Small Firm Mutual Funds: Additional Evidence on the Small Firm Effect*

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ABSTRACT. Returns generated with small firm mutual fund data are used to examine the extent to which identification of a "small firm effect" is due to the difficulty in measuring the direct and indirect transaction costs involved in investing in the common shares of small capitalization stocks. Little if any evidence of the excess risk-adjusted returns is obtained for either of the period 1978—1983, when the small firm effect was observed, or the period 1984—1989, when it was not. The "small firm effect" may therefore be attributed to (1) higher direct transaction costs including bid-ask spread and broker fees and (2) higher indirect transaction costs including portfolio management expenses and market impact costs.

I. Introduction

Small firm mutual fund returns offer a unique opportunity to examine the extent to which identification of a "small firm effect" is due to the difficulty of measuring the direct and indirect transaction costs involved in common stock investing. The "small firm effect" refers to the persistent abnormal returns apparently available in the common stock of small capitalization firms. While attempts have been made to explain the persistence of this anomaly in terms of misspecification of the asset pricing model, high abnormal returns earned in the month of January, correlation with other return anomalies, and the presence of high transaction costs, the small firm anomaly has proved resilient.

This study proposes to examine the small firm effect using a methodology that more completely compensates for the impact of transaction costs. Prior work in the transaction costs area has focused on measuring *direct* transaction costs, defined as broker fees, commissions and the bid-ask spread. In this study, indirect as well as direct transaction costs are accounted for by examining the returns of small firm mutual funds.

Indirect transaction costs take two forms: portfolio management costs and market impact costs. Portfolio management costs involve the research and analysis required to form prudent judgments of value, and can be especially high in the case of small firms. Market impact costs occur when, in illiquid markets, transactions tend to occur at adverse prices. In such cases, stocks tend to be bought at higher and sold at lower than equilibrium prices.

Since the net asset values of mutual funds are reported after all costs have been accounted for, such data can be used to measure the impact of transaction costs on stock returns.[1] Hence, by generating a return using changes in net asset value (plus distributions), it is possible to measure returns net of broker fees and commissions, bid-ask spreads, portfolio management costs, and market impact costs.

This study compares the net returns of two groups of funds: one group invests in the stocks of growth-oriented small firms, while the second invests in growth-oriented but not necessarily small firms. The results indicate that when both direct and indirect transaction costs are accounted for, the small firm effect virtually disappears.

II. Review of the small firm effect research

The small firm effect was first identified by using the Capital Asset Pricing Model (CAPM) to compare the risk-adjusted returns of the stocks of small capitalization firms to those of large capitalization firms. Findings indicate significant, persistent, positive excess returns in the stocks of small firms (Banz, 1981; Basu, 1978; Reinganum,

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1981). Since its discovery, many attempts have been made to explain it. These fall under the headings of mis-specification, January effects, neglected firm effects, and transaction costs.

A. *Misspecification*

The small firm effect has often been attributed to CAPM misspecification. In particular, small firms are prone to potential problems created by the limited information available on small firms (Banz, 1981). Adding to this problem are "risk factors that are omitted from the CAPM . . ." (Reinganum, 1981).

In defense of the CAPM it is argued that estimates of the betas of small firm stocks have been mismeasured. Infrequent or non-synchronous trading imparts a downward bias to ordinary least squares estimates of small firm betas. Correcting for this problem by using an adjusted beta estimator, such as that developed by Dimson accounts for part, but not all, of the small firm effect (Roll, 1981; Reinganum, 1982). Additional findings indicate that estimates of beta based on annual versus monthly return intervals reduces the size and statistical significance of the small firm effect (Handa *et al.*, 1989). Furthermore, portfolios formed by the arithmetic and rebalanced methods (both commonly used in empirical studies) produce a small firm effect twice as large as that found in portfolios formed with a buy-and-hold method, as might actually used by investors (Roll, 1983a). Subsequent re-examinations of the mismeasurement of beta argument, find that the magnitude of the mismeasurement is simply too small to provide an explanation of the small firm effect (Reinganum, 1982; Stoll and Whaley, 1983).

