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What Determines Mutual Fund Growth: Evidence from Finland*

ABSTRACT

The results from the empirical analysis suggest that investors of mutual funds distributed through independent management companies allocate their capital between mutual funds based on prior performance. These results are robust to using different measures of performance. Investors of mutual funds distributed through banks, however, seem to be rather ignorant of prior performance. Neither the level of management fee nor the level of load fees seems to be related to external fund growth. The evidence also suggests that the amount of fund advertising is positively related to external fund growth during positive category growth, but unrelated to growth during negative external fund category growth. In addition, the analysis provides very tentative evidence of a positive relationship between services provided by a fund and external fund growth.

Key words: *mutual funds, fund growth, advertising*

JEL classification codes: G21, G23

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1. INTRODUCTION

1.1 Background of the study

Mutual funds represent the fastest growing financial intermediary globally. At the end of September 2000, there were 22447 funds in Europe controlling 3486 billion euros worth of assets while the 7885 funds controlled 7645 billion euros worth of assets in the USA[1]. Although mutual funds control tremendous wealth, they are typically retail businesses that compete by attracting many small investments from a disparate clientele. Most research in the field, however, has centered mainly on the investor standpoint, neglecting the mutual fund supplier standpoint. Yet information on factors contributing to investor decision making in selecting between mutual funds is of great importance to the mutual fund industry.

The economic motivation for mutual funds is commonly explained by the fact that they provide investors with services to which they could otherwise have no or limited access. These services include, among others, diversification of the investment portfolio, and the use of financial expertise in managing the portfolio. Individual investors usually neither possess the resources to cost-efficiently diversify their portfolios nor sufficient knowledge or time to actively analyze the financial markets and make investment decisions. Therefore, mutual fund investors can be seen as purchasing a bundle of performance and services from the mutual fund suppliers.

As remuneration for the services provided to mutual fund investors, the mutual fund suppliers charge fees which are partly a predetermined fixed percentage of the amount of assets under management. There is evidence that the fees charged of investors are inversely related to account, fund, and fund complex size, which corroborates economies of scale for the mutual fund industry. With flat marginal revenues and declining marginal costs, a profit maximizing management company seeks to maximize the amount of assets under management.

Potential mutual fund investors, searching for new investments, must select from a large number of very similar fund offerings. In this homogenous market place, investors may find it difficult to distinguish between nearly identical funds, and identify superior products. If investors cannot perceive differences among offerings, then mutual fund management companies that sell close substitutes will profit less than vendors who can successfully differentiate their wares. Thus, the mutual fund suppliers have an incentive to differentiate their product offerings where possible.[2]

The relationship between mutual fund investors and mutual fund suppliers can be characterized as a principal-agent relationship in which the investor (principal) hires an invest-

1 FEFSI (2000)
2 Sirri and Tufano (1993)

ment advisor (agent) to supply investment information that affects the distribution of the investor's portfolio return.[3] The potential conflict between mutual fund suppliers and mutual fund investors is an example of an agency problem. Investors presumably want the fund in which they invest to use its judgment to maximize the risk adjusted expected return at a fairly stable risk level initially chosen by the mutual fund investor.

The mutual fund suppliers, however, are motivated by their fee income which is generated from managing the assets in the fund. In addition, the information that they possess and how they use it is not directly observable. As a result, if actions which maximize the profits of the mutual fund suppliers differ somewhat from the actions which maximize the risk adjusted expected return at a fairly stable risk level, inefficiencies may arise. Information on mutual fund selection criteria used by investors would enable fund management to differentiate a fund in a manner which maximizes investor attraction. Therefore, it is of great importance to mutual fund management to understand which criteria potential investors use in selecting a fund within a fund category.

1.2. Research objectives

Several studies have examined fund performance in return and risk terms but relatively little research has been focused on mutual fund growth. While the fund industry is rapidly growing it is highly important to understand which factors determine the fund growth. Unlike majority of earlier papers which focus on the mutual fund investor standpoint, this study focuses on the mutual fund supplier standpoint. Therefore, the focus of this study is not on whether past returns can predict a fund's ability to earn excess risk adjusted return in the future per se, but whether past returns, among other factors, have power to explain investor behavior in their selection of mutual funds. For the first time, we explicitly examine the effect of fund advertising on generating demand for mutual fund shares.

A mutual fund is in virtually unlimited supply, because a fund creates new shares for all new capital entrusted. This feature makes the flow of capital into a fund interpretable as investor response to the attributes offered by a fund.[4] Economists hypothesize that utility increases with expected wealth and decreases with effort expended. For the mutual fund investor, this logic implies that rationally acting buyers should prefer funds that are expected to deliver higher performance and more services at lower fees.

3 See Golec (1992)
4 Sirri and Tufano (1993)

Null hypothesis:

External fund growth of a mutual fund relative to other funds is merely random in nature, and therefore it is not related to the following fund specific attributes:

1. Prior net performance independent of the method of risk adjustment
2. Level of management fee
3. Level of load fees
4. Amount of fund advertising
5. Services provided by a fund

Total fund growth is a function of external fund growth and internal fund growth. External fund growth is defined as net capital flow from investors to a mutual fund in exchange for fund shares. Internal fund growth, on the other hand, is defined as growth in the value of mutual fund shares. In other words, external fund growth is determined by investor behavior, and internal fund growth is a function of management behavior and aggregate market return. This study, adopting the mutual fund supplier standpoint, focuses specifically on determinants of external fund growth.

The aim of this study is to explain mutual fund investor behavior as a response to fund specific attributes in selecting between Finnish equity funds. Finnish equity funds are defined as funds marketed in Finland and investing mainly in Finnish securities independent of the jurisdiction of registration. In other words, this study analyses empirically, which fund specific attributes investors use in allocating their capital between Finnish equity funds. Specifically, this study focuses on the micro level relationship between external fund growth and prior performance, management fee, load fees, advertising, as well as services of Finnish equity funds.

We use data from Finland where mutual funds have grown rapidly in recent years. At the end of June, 1997 there were 72 funds in Finland representing $3321 thousand as assets under management. The growth of the fund industry had been tremendous as at the end of 1992 there were only slightly over $100 million invested in Finnish mutual funds. It is easy to foresee that the strong market growth will continue in the future following international trends. Now, at the end of 2000, the Finnish fund market has already grown to $13 billion. Also, the competition between funds can be expected to further tense.

