for j = 1, 2, 3, over the sixty month beta estimation periods:

$$\bar{S}_j = \left[\frac{1\ 2}{60\ N_j} \sum_{i=1}^{N_j} \sum_{t=1}^{60} \xi_{it}^2 \right]^{1/2} \tag{6}$$

Given the beta estimates for each security, the monthly excess returns, e_{it}, were calculated separately for the years 1972 to 1976, based on the corresponding security market line for each month.

$$e_{it} = R_{it} - R_{ft} - \hat{\beta}_i (R_{mt} - R_{ft}) \tag{7}$$

This procedure resulted in five twelve-month test periods, each based on a beta estimation period covering the immediately preceding sixty months.

Excess returns as defined by (7) tend to depend in a systematic manner on $\hat{\beta}_i$: high beta assets tend to have negative excess returns and low beta assets positive excess returns [15]. Since security concentration also may be related to systematic risk, the latter may enter as an intervening variable and create a spurious relationship between research concentration and excess returns. To avoid this problem and isolate the security research effect, iso-beta portfolios were created, facilitating a comparison of portfolio excess returns with identical betas but different research rankings.[2]

Measurement bias in the betas could still occur, however, if the weighting system used to construct the iso-beta portfolios resulted in only a few securities from each research category being represented in a portfolio. To ensure relatively equal participation levels for all securities in a research class, the following linear programming model was developed for constructing iso-beta portfolios:

$$\text{minimize } A_1 - A_2$$

$$\text{subject to: } w_i - A_2 \geq 0 \quad i = i \ldots\ldots n \tag{8a}$$

$$w_i - A_1 \leq 0 \quad i = i \ldots\ldots n \tag{8b}$$

$$\sum_i w_i - 1 = 0 \tag{8c}$$

$$\sum_i w_i \hat{\beta}_i - \beta^* = 0 \tag{8d}$$

where A_1 = largest assigned weight,

A_2 = smallest assigned weight,

w_i = weight assigned to security i,

$\hat{\beta}_i$ = beta of security i and

β^* = specified portfolio beta (iso-beta)

The objective function minimizes the difference between the maximum weight given to any security in the portfolio and the minimum weight. This ensures that all securities will be, as much as possible, equally represented. Constraint (8a) ensures that no weight will be lower than the minimum; constraint (8b) that no weight will be higher than the maximum; and constraint (8c) that the sum of the weights will be one. The last constraint ensures that the portfolio assumes the prespecified value of beta (β^*).

Hypotheses 2 and 3 were tested over the five years from 1972 to 1976, by comparing the weighted average annual excess returns ($\overline{E}_{jk}$) by iso-beta category (k) of the portfolios corresponding to research concentration groups j:

$$\overline{E}_{jk} = \frac{1}{N_{jk}} \sum_{i=1}^{N_{jk}} \sum_{t=1}^{12} w_i e_{it} \tag{9}$$

where N_{jk} is the number of securities in iso-beta portfolio jk. For completeness, the average annual excess returns were also computed ignoring the iso-beta restriction:

$$\overline{E}_j = \frac{1}{N_j} \sum_{i=1}^{N_j} \sum_{t=1}^{12} e_{it} \tag{10}$$

To further test H3 and to distinguish between potential measurement errors in the $\hat{\beta}_i$ of neglected securities and a return premium for lack of information [equations (2) and (3)], the average unadjusted annualized returns ($\overline{R}_{jq}$) for RCR group (j) were computed for each year separately over the months q when the market (R_m) went up and down, respectively:

$$\bar{R}_{jq} = \frac{12}{N_q N_j} \sum_{i=1}^{N_j} \sum_{t \epsilon q} R_{it}$$

where q is the set of either up or down months for the year in question and N_q is the number of months in each set q.