B. *January effect*

A second area of small firm research addresses the interaction between the small firm and January anomalies. A large proportion of the entire year's return for small firms is concentrated in the first few days of January (Keim, 1983; Reinganum, 1983). It has also been demonstrated that excess returns to small firm stocks are obtained *only* during the month of January, and that there are no excess returns to the stocks of small firms in the remainder of the year (Carlton and Lakonishok, 1983).

While these dramatic movements may be attributable to "turn-of-the-year" tax-loss selling (Givoly and Ovadia, 1983), something must explain the persistence of this seasonal pattern in the face of tax exempt investors, especially institutions such as pension funds (see Brown, Keim *et al.*, 1983, and Constantinides, 1984). In this regard, there is no evidence of increased insider trading activity during the month of January and, therefore, one cannot explain the January effect as compensation for expected losses against informed traders during that month (Seyhun, 1988). Research also indicates that bid-ask spreads are similar between January and other months (Blume and Stambaugh, 1983). Hence, while some of the size phenomenon is explained by the January anomaly, a residual size effect still remains.

C. *Neglected firm effect*

A third explanation of the small firm effect pertains to the correlation between size and the neglected firm effect. Evidence of positive abnormal return to "neglected firms" have been shown. Neglected firms are proxied as (in order of importance) those with few analysts covering them; with low holdings of their stock by institutions; with small relative trading volume; with few shareholders; and with short periods of listing (Arbel *et al.* (1983), Carvell and Strebel (1987), and Strebel and Arbel (1983)). Rationalization of these abnormal returns include the greater cost of financial research and analysis of neglected firms, estimation risk, and the reduced ability to diversify away the otherwise non-systematic risk of such stocks in portfolios consisting of finite numbers of stocks.

To the extent that estimation risk might be considered idiosyncratic, it might be thought that "diversification can be achieved simply by holding small firms within a large portfolio" (Reinganum and Smith, 1983). Nevertheless, investors who have relatively limited information with which to estimate the risk of certain securities would rationally restrict their investments in such securities (Klein and Bawa (1976, 1977); Barry and Brown (1984, 1985)). Estimation risk, while seemingly idiosyncratic, would act like non-diversifiable risk.

D. *Transaction costs*

A fourth extension of the small firm effect research addresses the impact of transaction costs. It has been demonstrated that *direct* transaction costs, including broker fees and bid-ask spreads, can explain the small firm effect for short holding periods (Stoll and Whaley (1983)). These findings have been replicated with holding periods of one to six months both inclusive and exclusive of the month of January. However, for holding periods that include January, positive access returns have been found for holding periods as brief as one month, leading to the conclusion that the size effect can not be explained by transaction costs alone (Schultz (1983)). (See Roll, 1986b, for more on the January effect and transaction costs.)

Transaction cost effects have been further examined using a formal model that relates stock returns to systematic risk and bid-ask spread (Amihud and Mendelson (1986)). The findings indicate that the size effect may be a proxy for the impact of differing spreads, reflecting higher transaction costs and/or illiquidity. It is suggested that corporate financial policies that enhance liquidity (e.g., going public, standardizing debt contracts, etc.) may increase firm value. Based on this suggestion, it would be interesting to test whether the liquidity-enhancing service performed by mutual funds increases investor returns net of all portfolio management costs, or that mutual fund returns simply provide an explicit measure of otherwise elusive transaction costs.

Estimates of direct transaction costs vary. One study has found that broker fees average 16 cents per share in large block trades (Berkowitz and Logue (1986)). For $40 shares, and presuming the bid-ask spread to be one-eighth, this implies a conservative estimate of direct transaction costs of about 0.7 percent. Based on serial covariance, the "effective bid-ask spread," which would include the actual bid-ask spread as well as market impact cost, is 0.3 percent with daily data and 1.7 percent with weekly data (Roll (1984)). With broker fees, these would imply transaction costs, exclusive of portfolio management cost, of 0.7 and 2.1 percent.

Related research demonstrates that while short-term price volatility is greater than long-term for small firm stocks, in the case of large firms, short- and long-term volatilities are more similar (Hasbrouck and Schwartz (1988); Cooper *et al.* (1985)). This is interpreted to mean that small firm stocks are less liquid, and therefore, that small firm stock trades are more likely to move price (in the absence of new information).