2. DATA DESCRIPTION

2.1 Mutual fund sample

While mutual funds were not introduced in Finland until October, 1987, as the law for mutual funds was passed on 1st September, 1987, they have long existed in other countries (US 1924,

UK 1931, Germany 1949, France 1964, and Sweden 1970).[5] The first Finnish closed-end funds have existed since 1984. The first mutual funds were established by banks, which had a dense office network for marketing the new investment vehicle.

The introduction coincided with the deregulation process of financial markets and the stock market crash. In the early 1980's financial markets in Finland were highly regulated. Interest rates on bank accounts were set by the Bank of Finland, and foreign ownership of Finnish shares was severely restricted, as was also investment abroad. Ordinary citizens typically invested in apartments financed by bank loans, tax-free bank deposits, tax-free government bonds, or in shares of individual companies recommended by banks' investment advisors. Financial markets were highly dominated by banks, and trading at the Helsinki Stock Exchange was thin.

The growth potential in Finland, however, is high, because for example in US the number of mutual funds has almost tripled and the amount of assets under management in mutual funds has become five fold during the last decade. Substantial growth in the number of funds and in invested capital started only five years after the introduction of the Finnish mutual fund industry. Table 1 presents the development of the amount of assets under management in the Finnish mutual funds in 1988–1999[6]:

TABLE 1. The amount of assets under management in the Finnish mutual funds.

Year	Assets under mgmt (thousand FIM)*
1988	**446**
1989	**369**
1990	**318**
1991	**342**
1992	**578**
1993	**3524**
1994	**6109**
1995	**5200**
1996	**11577**
1997	**18577**
1998	**29091**
1999	**60931**

*** 6 FIM equals 1 USD**

The empirical analysis of investor response to fund specific attributes is based on the assumption that investor behavior is symmetric between all funds studied. However, mutual fund

5 Kasanen and Puttonen (1994)
6 The Finnish Mutual Fund Association (1999)

investors may react asymmetrically to fund specific attributes between fund categories. For example, resources can presumably be used more effectively on acquiring information of future equity returns compared to money market returns. Therefore, investor sensitivity to high fees is intuitively stronger in the money market fund category compared to the equity fund category. In addition, different fund types appeal to different segments of clientele, who presumably use different criteria in selecting a fund. Therefore, criteria must be developed in order to associate each fund with one fund category.

There is not enough data from the new Finnish mutual fund market to analyze investor behavior separately in all fund categories. Consequently, the sample in this study includes only stock mutual (or, equity) funds, because they produce a sufficient amount of observations for the statistical analysis. Also, equity funds provide the most interesting arena for this kind of a research while their shares are mostly held by households and the funds' fees and services differ more than in other fund categories.

Data on assets under management in mutual funds is not available prior to October, 1993, when only a relatively small number of equity funds existed in Finland. In addition, the start of publishing the Mutual Fund Report published by HEX Helsinki Exchanges in 1993 may have resulted in a structural change in investor behavior, because prior to that mutual fund investors had no access to a comparison of mutual fund attributes published by an independent party. Therefore, the time series in this study covers the period from 1st January, 1994 to 31st April, 1996.

Table 2 presents the funds included in this study. The sample includes the whole population of Finnish equity funds at the end of the period of study. The data on funds de-listed during the period of study are excluded from the sample. If poorly performing funds shrink and cease to be sold, and if the data only includes funds that survive, the potentially positive relationship between prior performance and external fund growth may not be detected among the worst performing funds.[7] The survivorship bias in this study, however, should be economically unimportant, because only one equity fund (Arctos Finland, Guernsey) has been de-listed during the period of study. In addition, one fund (Merita Nordia) has been subject to a renewal of policy to an extent which makes it questionable to define it as a Finnish equity fund after the renewal of policy. The fund, however, is included in the sample until the end of the period of study.

7 Sirri and Tufano (1993)

TABLE 2. The sample of equity funds in the period 1st January, 1994 to 31st April, 1996.

Name*	Inception
Aktia Capital	15.05.1992
Alfred Berg Finland	07.12.1992
Arctos Finland	07.06.1994
Arctos Futura	07.06.1994
Diana Osake	08.09.1993
Evli Select	16.10.1989
Gyllenberg Finlandia (Gyllenberg Index)	01.10.1993
Gyllenberg Small Firm	19.04.1994
Interbank Osake	01.10.1993
Investa-Osake	12.03.1993
Merita Avanti (Riski-SYP)	01.09.1987
Merita Fennia (Kansallis-Kasvu)	15.05.1992
Merita Nordia (Kasvu-SYP)	01.09.1987
Odin Finland	27.12.1990
OP-Delta	01.02.1993
Presta	15.10.1987
Selin-Osake	04.12.1992

*The former name of the fund is in parentheses

2.2 Fund specific data

The time series of daily net returns adjusted for dividend distributions in logarithmic form for all Finnish mutual funds since January, 1988 are obtained from HEX. The daily returns are transformed to non-logarithmic form for the computation of various measures of prior performance.

Data on the amount of assets under management at the end of month in each fund since September, 1993 is also obtained from HEX. Table 3 presents the aggregate amount of assets under management, measured in millions FIM, in the Finnish equity fund category.

Data on the level of management fee and load fees are obtained from Mutual Fund Reports published by HEX monthly. The level of load fees in percentage terms depends on the

TABLE 3. Descriptive statistics of the Finnish equity fund category at the end of 1993, 1994, 1995, and 4/1996.

	1993	1994	1995	4/1996
Number of funds	15	17	17	17
Assets under management	2609T	3237T	2404T	2738T
Number of shareholders	26879	35519	30454	28560
Average management fee	1.99%	1.93%	1.93%	2.13%
Average front-end load fee	1.17%	1.24%	1.09%	1.25%
Average back-end load fee	0.93%	0.94%	0.94%	0.91%

size of an investment in several of the funds included in the sample. We have calculated an arithmetic average of the minimum and maximum levels of the load fee for each fund. The figures in Table 3 indicate that the average level of fees in the equity fund category has been relatively stable during the period of study. Some funds, however, have offered the possibility to invest in the fund at reduced front-end load fees during some predetermined periods. These discounts are taken into consideration, if the Mutual Fund Reports had information on them.