To examine the relations between firm size, analysts' coverage and excess returns, the sample was divided into ten iso-size deciles using market value as a measure of firm size. The percentage distribution of firms across RCR groups within the size deciles was tabulated and average annual excess returns ($\bar{E}_{js}$) were calculated for each size decile (s) and RCR group (j):

$$\bar{E}_{js} = \frac{1}{N_{js}} \sum_{i=1}^{N_{js}} \sum_{t=1}^{12} e_{it}$$

where N_{js} is the number of securities in RCR group j within the iso-size decile s.

Finally, to check for the possible existence and variation of serial correlation in the returns across RCR groups, the serial correlation coefficients of the returns for each company over the sixty-month period (1972-1976) were calculated. The number of serial correlation coefficients significant at the 5 percent level, as well as the average regardless of significance level, was tabulated by RCR and iso-size categories.

IV. *Results and Interpretation*

The data on the distribution of forecasters by companies (see "Totals" in Table 1) clearly indicate that analysts' coverage is not equally distributed across companies. About 23 to 31 percent of the companies (depending on the year) ranked in RCR 3 received no attention at all or a coverage of just one forecaster (out of forty-five major analysts). At the other end of the scale, 23 to 33 percent of the companies were intensively researched as indicated by a ranking of RCR 1. Thus, in spite of the fact that the 500 stocks comprising the S&P Index represent comparatively larger firms and more popular securities, analysts' coverage varies widely.

Examination of the research coverage over time reveals a significant shift in analysts' attention among companies. Table 1 is a switching matrix describing the stability of the RCR classification between 1972 and 1976. Overall, only 42.6 percent of the firms remained in the same category over the five years. The instability was most pronounced for the neglected security category 3: only 31.6 percent of the firms originally in this category in 1972 were classified the same way in 1976. Given this large variation in analysts' coverage, the tests for the impact of security research were based on revised classifications for each year, rather than a constant classification for the whole period.

Table 1

SWITCHING MATRIX: RESEARCH CONCENTRATION RATIOS (RCR) 1976 vs. 1972

	Frequency Percent	RCR 1976 1	2	3	TOTAL
	1 (most researched)	54 11.4%	45 9.5%	12 2.5%	111 23.4%
RCR 1972	2	66 13.9%	102 21.5%	50 10.5%	218 45.9%
	3 (least researched)	37 7.8%	63 13.3%	46 9.7%	146 30.7%
	TOTAL	157 33.1%	210 44.2%	108 22.7%	475 100.0%

Table 2

AVERAGE RISK AND ANNUAL RETURN BY RESEARCH CONCENTRATION GROUP (RCR)

YEAR	RCR	Systematic Risk $\bar{\beta}_j$	Unsystematic Risk $\bar{S}_j$	Annual Return* $\bar{R}_j$	Annual Excess Return* $\bar{E}_j$
1972	1	.98	.204	.183	.005
	2	1.05	.211	.125	-.062
	3	.97	.222	.189	.014
1973	1	.98	.197	-.206	-.037
	2	1.01	.218	-.221	-.045
	3	1.01	.232	-.097	.078
1974	1	1.00	.218	-.282	.034
	2	1.05	.222	-.255	.079
	3	.97	.225	-.123	.178
1975	1	.98	.236	.405	.037
	2	1.01	.239	.511	.134
	3	1.02	.267	.541	.163
1976	1	.94	.242	.231	.045
	2	1.03	.242	.332	.136
	3	1.03	.281	.373	.198
1972-1976**	1	.98	.218	.066	.017
	2	1.03	.239	.098	.048
	3	1.00	.246	.177	.126

*See footnote (4)

**Simple arithmetic average

H1 may be tested using the data in Table 2, which contains the average systematic risk for each of the three research concentration groups for the years 1972 to 1976. The average betas ranged between 0.94 and 1.00 for the most highly researched securities, between 1.01 and 1.05 for those in the intermediate category, and between 0.97 and 1.03 for the least researched. It is clear that security research had no significant impact on ex-post systematic risk over the period. Therefore, Hypothesis 1 can be rejected.