In order to take both direct and indirect transaction costs into account, this study investigates the performance of small firm mutual funds. If small firm stocks do offer risk-adjusted, net-of-transaction costs abnormal returns, then it is appropriate to ask if investors in small firm mutual firms capture these abnormal returns. If, however, the small firm effect is a statistical artifact due to the difficulty in taking direct and indirect transaction costs into account when examining the price history of small firm stocks, then no differences will be identified between small and non-small firm mutual fund returns.

E. *Whither the small firm effect?*

A persistent small firm effect was documented through the mid 1980s. Ibbotson *et al.* (1990) present average annual returns over five-year periods for a variety of investments. Separating stocks into ten portfolios by capitalization, they report — for the period 1978—1982 — that the portfolio of the smallest firms achieved an average annual return of 27.8 percent versus an average annual return of 12.1 percent for the portfolio of the largest firms. Ignoring any difference in risk, this would indicate a substantial small firm effect. However, for the period 1983—1987, they report that the portfolio of the smallest firms achieved an average annual return of 12.7 percent versus an average annual return of 17.5 percent for the portfolio of largest firms. If anything, this would indicate that a "reverse small firm effect" was operative during this period.

Because of the apparent shift in the small firm effect during the mid '80s, this study splits its sample into two subperiods: 1978—1983, when a small firm effect was observed, and 1984—1989, was this effect was not observed.

III. Mutual fund performance

The first modern studies of mutual fund performance, addressed whether mutual funds, being professionally-managed, could outperform the

market (Jensen (1968)). More recent studies focus on issues related to efficiency. As in this investigation, fund returns are measured as changes in net asset value per share (plus distributions), which would be net of management fees and turnover costs but gross of load factors for load funds. Results using a model that controls for each fund's systematic risk, show that management fees, expenses and turnover all fail to effect fund returns, indicating that at the margin the benefit of active portfolio management approximately equals the cost. Additional findings indicate that load funds achieve a higher return, implying a break-even holding period for investors of about five years (Ippolito, 1989).

Another recent study finds no evidence of abnormal returns in mutual fund net returns. However, abnormal returns in a measure referred to as "gross returns," formed by adding an estimate of these funds' transaction costs to their net returns do appear to exist. Interestingly, when funds are differentiated by investment objective, findings indicate that aggressive-growth-oriented and growth-oriented funds achieve abnormal returns of 3 percent per year in "gross returns," and zero in net returns (Grinblatt and Titman (1989)). This finding suggests that the appearance of abnormal returns in certain stocks may be due to unaccounted transaction costs. However, small firm mutual funds are not specifically analyzed.

IV. Mutual fund data

To conduct this study, data on twenty-seven mutual funds are collected. First, consultation of the *Weisenberger Investment Companies Service* mutual fund guide revealed the existence of nine open-end mutual funds that specifically invest in small firms. These nine form the test group of funds. An additional eighteen open-end funds, also having a growth orientation but which have not restricted themselves to investing in small firms, are chosen to form a control group.

Examples of the investment objectives of the small firm mutual funds include: invest in "smaller, developing growth companies" (Lord Abbett Developing Growth Fund, *Weisenberger*, 1988, p. 413); in "relatively small, unseasoned or embryonic companies" (Explorer Fund, p. 296); in "relatively small, unseasoned or unknown companies, or those in an early stage of development" (First Investors Discovery Fund, p. 320); and, in "small growth companies" (T. Rowe Price New Horizons Fund, p. 497).

An indication of the size of the firms held by small firm mutual funds can be readily obtained using the top five holdings reported in *Weisenberger.*[2] Based on the weighted average capitalization of these top five holdings, it can be said that the size of the firms held by small firm mutual funds are indeed much smaller than that of other growth-oriented mutual funds.

A more representative indicator of size would be based on a random sample, if not a census, of small firm mutual fund holdings. Based on samples consisting of every fifth holding of five small firm mutual funds, the average capitalization of the firms in these funds in 1986 is $183 million.[3] While the average size of the top five holdings appears to be much larger than the true average size of the firms held by small firm mutual funds, the top five measure does preserve the rank orderings of size as indicated by the more representative samples.