The advertising data is collected manually from Finnish newspapers and magazines. The sizes of advertisements, measured in square centimeters, are collected from Helsingin Sanomat (the major daily newspaper), Kauppalehti (the major daily business newspaper), Optio, and Talouselämä (the major weekly business magazine) during the period of study. The majority of mutual fund advertising is found in these publications. Some advertising in other publications, however, is inevitably excluded from the data utilized in this study.

An advertisement is recorded if the name of a mutual fund included in the sample is explicitly mentioned in the advertisement or if the advertisement promotes all funds of a management company that manages a fund that is included in the sample. We have not attempted to classify the advertisements according to appearance, location in the publication, estimated cost, or any other criteria except size. This simplification probably buries details in the effectiveness between advertisements. However, we believe that even this simplistic approach serves as a reasonable proxy for mutual fund investor exposure to fund advertising.

By looking at the time series of the aggregate amount of stock mutual fund advertising it seems that the amount of advertising has decreased from 1994 to 1996 (Table 4). The amount of advertising in 1995 exceeded the amount of advertising in 1994 only in December. Moreover, the amount of advertising in 1996 exceeded the amount of advertising in 1995 only in February. The time series, however, is too short for drawing any conclusions from the seemingly declining trend in stock fund advertising. The amount of advertising, however, seems to clearly decrease during the summer months. Finally, at least some mutual fund suppliers presumably believe that advertising can create demand for their fund, because advertising is not a trivial activity in the Finnish mutual fund industry.

In the Finnish mutual fund market some mutual fund suppliers expend significantly more resources on attracting advertising driven investors than other funds (Table 5). Intuitively mutual funds distributed through banks may benefit less from advertising compared to non-bank funds with much more limited distribution channels. During the research period, however, the amounts of advertising in these two groups of funds do not seem to differ significantly from each other at an aggregate level. At a fund level it is clear that the largest independent fund companies (Alfred Berg, Gyllenberg and Evli) have invested the most in advertising.

TABLE 4. The aggregate amount of advertising measured in square centimeters of Finnish equity funds in Helsingin Sanomat, Kauppalehti, Optio, and Talouselämä in the period 1/1994 to 4/1996.

	1994	1995	1996
January	4000	3200	2800
February	3700	1400	2800
March	3600	1000	800
April	3600	800	200
May	4400	1000	
June	1600	500	
July	1300	200	
August	1800	300	
September	1900	400	
October	4500	800	
November	1600	400	
December	2000	3000	
TOTAL	34000	13000	6600

TABLE 5. The amounts of advertising measured in square centimeters of Finnish equity funds in Helsingin Sanomat, Kauppalehti, Optio, and Talouselämä during 1–12/1994, 1–12/1995, and 1–4/1996.

Fund	1–12/1994	1–12/1995	1–4/1996	TOTAL
Aktia Capital	1800	100	0	1900
Alfred Berg Finland*	7600	2400	0	10000
Arctos Finland*	400	300	0	700
Arctos Futura*	400	300	100	800
Diana Osake*	0	0	0	0
Evli Select*	5600	2100	400	8100
Gyllenberg Finlandia*	2200	1100	1400	4700
Gyllenberg Small Firm*	1500	1200	1400	4100
Interbank Osake	3500	0	100	3600
Investa-Osake	1500	1300	500	3300
Merita Avanti	2200	1100	500	3800
Merita Fennia	2100	1000	500	3600
Merita Nordia	2200	900	500	3600
Odin Finland*	0	100	0	100
OP-Delta	2200	1000	600	3800
Presta	800	100	600	1500
Selin-Osake*	0	0	0	0
TOTAL	34000	13000	6600	53600

* fund independent of banks

2.3 Market index

The market rate of return is measured by HEX-index in its total return form. It is computed by the Helsinki Stock Exchange and it is a market value weighted index of all stocks listed on the official list of the Helsinki Stock Exchange. The particular version of the index, the so called "HEX-tuotto", is adjusted for stock dividend, splits, rights issues, and cash dividend payments by reinvesting all the proceedings back into the index. The index is obtained on a daily basis from HEX.

2.4 Risk free rate of return

As a proxy for the risk free rate of return, the 1-month HELIBOR rate (then, Helsinki Interbank Offered Rate, now Euribor), which is obtained from HEX, is used in the computation of excess returns. Because the 1-month rate is quoted on a per annum basis, it is transformed to an equivalent per day basis. The transformation is done in two steps. First, the quoted 1-month rate per annum is transformed to an equivalent 1-month rate per month according to the prevailing bank practice. Second, the 1-month rate per month is transformed to an equivalent 1-day rate per day by continuous compounding. The implicit assumption of a flat yield curve within the month in step two is consistent with the practice of earlier papers.

3. RESEARCH METHODS FOR INVESTOR BEHAVIOR ANALYSIS

3.1 Statistical tools for investor behavior analysis

Earlier papers have studied the effect of fund specific attributes on external fund growth using correlation analysis[8], linear regression analysis[9], simultaneous equations framework[10], or a semiparametric model[11]. This section discusses the choice of appropriate tools for analyzing the behavior of fund investors in this study.

Current external fund growth is likely to affect fees, if the mutual fund suppliers have some knowledge of new capital inflows from investors, and in turn set fees to their advantage conditional of these forecasts. On the supply side there is evidence that fee setting is indeed related to external fund growth among other factors. In addition, findings from earlier papers suggest that on the demand side external fund growth is related to fees among other factors.[12]

From an econometric standpoint, the joint nature of mutual fund investors' and mutual fund suppliers' decision making poses an estimation problem, because it defines a system whose

8 See Smith (1978), Spitz (1970)
9 See Ippolito (1992)
10 See Sirri and Tufano (1993)
11 See Chevalier and Ellison (1995)
12 Sirri and Tufano (1993)

parameters must be simultaneously determined.[13] Therefore, intuitively a simultaneous equations framework would be needed to estimate the effect of fund specific attributes on external fund growth.