Turning to H2, the average annual excess returns are listed in Table 3 for the risk adjusted iso-beta categories 0.9, 1.0, and 1.1. In contrast to the lack of impact on ex-post systematic risk, differential security research had a strong effect on excess returns in the last four of the five years studied: the less researched the security, the greater the return.[3] Since systematic risk is not affected, the results are adequately summarized by the average excess returns across risk categories in Column 6 of Table 2. In all five years the portfolio of least researched securities had a higher return than the most highly researched:[4] the difference ranged from 0.9 percent in 1972 to 14.4 percent in 1974 and averaged 10.9 percent annually, over the five years. Thus, it follows that Hypothesis 2 can be rejected within the context of the S & P 500.

Table 3

AVERAGE ANNUAL EXCESS RETURNS ($\overline{E}_{jk}$) BY ISO-BETA PORTFOLIOS*

		Iso-Beta		
YEAR	RCR	0.9	1.0	1.1
1972	1	.039	.020	.001
	2	-.011	-.032	-.053
	3	.029	.017	.005
1973	1	-.034	-.037	-.039
	2	-.013	-.029	-.045
	3	.067	.073	.079
1974	1	-.008	.013	.033
	2	-.023	.012	.055
	3	.116	.152	.189
1975	1	.019	.028	.039
	2	.126	.130	.133
	3	.116	.138	.154
1976	1	.032	.013	-.006
	2	.093	.091	.082
	3	.171	.160	.149
1972-	1	.009	.007	.005
1976	2	.034	.034	.034
**	3	.100	.108	.116

*See footnotes (3) and (4).

**Simple arithmetic average.

With respect to H3, Table 4 lists the average monthly returns (unadjusted for risk) by RCR group during the months when the market went up or down in each year. Every year during the up months, the neglected securities in RCR 3 had the highest returns. During the down months, the least researched securities performed best in three of the five years. Thus, although H3 cannot be rejected, it is difficult to say whether the superior returns on the neglected securities were due to ex-ante β estimation problems as in equation (2), or reflected a return premium as in equation (3). Whatever the reason, over the five-year period, the average annual excess return on the highly researched portfolio was 1.7 percent, and on the portfolio of neglected securities it was 12.6 percent.

Table 4

AVERAGE MONTHLY RETURNS FOR UP AND DOWN MARKETS BY RCR GROUPS (1972-1976)

	1972	1973	1974	1975	1976	Average 1972-1976*
1. Down Market						
No. of Months	n = 2	n = 10	n = 8	n = 3	n = 5	
RCR: 1	-.0177	-.0391	-.0494	-.0326	-.0129	-.035
2	-.0219	-.0399	-.0517	-.0296	-.0133	-.036
3	-.0198	-.0297	-.0432	-.0291	-.0184	-.030
2. Up Market						
No. of Months	n = 10	n = 2	n = 4	n = 9	n = 7	
RCR: 1	.0227	.0880	.0302	.0559	.0424	.043
2	.0178	.0888	.0397	.0675	.0561	.047
3	.0231	.1018	.0545	.0697	.0696	.052

*Weighted by number of companies and months for up or down markets.

There are several possible reasons for the increasing discrepancy between the returns predicted by the capital asset pricing model and actual returns, as the concentration of security research declines. One explanation may be found in the corresponding differences in unsystematic risk which declined slightly with increasing security research (see Table 2). The differences in unsystematic risk between research groups one and three were small and varied from .007 in 1974 to .039 in 1976. If investors were well diversified, these differences would have had no impact on the capital asset pricing process. However, if the investors in neglected securities were not well diversified, the differences in unsystematic risk might have resulted in differences in return in the same direction as those in Table 2. Unfortunately, as pointed out by Levy [14], it is difficult to correct for this effect empirically. Moreover, the variation in return and unsystematic risk persisted, despite the large degree of switching between the neglected and more researched security categories. Assuming differential diversification, this would imply that investor clienteles shifted at approximately the same time as analysts: the well diversified investors followed the shifts in attention of the analysts, while the less diversified clienteles concentrated their investment in less researched securities. If this were the case, however, it is surprising that the well diversified investors did not extend their diversification to benefit from the persistently higher returns on neglected securities. It seems unlikely, therefore, that differences in diversification among investors, as discussed by Levy, fully explain the observed differences in returns.