Statistics describing the data are presented in Table I. Consistent with prior research on the small firm effect, the periods 1978—1983 and

TABLE I
Descriptive statistics

	Small firm mutual funds	Other growth-oriented mutual funds
1978—1983:		
Wtd. ave. cap. of top five holdings, 1980	$1.3 MMM	$3.4 MMM
Mean return	25.8%	21.9%
Mean beta	1.37	1.21
Mean expense ratio	1.22%	0.95%
Mean turnover rate	64.8%	81.8%
Number of funds	6	15
1984—1989:		
Wtd. ave. cap. of top five holdings, 1986	$3.1 MMM	$9.3 MMM
Mean return	5.7%	12.6%
Mean beta	1.12	1.06
Mean expense ratio	1.07%	0.93%
Mean turnover rate	57.1%	81.5%
Number of funds	9	18

1984—1989 are quite different in terms of average annual returns of small firm mutual funds versus those of other growth-oriented mutual funds. During the first period, the small firm mutual funds achieve higher returns than other growth-oriented mutual funds. During the second period, the small firm mutual funds achieve lower returns.

It should be pointed out that the higher returns achieved by small firm mutual funds during the period 1978—1983 do not necessarily reflect a small firm effect. Because the small firm mutual funds had higher average betas, their higher returns could be merely compensation for systematic risk.

Also of interest, expense ratios are higher for small firm mutual funds than for other growth-oriented mutual funds, perhaps indicating that portfolio management is more costly when investing in small capitalization stocks.[4] In addition, turnover rates are lower for small firm mutual funds, indicating that the common stocks of small firms may be less liquid.

V. Empirical model

The first step in this study's analysis of small firm mutual fund performance is to calculate monthly fund returns for the two test periods. After adjusting for the impact of splits, the monthly fund return is calculated as follows:

$$R_{is} = \log(NAV_{is} + D_{is}) - \log(NAV_{is-1}), \quad (1)$$

where: R_{is} = the return for fund i in month s,
NAV_{is} = net asset value per share for fund i in month s,
D_{is} = the dividend and capital gains distribution for fund i in month s.

In order to control for risk, betas are calculated for each fund for each of the two test periods, i.e., January 1978—December 1983 and January 1984—December 1989. Beta is obtained from the following ordinary linear regression:

$$R_{is} - CP_s = \alpha_i + \beta_i(R_{Ms} - CP_s) + \varepsilon_{is}, \quad (2)$$

where: CP_s = $[\log(1 + X/12)] - 1$, X being the 6-month Commercial Paper Rate in month s,
R_{Ms} = CRSP value-weighted market monthly holding period return (including dividends) in month s,

and where β_i, is taken as the slope coefficient.

The second step is to estimate a model of mutual fund returns of the following form for each of the two test periods:

$$R_{it} - CP_t = a_0 + a_1[\beta_i(R_{Mt} - CP_t)] + a_2 SMALL_i + a_3 LOAD_{it} + a_4 SIZE_{it} + a_5 TURN_{it} + \varepsilon_{it}, \quad (3)$$

where: R_{it} = $[\pi_{s=1,12}(1 + R_{is})] - 1$, for the twelve months in year t,
CP_t = $[\pi_{s=1,12}(1 + CP_s)] - 1$, for the twelve months in year t,
R_{Mt} = $[\pi_{s=1,12}(1 + R_{Ms})] - 1$, for the twelve months in year t,
$SMALL_i$ = a dummy variable denoting small firm mutual funds,
$LOAD_{it}$ = a dummy variable denoting load funds,
$SIZE_{it}$ = log(Net Assets) for fund i in year t,
$TURN_{it}$ = asset turnover rate of fund i in year t.

The beta-weighted, excess return $[\beta_i(R_{Mt} - CP_t)]$ is included in the model to account for the return expectation given the systematic risk of the fund. The coefficient a_1 should not significantly differ from one.

Funds that are sold with a front-end load, or sales fee, are expected to earn greater returns as compensation for investors. Hence, the dummy variable LOAD, which takes on the value of one in the presence of a load, is included in the model and its sign is expected to be positive.