However, funds' fees are typically changed only gradually. In fact fees of Finnish mutual funds have been quite stable in time. As a result, a more appropriate model for estimating external fund growth would hold fees fixed over the period of external fund growth, thereby obviating the need for simultaneous estimation. Consequently, the effect of fund specific attributes on external fund growth is analyzed using ordinary least squares regression analysis. The 28 cross-sections, consisting of 9 funds at the beginning of the period of study and 17 funds at the end of the period of study, are pooled to a data set of 398 observations.

Piecewise regression and dummy variables are used to detect potentially critical asymmetries in investor behavior. In addition, different lags and measures of prior performance are used in order to gain more detailed information on investor behavior in selecting between mutual funds.

Earlier papers have analyzed the effect of fund specific attributes on external fund growth using annual data on external fund growth. The time series available from the young Finnish mutual fund market, however, is significantly shorter. Therefore, an analysis of annual data would result in only few observations, and thus restrict the use of statistical analysis due to noisy fund growth data.

In addition, monthly data on assets under management in Finnish mutual funds is available from HEX. The monthly data is widely reported in e.g. Talouselämä a couple of days after the month end. Consequently, the effect of fund specific attributes on external fund growth is analyzed here using monthly data on external fund growth.

External fund category growth is used as an independent variable in statistical analyses in order to avoid attributing external fund category growth to fund specific attributes. This procedure is similar to using month dummy variables, thus ignoring the variation common to funds, i.e. variation in external fund category growth over time.[14] Omitting external fund category growth from the model of investor behavior may result in autocorrelation of the error terms between funds within time. As a result, including external fund category growth as a trend variable is necessary in order to produce efficient estimates of the regression coefficients of the fund specific attributes.

It is ambiguous how external fund category growth is distributed between individual funds within a fund category. Therefore, the use of external fund category growth alone as a trend

13 Sirri and Tufano (1993)
14 Ippolito (1992)

variable may not be sufficient to avoid attributing external fund category growth to fund specific attributes.

On average, new investors presumably invest an equal amount of capital in nominal terms to all funds, given that fund specific attributes of all funds are identical. Therefore, fund size measured as the amount of assets under management at the beginning of the observation period (month) is used as an additional independent variable. This reflects the fact that small funds may experience large percentage external fund growth despite small nominal growth.

3.2 Appropriate performance measure

The research of performance measurement has raised questions concerning the most appropriate and least biased performance measure. This study focusing on investor behavior, however, is not concerned of the theoretically most appropriate measure per se. Rather, the criteria for including a performance measure as an independent variable in the analysis is based on assumptions on its actual use as a tool for evaluating the future performance of mutual funds by an average mutual fund investor.

We assume that investors use performance measures that are commonly reported, available to mutual fund investors, and easy to understand. The raw return measures are quoted in daily main news papers. In addition to non-risk adjusted return, Sharpe's index and Jensen's alpha are reported in the Mutual Fund Report published by HEX.

Consequently, only raw return, Sharpe's index[15], and Jensen's alpha[16] are used to measure the historical performance of mutual funds. Including both raw return and risk adjusted measures of prior performance makes it possible to study investors' perception of risk. For example, risk-neutrality or risk-aversion among mutual fund investors on average as far as mutual fund performance is concerned may provide different economic incentives to the mutual fund suppliers.

We assume that investors use performance measures that are easily available. Therefore, the lengths of period over which the performance of mutual funds is calculated are same as in main newspapers and in the Mutual Fund Report. All measures of historical performance are calculated over prior 1-month, 3-month, 6-month, and 12-month periods.

Earlier papers have studied the effect of prior performance on external fund growth measuring performance in either absolute[17] or relative terms[18]. This study focusing on the micro level relationship between prior performance and external fund growth should isolate the ag-

15 See Sharpe (1966)
16 See Jensen (1968)
17 See e.g. Ippolito (1992)
18 See e.g. Sirri and Tufano (1993)

gregate market performance from the performance of an individual fund relative to other funds that are close substitutes to mutual fund investors.

Raw return or Sharpe's index do not express the performance of a fund relative to some absolute standard such as the aggregate market return. Therefore, their values are correlated with the aggregate market return assuming that funds' beta coefficients deviate from zero. On the other hand, Jensen's alpha expresses the performance of a fund relative to the aggregate market return. Therefore, intuitively Jensen's alpha is not correlated with the aggregate market return. Mutual fund investors, however, may be satisfied with even poorer performance relative to the aggregate market return, because there is no Finnish index fund available.[19] Thus, even a negative Jensen's alpha and micro level external fund growth may be positively correlated, if many mutual funds underperform the market index.

Consequently, this study measures the performance of mutual funds that are close substitutes to each other in relative terms, not in absolute terms. Each fund is assigned a continuous ranking in [0,1] relative to other funds in the same fund category based on all three performance measures separately. The fund with the best performance measure is assigned a ranking of 1, the fund with the poorest performance measure is assigned a ranking of 0, and the rest of the funds are assigned a ranking linearly between 0 and 1 according to their relative rankings. The ranking based on prior net performance of fund i is denoted as $NPER_{i,t-1}$. In other words, the regression coefficient of $NPER_{i,t-1}$ is interpretable as the slope of the relationship between relative prior performance ranking and external fund growth.

3.3. Asymmetry between performance classes

Using a simple linear specification of performance ranking may bury asymmetries in the relationship between relative prior performance and external fund growth.[20] Earlier papers have indeed revealed significant asymmetry in mutual fund investor response to prior performance between different performance classes.[21]

The majority of research on the economic incentives of professional portfolio managers focuses on explicit incentive fee contracts used in the institutional money management business.[22] Incentive fees are typically structured with two components: a base fee and a contingent fee which allows the manager to share in incremental return relative to an established benchmark. The manager does not usually, however, share in negative relative returns. In other words, the manager does not compensate the investor due to underperforming the selected

19 Heikkilä (1993). Since 1996 two Finnish index funds gave been launched by Seligson and OP.
20 Sirri and Tufano (1993)
21 See Chevalier and Ellison (1995), Ippolito (1992), Sirri and Tufano (1993)
22 See e.g. Cohen and Starks (1988), Davanzo and Nesbitt (1987), Golec (1992), Grinblatt and Titman (1987), Grinblatt and Titman (1989a), Grinold and Rudd (1987), Kritzman (1987)

benchmark.[23] The moral hazard associated with an explicit incentive fee contract arises from the convexity of the compensation schedule, i.e. the lack of sharing the underperformance but participating in the overperformance of the portfolio by the manager.