Another explanation of the results may be in the possible existence of a transient market inefficiency between 1973 and 1976. Such transient inefficiency might be related to the number of active traders or the frequency of transactions [12, 21]. Traders could have beaten the market over this period by utilizing the following trading rule: use the S&P *Earnings Forecaster* as a guide to select a portfolio of neglected stocks in research concentration category three; each year revise the portfolio to reflect changes in the focus of security research and repeat. This trading rule would have beaten the market in each of the five years studied, assuming, of course, that the capital asset pricing model provides valid risk adjusted returns over the period.[5] Excluding transaction costs, the cumulative excess return relative to the market would have been 63.1 percent. Such inefficiency implies, of course, that analysts consistently selected securities with lower performance, which begs the question of why they didn't correct their apparent error. In our opinion, the explanation is unlikely to be found in a market inefficiency, owing to the self-correcting nature of inefficiencies.

A third explanation may be that research concentration is merely a proxy for size. Table 5 shows the relationship between research concentration and size as measured by the market value of the firms in 1976. Firms were ranked according to their size and divided into ten deciles numbered from one for the smallest firm to ten for the largest. Table 5 lists the percentage of firms by research concentration group within each size decile. It can be seen that, for the single year shown, the neglected firms in RCR 3 are concentrated in the smaller size deciles, while the highly researched firms in RCR 1 are concen-

Table 5

DISTRIBUTION OF COMPANIES
BY SIZE* AND RESEARCH CONCENTRATION (Percent) 1976

	SIZE DECILES (1 = Smallest, 10 = Largest)									
	1	2	3	4	5	6	7	8	9	10	TOTAL
RCR 1	0.7	6.1	4.1	6.8	8.7	7.4	12.2	10.1	19.6	24.3	100.0
RCR 2	8.2	11.7	12.2	10.7	11.2	13.3	11.7	11.7	6.1	3.2	100.0
RCR 3	27.9	12.4	15.0	14.0	9.7	6.5	3.7	6.5	3.2	1.1	100.0

*Company size is measured in terms of market value.

trated in the larger size deciles. Similar results were obtained for the other four years studied. Since small firms are known to have positive excess returns on a risk adjusted basis (Banz [3] and Reinganum [18]) perhaps it is not surprising that neglected firms have superior excess returns.

The large switches in analysts' attention over time, however, suggest that research concentration is not merely a proxy for size. While the relative sizes of companies did not change much over the five years, Table 1 shows that the RCR rankings switched significantly. To test whether there is a neglected firm effect beyond that associated with size (H4), the annual risk adjusted excess returns were computed for the portfolios of firms corresponding to each of the RCR iso-size cells in Table 6. The average results for the five years are shown in Table 6. There is a neglected firm effect in eight of the ten size deciles. Interestingly, the effect tends to be stronger in the smaller size deciles. This is even more apparent when the results are analyzed on a year by year basis from 1972 to 1975. Taking the first, second, and third iso-size deciles as representative of small firms, over the five years studied, there was a neglected firm effect in thirteen of the fifteen cases. By contrast, taking the eighth, ninth, and tenth deciles as representative of large firms, there was a neglected firm effect in only seven of the fifteen cases over the five years. Using a χ^2 test under the assumption that the data was independent from year to year, the neglected firm effect is insignificant in the large firm deciles and significant among the small firms at the 1 percent level.