Potential economies of scale portfolio management may lead to large portfolios having greater returns. To account for this potential portfolio size effect, the log of the net asset value (SIZE) for each fund is included in the model. If significant, the coefficient is expected to be positive. If, however, funds are randomly distributed about their optimal size, one would expect a coefficient of zero. This is made more important by the observed difference in size of the small firm funds in the test group and the other funds included in the control group.

Differences in portfolio turnover have also been observed between the test and control groups of mutual funds in this sample. While turnover may be costly, offsetting benefits may accrue to funds whose managers have a comparative advantage in the market timing of their transactions. Therefore, turnover is included in the model (TURN), and its coefficient is expected to be negative, if significant at all.

Critical to testing the hypothesis of this study, that a small firm effect exists, is the dummy variable accounting for small firms (i.e., SMALL). This variable is specified and tested in two ways: first, a simple dichotomous dummy variable taking the value of one in the presence of a small firm fund is employed. Second, the simple dummy variable is replaced by a more continuous variable measuring the relative size of firms held by the mutual fund.[5] The sign and significance of the small firm variable will indicate whether or not a small firm effect does in fact exist in the data.

Notice that equation (3) uses annual returns (generated with monthly compounding), coincident with the periodicity of the data reported in *Weisenberger*, while the betas included in the equation are formed from monthly returns over the same time period. This approach gains precision in the estimation of beta at the cost of potential bias due to use of different intervals.

The sample is recognized as a pooled, cross-section/time-series sample. Ordinary least squares, while unbiased, would therefore not be efficient. Accordingly, equation (3) is estimated as a system of equations. For each of the two time periods, six equations are formed for each mutual fund, these equations pertaining to the years of the subperiod. Zellner's Seemingly Unrelated Regressions (SUR) is, then, used to estimate the system of six equations. The cross-equation correlation in errors used by SUR to gain efficiency (usually cross-sectional correlation, but in this case, serial correlation) would reflect persistent mutual fund-specific abnormal returns.

VI. Results

Estimates of the system are reported in Table II. Columns (1) and (3) present estimates of the full model for the early and late sub-period respectively. In the first subperiod, the coefficient on the beta-weighted excess market return is not significantly different from one. Somewhat puzzling, however, is the estimate of this coefficient during the 1984—1989 time period, being that it is significantly different from one.

The coefficient of interest, of course, is that on the dummy variable denoting small firm mutual funds. In the 1978—1983 subperiod, when a small firm effect is widely thought to have existed, this coefficient is insignificant. This is consistent with the hypothesis that the small firm effect observed during that time period may be driven by unaccounted transaction costs. In the 1984—1989 subperiod, the coefficient is significantly negative. This finding is consistent with the results of Ibbotson (1990) that were outlined earlier in the paper.

The remainder of the regression results provide some interesting insights concerning mutual fund portfolio management. The coefficient on the dummy variable denoting load funds is insignificant in both subperiods. This indicates that load funds did not compensate their investors for their buy-in fees during the sample period. Perhaps not coincidentally, many of the funds in the sample that were load funds at the begining of the sample period had converted to no load funds by the end of the sample period.

The coefficient on the portfolio size variable is positive and significant in the 1984—1989 subperiod, indicating the presence of positive economies to scale in portfolio management. That this coefficient is insignificant in the first subperiod would indicate that, within the range of the portfolio sizes of the mutual funds included in the sample, economies of scale were not pronounced.

The coefficient on turnover rate is negative and significant in the 1978—1983 subperiod. This would indicate that at the margin, turnover or active management was inefficient. Interestingly, turnover in this study's sample of mutual funds is lower in the latter subperiod, which if representative would indicate a reversal of the prior trend of increasing turnover observed in mutual fund portfolios (Ippolito, 1989). The coefficient on turnover proves insignificant in the 1984—1989 subperiod.