The fee income of none of the Finnish mutual fund suppliers is based on an explicit incentive fee contract, thus intuitively making the mutual fund business free of agency problems alike those in the private asset management business. The mutual fund business may, however, be fraught with agency problems similar to, and possibly no less troublesome than those in the asset management business. In fact evidence from earlier papers suggests that mutual fund investors seem to implicitly grant a free call option on the amount of assets under management to the mutual fund suppliers by allocating their capital disproportionally to the top performing funds. Moreover, the fee income of the mutual fund suppliers is a function of the amount of assets under management, thus providing the mutual fund suppliers with incentives that are similar to those documented in the asset management business.[24]

Consequently, this study also allows asymmetries in the relationship between relative prior performance ranking and external fund growth. In order to differentiate between the sensitivity of the external fund growth-prior performance relationship between different performance classes, the analysis is structured using piecewise regression analysis. This technique enables an analysis of the sensitivity of the relationship between external fund growth and prior performance separately in different performance classes. The piecewise variables are defined as:

$$NPER(L20\%)_{i,t-1} = Min[NPER_{i,t-1}, 0.2]$$
$$NPER(M60\%)_{i,t-1} = Min[NPER_{i,t-1} - NPER(L20\%)_{i,t-1}, 0.6]$$
$$NPER(H20\%)_{i,t-1} = NPER_{i,t-1} - [NPER(L20\%)_{i,t-1} + NPER(M60\%)_{i,t-1}]$$

Because $NPER_{i,t-1}$ is assigned a value between 0 and 1, $NPER(L20\%)_{i,t-1}$ may receive values between 0 and 0.2, $NPER(M60\%)_{i,t-1}$ may receive values between 0 and 0.6, and $NPER(H20\%)_{i,t-1}$ may receive values between 0 and 0.2. Thus, the coefficients of $NPER(L20\%)_{i,t-1}$, $NPER(M60\%)_{i,t-1}$, and $NPER(H20\%)_{i,t-1}$ are interpretable as the slope of the relationship between performance ranking and external fund growth in the lowest 20%, middle 60%, and highest 20% performance classes respectively.

3.4 Appropriate specification of fees

The effect of management fee, front-end load fee, and back-end load fee on external fund growth is studied separately. This separate analysis presumably provides information on investors' beliefs about the mutual fund suppliers' actual use of the various types of fees for adding

23 Kritzman (1987)
24 See Grinblatt and Titman (1989)

value to mutual fund investors in terms of higher return on investment. The level of management fee, front-end load fee, and back-end load fee are represented by $MFEE_{i,t}$, $FLFEE_{i,t}$, and $BLFEE_{i,t}$ respectively.

3.5 Appropriate specification of advertising

Obviously, it is difficult to objectively isolate the effect of different components of the marketing communication mix on generating demand for any product. The mutual fund suppliers typically use for example direct marketing, personal selling, and advertising in promoting their funds. Because the mutual fund suppliers engage in these costly activities, they can presumably be used effectively in generating demand for a fund. Only the amount of advertising, however, can be measured somewhat accurately.

The advertising variable, $ADV_{i,t}$, is assigned the sum of the sizes of fund advertisements, measured in square centimeters. The sum is calculated during the same period (month) as external fund growth. In order to control for the presumably marginally decreasing ability of advertising to generate demand for a fund as the amount of advertising increases the explanatory variable, $ADV_{i,t}$, is specified in logarithmic form.

In addition, in order to study separately the effect of advertising on external fund growth during positive and negative aggregate external fund growth, we introduce a dummy variable $EFCG(-)_t$. It equals 1, if external fund category growth during month t is negative. Thus, the sum of the coefficients of $\log(ADV_{i,t})$ and $EFCG(-)_t \times \log(ADV_{i,t})$ represents the relationship between advertising and external fund growth during negative external fund category growth. The logic for using this separate analysis lies in the assumption that advertising may be used more effectively in attracting new investments than keeping existing investments.

3.6 Appropriate specification of services

It is difficult to explicitly assign an objective quantitative value to a service variable. However, the effect of services provided by a fund on external fund growth can be estimated implicitly by constructing a service variable drawing on the econometric impact of unmeasured service on external fund growth. If investors respond to the services provided by a fund, but demand for mutual fund shares is estimated with some component of service as an omitted variable, then high service funds will systematically experience higher than predicted external fund growth.[25] As a result, the residuals associated with these funds would be systematically positive.

Service levels presumably change gradually. Therefore, the lagged residual is used as a measure of service level during current period. Alternatively, we could have estimated a fixed

25 Sirri and Tufano (1993)

effects model which uses a different constant term for each fund by using n-1 fund dummy variables, where n is the number of funds in the sample. However, the specification adopted here has the benefit of allowing service levels to vary over time.[26]

4. RESULTS OF INVESTOR BEHAVIOR ANALYSIS

4.1 Investor response to relative prior performance

4.1.1 Raw return ranking as the explanatory variable

Table 6 reports the simple linear regression results on the effect of relative [0,1] raw return ranking on monthly percentage external fund growth. Columns A through D report the results with prior net performance calculated over various lengths of measurement period.

TABLE 6. The effect of relative raw return ranking on monthly percentage external fund growth (EFG) for Finnish equity funds in the period 1st January, 1994 to 31st April, 1996.

$EFG_{i,t} = a + b_1 \times EFCG_t + b_2 \times AUM_{i,t-1} + c_1 \times NPER_{i,t-1} + e_{i,t}$

	The performance measures used to create relative [0,1] rankings for $NPER_{i,t-1}$			
	A Raw return (1-month)	B Raw return (3-month)	C Raw return (6-month)	D Raw return (12-month)
Intercept	0.009 (0.447)	0.018 (0.914)	0.015 (0.787)	0.018 (0.887)
$EFCG_t$	1.277a (6.344)	1.276a (6.313)	1.280a (6.340)	1.279a (6.329)
$AUM_{i,t-1}$	–0.000b (–2.260)	–0.000b (–2.211)	–0.000b (–2.322)	–0.000b (–2.295)
$NPER_{i,t-1}$	0.071b (2.506)	0.051 (1.790)	0.059b (2.093)	0.054 (1.915)
Adjusted R^2	0.103	0.096	0.098	0.097
N	398	398	398	398
F-value	16.156	15.020	15.455	15.193

a Significant at the 1% level **b Significant at the 5% level**

$AUM_{i,t-1}$ equals the size of fund i measured as the amount of assets under management at the end of month t–1.