Table 6

AVERAGE ANNUAL EXCESS RETURNS
BY FIRM SIZE AND RESEARCH CONCENTRATION
(1972-1976)

	ISO-SIZE PORTFOLIOS (1 = Smallest, 10 = Largest)										
	1	2	3	4	5	6	7	8	9	10	MEAN*
RCR 1	.016	−.096	−.045	.105	.042	.058	.088	.048	.056	.065	.051
RCR 2	.009	.140	.087	.071	.116	.054	.080	.084	.093	.041	.082
RCR 3	.132	.209	.156	.166	.210	.147	.148	.040	.085	.046	.150
MEAN*	.102	.121	.103	.121	.125	.077	.092	.061	.067	.062	

*Weighted by the number of companies in the corresponding cells.

A small firm effect also exists in the sample as a whole (see bottom row in Table 6). The average annual excess return for the smallest firms in the first decile was 10.2 percent compared with 6.2 percent for the largest firms in the tenth decile. But when the degree of neglect is controlled within each of the research concentration categories, the small firm effect is no longer apparent in the average five-year results. When the annual data is examined by research concentration categories, a small firm effect is manifest in some years and a reverse effect (with the larger firms earning higher returns) in other years. Taken overall, these results suggest that the small firm effect may be subsumed by the neglected firm effect;[6] the latter appears to be more fundamental in the sense that it persists even when the size effect is held constant, but the size effect does not persist when the neglected firm effect is held constant.

Roll has suggested that the small firm effect might be due to underestimated systematic risk coefficients generated by greater positive autocorrelation in the returns on small firms, owing to more discontinuities in the trading of their shares. To check for this possibility in our data, the autocorrelation coefficient was computed for each firm's monthly returns over the period studied.[7] The number of positive autocorrelation coefficients significant at the 5 percent level, as well as the average autocorrelation coefficient regardless of significance, for each RCR-size category, is listed in Table 7. Overall, there is not much autocorrelation in the data. This is not surprising since our sample comprises monthly returns on S&P 500 companies, while Roll's data included daily returns on the composite NYSE and AMEX companies.

As shown in Table 7, there is some weak indication of greater positive autocorrelation in the data for smaller firms. Thus, even for our sample, at least some of the overall small firm effect in Table 6 might be due to the beta bias emphasized by Roll. By contrast, there is no sign of greater positive autocorrelation across research concentration groups; if anything, Table 7 indicates less positive autocorrelation among the neglected firms in RCR 3 compared to the highly researched firms in RCR 1. While the small firm effect might be attributable at least in part to beta bias, the latter does not seem to explain the neglected firm effect. H4, therefore, cannot be rejected.

A plausible explanation for the neglected firm effect might consist in the higher perceived risk associated with neglected companies and, especially with small neglected firms. Larger perceived risk implies less stable ex-ante return distributions. The greater the information deficiency in such cases, the less reliable the usual ex-post risk measures. Lack of information is likely to be much more critical for small firms given their higher risk. Indeed, our findings suggest that the neglected firm effect is much stronger for small firms; investors demand higher excess returns to offset the greater uncertainty associated with small neglected firms. Similarly, lower perceived risk among bigger firms suggests more stable ex-ante return distributions, which in turn reduces the value of security research and the required premium for its absence. This raises the question of why the higher required return on small neglected firms is not eliminated by more security research. Investors have the choice of paying security analysts to collect and process new information, thereby reducing their uncertainty and lowering the required return. The economies of scale in security research are less, however, in the case of companies with small market values.[8] Per dollar invested, the cost of security re-

Table 7

NUMBER OF SIGNIFICANT AUTO CORRELATION COEFFICIENTS (AT 5 PERCENT LEVEL OR BETTER) AND AVERAGE AUTOCORRELATION COEFFICIENT BY FIRM SIZE AND RESEARCH CONCENTRATION*