As reported in columns (2) and (4) of Table II, the model is re-estimated without the mutual fund

TABLE II
System estimates of mutual fund annual excess returns, $R_{it} - CP_t$, by subperiod

	Subperiod			
	1978—1983		1984—1989	
Independent	(1)	(2)	(3)	(4)
Constant	0.0269	−0.0044	−0.2577[a]	−0.1426[a]
	(0.0388)	(0.0117)	(0.0603)	(0.0158)
$\beta_i(R_{Mt} - CP_t)$	0.9707[a]	0.9316[a]	1.1051[a]	1.1385[a]
	(0.0422)	(0.4254)	(0.0412)	(0.0423)
$SMALL_i$	−0.0054	−0.0120	−0.0587[b]	−0.0380
	(0.0167)	(0.0182)	(0.0229)	(0.0249)
$LOAD_{it}$	0.0077		−0.0322	
	(0.0164)		(0.0221)	
$SIZE_{it}$	−0.0013		0.0276[b]	
	(0.0071)		(0.0094)	
$TURN_{it}$	−0.0554[b]		−0.0088	
	(0.0188)		(0.0123)	
Number of funds	19		26	
Number of years	6		6	
Number of observations	114		156	

(standard errors in parentheses)
[a] Significant at 1 percent level.
[b] Significant at 5 percent level.

policy variables with the result that the small firm mutual fund variable proves insignificant in both time periods. When the dichotomous small firm mutual fund variable is replaced by the continuous variable denoting the average size of the firms in the mutual fund, no substantial difference in the results is observed, and therefore, these results are not reported. Additionally, when the coefficient on the beta-weighted excess market return is constrained to one, there is no material impact on the regression. Finally, when each mutual fund is sequentially dropped from the sample and the regression re-estimated with the smaller sample, there is no indication that the reported results are due to the influence of outliers. Accordingly, the results appear to be robust with respect to small changes in the regression model and sample.

VII. Conclusions

Analysis of mutual fund returns over the period 1978—1983 indicates that to the extent small firm mutual funds achieved higher returns it was because they also carried greater systematic risk as reflected by their betas. Indeed, during this period, the only departure from the single-factor market model revealed was turnover's drag on mutual fund performance.

That a small firm effect is observed in direct analysis of the returns of common stocks during the period 1978—1983 may indicate that, as careful as researchers have been in estimating betas, their research still suffers misspecification. More likely, however, analysis of simple measures of common stock returns cannot accurately account for indirect as well as direct transaction costs, which are especially significant when investing in small capitalization stocks.

This study's findings for the 1978—1983 period can be interpreted as implying that, after controlling for broker fees, bid-ask spreads, portfolio management, and market impact costs, there is no abnormal return to be earned by investing in small firm stocks. That is, the apparent abnormal returns to such investments are little more than compensation for the higher costs involved in

investing in the stocks of small firms. Usually these costs are implicit, as in the case of the opportunity cost of an investor's time, and are therefore difficult for researchers to take into account. But, in the case of the professionally-managed mutual funds examined in this study, these costs are made explicit.

This study's analysis of mutual fund returns during the 1984—1989 period are not very informative. To be sure, the small firm effect has not been observed during this period. Therefore, there is no small firm effect to be explained. Nevertheless, a significant negative coefficient is obtained on the small firm mutual fund variable in one specification. Explanation of this result may be considered beyond the scope of this investigation. It may be sufficient to state that this result could be due to a particular sample of *ex post* returns.[6]

Notes

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[1] From the investor's perspective, this ignores the load factor in load funds, and any discount or premium of market value from net asset value in closed-end funds.

[2] In order to calculate capitalization, share market values and shares outstanding were obtained from *Daily Price Record, New York Stock Exchange, American Stock Exchange*, and *Over The Counter*, depending on the listing, if any, of the stock.

[3] This test is limited to funds for which data on holdings are available in *Moody's Manual of Investments, Bank and Finance, Volume 2, 1987.*

[4] However, in the context of a system of equations similar to those reported below, in which fund size, turnover rate and load are included as independent variables in addition to small firm, small firm mutual funds were not found to have higher expense ratios. The higher expense ratios of small firm mutual funds might only reflect their relative inability to achieve economies of scale through fund size.

[5] This variable is created by ranking the average capitalization of the top five holdings according to the CRSP size decile into which it falls. While this may overstate the actual size of the stocks in the portfolio, it appears that the ordinal size rankings are preserved.

[6] Any number of *ex post* rationalizations might be offered to explain the relative performance of any particular sector of the economy during a particular time period, e.g., tax-induced changes in earnings growth (Boyd, 1990). However, it would only be the *persistence* of a returns anomaly over a very long period of time that would warrant scientific interest.

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