$EFCG_t$ equals the aggregate percentage growth of all funds in the equity fund category during month t in excess of that which would have occurred had investors invested no additional capital and all dividend been reinvested.

$NPER_{i,t-1}$ equals the continuous ranking in [0,1] of fund i based on its prior performance relative to other funds.

26 Sirri and Tufano (1993)

As expected, external fund category growth ($EFCG_t$) is positively related to external fund growth at the 1% level. In addition, the size of a fund measured as assets under management at the beginning of month ($AUM_{i,t-1}$) is negatively related to external fund growth at the 5% level.

The regression coefficients of $NPER_{i,t-1}$ are positive and statistically marginally significant. They are in the range between 0.051 and 0.071, which can be interpreted so that moving up twenty percentiles in the performance ranking produces approximately 1.2% (0.2×0.06) additional growth per month. This corresponds to economically significant approximately 15% ($1.012^{12}-1$) additional growth per annum. The coefficients of performance rankings based on raw return, calculated over prior 1-month and 6-month periods, are statistically significant at the 5% level. As a result, the hypothesis that non-risk adjusted prior net performance is not related to external fund growth can be rejected at 95% confidence level.

Table 7 reports the piecewise regression results on the effect of relative [0,1] raw return ranking in the bottom 20%, middle 60%, and top 20% performance classes on monthly percentage external fund growth. Columns A through D report the results with prior net performance calculated over various lengths of measurement period.

As with the simple linear specification, external fund category growth ($EFCG_t$) is positively related to external fund growth at the 1% level. In addition, in line with the previously reported results, the size of a fund measured as assets under management at the beginning of month ($AUM_{i,t-1}$) is negatively related to external fund growth at the 5% level.

The regression coefficients of $NPER(L20\%)_{i,t-1}$ and $NPER(M60\%)_{i,t-1}$ are in the range between –0.017 and 0.062. Two of them are negative, unlike expected, and none of them is statistically significant. Therefore, the hypothesis that non-risk adjusted prior net performance in the bottom 80% performance class is not related to external fund growth cannot be rejected using a piecewise specification. On the other hand, the regression coefficients of $NPER(H20\%)_{i,t-1}$ are positive as expected, and they are in the range between 0.176 and 0.372. The coefficient of $NPER(H20\%)_{i,t-1}$, based on prior 1-month period, is statistically significant at the 5% level. As a result, the hypothesis that non-risk adjusted prior net performance in the top 20% performance class is not related to external fund growth can be rejected at 95% confidence level.

The regression coefficients of raw return rankings in the top 20% performance class are substantially higher compared to the coefficients in the bottom 80% performance class or in the whole performance region on average. Especially the coefficient of $NPER(H20\%)_{i,t-1}$, based on prior 1-month raw return, which is also statistically significant at the 5% level, is economically significantly higher than the coefficients in the lower performance classes. The figure can be interpreted so that moving up twenty percentiles in the performance ranking in the top

TABLE 7. The effect of relative raw return ranking in the bottom 20%, middle 60%, and top 20% performance classes on monthly percentage external fund growth for Finnish equity funds in the period 1st January, 1994 to 31st April, 1996.

$EFG_{i,t} = a + b_1 \times EFCG_t + b_2 \times AUM_{i,t-1} + c_1 \times NPER(L20\%)_{i,t-1} + c_2 \times NPER(M60\%)_{i,t-1} + c_3 \times NPER(H20\%)_{i,t-1} + e_{i,t}$

The performance measures used to create relative [0,0.2], [0,0.6], and [0,0.2] rankings for $NPER(L20\%)_{i,t-1}$, $NPER(M60\%)_{i,t-1}$, and $NPER(H20\%)_{i,t-1}$ respectively

	A Raw return (1-month)	B Raw return (3-month)	C Raw return (6-month)	D Raw return (12-month)
Intercept	0.025	0.019	0.020	0.026
	(0.845)	(0.649)	(0.675)	(0.887)
$EFCG_t$	1.267a	1.272a	1.269a	1.270a
	(6.298)	(6.277)	(6.272)	(6.269)
$AUM_{i,t-1}$	–0.000b	–0.000b	–0.000b	–0.000b
	(–2.085)	(–2.111)	(–2.021)	(–2.048)
$NPER(L20\%)_{i,t-1}$	–0.017	0.062	0.040	–0.007
	(–0.093)	(0.333)	(0.218)	(–0.036)
$NPER(M60\%)_{i,t-1}$	0.036	0.028	0.028	0.042
	(0.667)	(0.525)	(0.528)	(0.786)
$NPER(H20\%)_{i,t-1}$	0.372b	0.176	0.263	0.186
	(2.020)	(0.948)	(1.396)	(0.983)
Adjusted R^2	0.106	0.104	0.097	0.094
N	398	398	398	398
F-value	10.383	9.071	9.510	9.223

a Significant at the 1% level **b Significant at the 5% level**

$NPER_{i,t-1}$ equals the continuous ranking in [0,1] of fund i based on its prior performance relative to other funds.

$NPER(L20\%)_{i,t-1}$ equals $Min[NPER_{i,t-1}, 0.2]$

$NPER(M60\%)_{i,t-1}$ equals $Min[NPER_{i,t-1} - NPER(L20\%)_{i,t-1}, 0.6]$

$NPER(H20\%)_{i,t-1}$ equals $NPER_{i,t-1} - [NPER(L20\%)_{i,t-1} + NPER(M60\%)_{i,t-1}]$

20% performance class produces approximately 7.4% (0.2×0.372) additional growth per month. This corresponds to economically very significant 136% (1.074^{12}–1) additional growth per annum.

However, the regression coefficient of $NPER(H20\%)_{i,t-1}$ is not statistically significantly higher than the coefficients of $NPER(L20\%)_{i,t-1}$ or $NPER(M60\%)_{i,t-1}$. As a result, the hypothesis that investor response to non-risk adjusted prior performance, calculated over even the prior 1-month period, is symmetric in different performance classes cannot be rejected. The results are also robust to combining the two lowest performance classes or using different cut-offs for the performance classes.