	ISO SIZE GROUPS (1 = Smallest, 10 = Largest)										
	1	2	3	4	5	6	7	8	9	10	TOTAL & MEAN**
RCR 1	0	1	2	0	1	1	1	1	0	0	7
n = 111	(− .022)	(.075)	(.123)	(.033)	(− .062)	(.025)	(− .012)	(.001)	(− .063)	(− .073)	(− .025)
RCR 2	1	3	1	0	2	0	0	0	0	0	7
n = 218	(.040)	(.048)	(.029)	(− .036)	(.024)	(− .032)	(− .040)	(− .032)	(− .077)	(− .039)	(− .009)
RCR 3	0	0	0	1	0	1	0	0	1	0	3
n = 146	(.011)	(.007)	(.024)	(− .024)	(.005)	(.001)	(− .073)	(− .008)	(.078)	(− .040)	(.004)
TOTAL &	1	4	3	1	3	2	1	1	1	0	17
MEAN**	(.020)	(.044)	(.040)	(− .017)	(− .004)	(− .009)	(− .033)	(− .019)	(− .055)	(− .068)	(− .0009)
n = 475											

*The numbers in parentheses are average autocorrelation coefficients for all stocks included in each size group regardless of the significance level.

**Weighted by the number of companies in the corresponding cells.

search in smaller firms may exceed the benefits of a reduction in uncertainty. As a result, smaller companies tend to be more neglected by security analysts than larger companies.

V. *Conclusion*

A low level of security research is not reflected in ex-post systematic risk, but is strongly related to higher excess returns: the most neglected securities performed best in each of the years in the period studied. This neglected firm effect exists beyond that associated with size, but it was found to be stronger for small firms. If an efficient market and well diversified investors are assumed, the results are sufficient to reject the hypothesis that the ex-post capital asset pricing model can account for differences in return across different concentrations of security research. Also, measurement bias associated with autocorrelation is largely ruled out. The most plausible explanation for the neglected firm effect is greater uncertainty concerning ex-ante return distributions. As compensation for the greater uncertainty associated with lack of information, investors demand a positive premium above the return predicted by the two moment capital asset pricing model. Plausible as this explanation might be, its confirmation requires rigorous examination of the ex-ante return distributions, which unfortunately is difficult to carry out empirically.

Footnotes

[1]The yearly research concentration measures were based on the number of forecasters covering each company as reported in the first S & P *Earnings Forecaster* report [20] published in January of each year. Companies were divided into research concentration groups as follows: RCR 1: four or more forecasters, RCR 2: two or three forecasters and RCR 3: one or no forecaster.

It is possible that companies that are relatively neglected at the beginning of the year are followed by a larger number of analysts towards its end. This "popularity flow" is to a large extent captured by the revised RCR classification used for each year.

[2]For further discussion on the iso-beta portfolio approach see Gonedes [13] and Arbel, et al. [1].

[3]Due to possible small differences in the number of securities across iso-beta portfolios, a simple arithmetic average of the returns on these portfolios cannot be used to obtain the return on the corresponding RCR portfolio.

[4]The differences in mean excess return between research groups 1 and 3 are significant at the 5 percent level for the period as a whole and for each of the years taken separately, except 1972.

The number of positive excess returns exceeds the negative number because the reference market portfolio was the value weighted S & P 500, whereas the excess return averages in Tables 2 and 3 were computed arithmetically.

[5]Tests of market efficiency are joint tests of the risk adjustment model used, and vice versa. Thus, the discrepancy between the results reported in this paper and the capital asset pricing model may be indicative of either shortcomings in the model, or market inefficiency, or both.

[6]A more detailed analysis of this point is beyond the scope of the present paper and will be reported on elsewhere.

[7]Serial correlation tests also were conducted on the daily returns of the companies in each research concentration group. There was no sign of any significant difference in daily serial correlation between the research groups.

[8]The following quote is relevant in this respect:

> "Institutional investors aren't interested in little companies so the research houses don't follow them. The institutions aren't interested because the capitalization is so small; they couldn't take a large position" [10].

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