4.1.2 Sharpe's index ranking as the explanatory variable

Table 8 reports the simple linear regression results on the effect of relative [0,1] Sharpe's index ranking on monthly percentage external fund growth. Columns A through D report the results with prior net performance calculated over various lengths of measurement period.

As expected, external fund category growth ($EFCG_t$) is positively related to external fund growth at the 1% level. In addition, as expected, the size of a fund measured as assets under management at the beginning of month ($AUM_{i,t-1}$) is negatively related to external fund growth at the 5% level.

TABLE 8. The effect of relative Sharpe's index ranking on monthly percentage external fund growth for Finnish equity funds in the period 1st January, 1994 to 31st April, 1996.

$EFG_{i,t} = a + b_1 \times EFCG_t + b_2 \times AUM_{i,t-1} + c_1 \times NPER_{i,t-1} + e_{i,t}$

	The performance measures used to create relative [0,1] rankings for $NPER_{i,t-1}$			
	A Sharpe's index (1-month)	B Sharpe's index (3-month)	C Sharpe's index (6-month)	D Sharpe's index (12-month)
Intercept	0.014 (0.732)	0.014 (0.702)	0.009 (0.484)	0.017 (0.878)
$EFCG_t$	1.279a (6.338)	1.278a (6.355)	1.283a (6.374)	1.278a (6.325)
$AUM_{i,t-1}$	–0.000b (–2.310)	–0.000b (–2.283)	–0.000b (–2.439)	–0.000b (–2.272)
$NPER_{i,t-1}$	0.061b (2.148)	0.061b (2.164)	0.073a (2.609)	0.054 (1.905)
Adjusted R^2	0.099	0.099	0.104	0.097
N	398	398	398	398
F-value	15.541	15.568	16.349	15.179

a Significant at the 1% level b Significant at the 5% level

The coefficients of performance rankings based on Sharpe's index, calculated over prior 1-month and 3-month periods, are statistically significant at the 5% level. In addition, the coefficient of Sharpe's index ranking, based on prior 6-month period, is statistically significant at the 1% level. As a result, the hypothesis that prior net performance, adjusted for systematic risk as well as unsystematic risk, is not related to external fund growth can be rejected at 99% confidence level.

Table 9 reports the piecewise regression results on the effect of relative [0,1] Sharpe's index ranking in the bottom 20%, middle 60%, and top 20% performance classes on monthly

percentage external fund growth. Columns A through D report the results with prior net performance calculated over various lengths of measurement period.

None of the regression coefficients of $NPER(L20\%)_{i,t-1}$, $NPER(M60\%)_{i,t-1}$, or $NPER(H20\%)_{i,t-1}$ is statistically significant. As a result, the piecewise regression cannot reject the linear specification between external fund growth and prior performance, adjusted for systematic as well as unsystematic risk, presented in Table 8.

Moreover, inconsistent with the results reported in Table 7, the coefficients in the top 20% performance class are not economically significantly higher compared to the coefficients in the lower performance classes. Therefore, inconsistent with investor response to very recent non-risk adjusted prior performance, the results do not provide any even tentative signs of asymmetry in investor response to prior performance adjusted for total risk. This may be inter-

TABLE 9. The effect of relative Sharpe's index ranking in the bottom 20%, middle 60%, and top 20% performance classes on monthly percentage external fund growth for Finnish equity funds in the period 1st January, 1994 to 31st April, 1996.

$$EFG_{i,t} = a + b_1 \times EFCG_t + b_2 \times AUM_{i,t-1} + c_1 \times NPER(L20\%)_{i,t-1} + c_2 \times NPER(M60\%)_{i,t-1} + c_3 \times NPER(H20\%)_{i,t-1} + e_{i,t}$$

The performance measures used to create relative [0,0.2], [0,0.6], and [0,0.2] rankings for $NPER(L20\%)_{i,t-1}$, $NPER(M60\%)_{i,t-1}$, and $NPER(H20\%)_{i,t-1}$ respectively

	A Sharpe's index (1-month)	B Sharpe's index (3-month)	C Sharpe's index (6-month)	D Sharpe's index (12-month)
Intercept	0.025 (0.861)	0.016 (0.551)	0.024 (0.847)	0.030 (1.029)
$EFCG_t$	1.277a (6.315)	1.281a (6.334)	1.280a (6.345)	1.270a (6.269)
$AUM_{i,t-1}$	–0.000b (–2.275)	–0.000b (–2.306)	–0.000b (–2.354)	–0.000b (–2.054)
$NPER(L20\%)_{i,t-1}$	–0.037 (–0.199)	0.024 (0.127)	–0.062 (–0.337)	–0.045 (–0.241)
$NPER(M60\%)_{i,t-1}$	0.083 (1.557)	0.090 (1.683)	0.105 (1.944)	0.056 (1.047)
$NPER(H20\%)_{i,t-1}$	0.019 (0.104)	–0.079 (–0.424)	0.014 (0.076)	0.139 (0.739)
Adjusted R^2	0.095	0.096	0.101	0.093
N	398	398	398	398
F-value	9.346	9.425	9.895	9.189

a Significant at the 1% level b Significant at the 5% level

preted as if investors were ignorant of the amount of total risk of prior performance when possibly allocating their capital disproportionally to the top performing funds.

Sharpe's index, however, behaves in an anomalous way in the face of changes to the level of risk during periods when the risk free rate of return exceeds the return of the portfolio. During the period of this study several of the funds have indeed experienced inferior returns compared to the risk free rate of return. Therefore, the performance rankings based on Sharpe's index may simply improve incorrectly as the level of risk increases.

4.1.3 Jensen's alpha ranking as the explanatory variable

Table 10 reports the simple linear regression results on the effect of relative [0,1] Jensen's alpha ranking on monthly percentage external fund growth. Columns A through D report the results with prior net performance calculated over various lengths of measurement period.

The coefficients of Jensen's alpha rankings, based on prior 1-month and 12-month periods, are statistically significant at the 5% level. In addition, the coefficients of performance rankings, based on prior 3-month and 6-month periods, are statistically significant at the 1% level. The results are in line with the previous Sharpe's index results.

TABLE 10. The effect of relative Jensen's alpha ranking on monthly percentage external fund growth for Finnish equity funds in the period 1st January, 1994 to 31st April, 1996.

$EFG_{i,t} = a + b_1 \times EFCG_t + b_2 \times AUM_{i,t-1} + c_1 \times NPER_{i,t-1} + e_{i,t}$

	The performance measures used to create relative [0,1] rankings for $NPER_{i,t-1}$			
	A Jensen's alpha (1-month)	B Jensen's alpha (3-month)	C Jensen's alpha (6-month)	D Jensen's alpha (12-month)
Intercept	0.009 (0.472)	0.005 (0.240)	0.111 (0.066)	0.013 (0.673)
$EFCG_t$	1.277a (6.342)	1.275a (6.339)	1.281a (6.389)	1.280a (6.345)
$AUM_{i,t-1}$	–0.000b (–2.245)	–0.000b (–2.169)	–0.000b (–2.382)	–0.000b (–2.330)
$NPER_{i,t-1}$	0.071b (2.521)	0.077a (2.725)	0.088a (3.146)	0.063b (2.250)
Adjusted R^2	0.103	0.105	0.111	0.100
N	398	398	398	398
F-value	16.183	16.578	17.487	15.706

a Significant at the 1% level b Significant at the 5% level

TABLE 11. The effect of relative Jensen's alpha ranking in the bottom 20%, middle 60%, and top 20% performance classes on monthly percentage external fund growth for Finnish equity funds in the period 1st January, 1994 to 31st April, 1996.

$EFG_{i,t} = a + b_1 \times EFCG_t + b_2 \times AUM_{i,t-1} + c_1 \times NPER(L20\%)_{i,t-1} + c_2 \times NPER(M60\%)_{i,t-1} + c_3 \times NPER(H20\%)_{i,t-1} + e_{i,t}$

	The performance measures used to create relative [0,0.2], [0,0.6], and [0,0.2] rankings for $NPER(L20\%)_{i,t-1}$, $NPER(M60\%)_{i,t-1}$, and $NPER(H20\%)_{i,t-1}$ respectively			
	A Jensen's alpha (1-month)	B Jensen's alpha (3-month)	C Jensen's alpha (6-month)	D Jensen's alpha (12-month)
Intercept	0.022 (0.746)	0.012 (0.413)	0.022 (0.738)	0.033 (1.226)
$EFCG_t$	1.271a (6.316)	1.272a (6.308)	1.275a (6.345)	1.274a (6.303)
$AUM_{i,t-1}$	–0.000b (–2.198)	–0.000b (–2.105)	–0.000b (–2.247)	–0.000b (–2.196)
$NPER(L20\%)_{i,t-1}$	0.015 (0.083)	0.017 (0.094)	–0.076 (–0.415)	–0.118 (–0.642)
$NPER(M60\%)_{i,t-1}$	0.032 (0.592)	0.084 (1.570)	0.110 (1.877)	0.081 (1.500)
$NPER(H20\%)_{i,t-1}$	0.366b (1.996)	0.093 (0.502)	0.121 (0.654)	0.136 (0.720)
Adjusted R^2	0.105	0.101	0.108	0.098
N	398	398	398	398
F-value	10.327	9.924	10.647	9.668

a Significant at the 1% level b Significant at the 5% level

Table 11 reports the corresponding piecewise regression results on the effect of relative [0,1] Jensen's alpha ranking in the bottom 20%, middle 60%, and top 20% performance classes on monthly percentage external fund growth.

In line with the previously reported results of piecewise regressions in Tables 7 and 9, none of the regression coefficients of $NPER(L20\%)_{i,t-1}$ or $NPER(M60\%)_{i,t-1}$ is statistically significant. Therefore, the hypothesis that prior net performance, adjusted for systematic risk, in the bottom 80% performance class is not related to external fund growth cannot be rejected using a piecewise specification. On the other hand, the coefficient of $NPER(H20\%)_{i,t-1}$, based on prior 1-month period, is statistically significant at the 5% level. In addition, consistent with the results of non-risk adjusted return reported in Table 7, the coefficient of $NPER(H20\%)_{i,t-1}$, based on prior 1-month Jensen's alpha is economically significantly higher than the other co-

efficients in the lower performance classes. Thus, consistent with investor response to very recent non-risk adjusted prior performance, the evidence from Table 11 may be interpreted as a weak sign of investors responding asymmetrically to very recent prior net performance adjusted for systematic risk.

4.1.4 Composite model

Table 12 reports the regression results on the effect of relative prior performance rankings, management fee, load fees, advertising, and service level of a fund on monthly external fund growth. Unlike previous sections, this section focuses on the combined effect of non-risk adjusted as well as risk adjusted prior performance, calculated over different lengths of period.

In order to reduce heteroscedasticity of the error terms in the composite model presented in Table 12, external fund growth is specified in logarithmic form. In addition, all t-values are based on standard errors corrected for heteroscedasticity according to White. Thus, even though heteroscedasticity cannot be completely eliminated by using a logarithmic specification, correct inferences can be drawn when testing statistical hypotheses.[27]

The symmetric (linear) relationship between prior performance rankings, calculated over the longer lengths of period than 1 month, and external fund growth, which is presented in Tables 6, 8, and 10, could not be rejected using a piecewise specification. Therefore, we use here a simple linear specification for the performance rankings based on these longer term performance measures. The variable $NPER_{i,t-1}$ is assigned the performance ranking which is based on Jensen's alpha, calculated over prior 6-month period, because of its high t-value in table 10.

On the other hand, the results presented in Tables 7 and 11 may be interpreted as a sign (statistically marginally significant) of asymmetry in the relationship between prior performance ranking, based on the short prior 1-month period, and external fund growth. Therefore, we focus here on the above mentioned relationship specifically in the top 20% performance class. The results are reported using raw return as the measure of prior performance. The results, however, are robust to using other performance measures as well.

In addition, it is necessary to distinguish between investor behavior of different segments of clientele. One striking feature of the Finnish equity fund industry is that the size of an average investment in funds distributed through banks is significantly smaller compared to the size of an average investment in funds distributed through independent mutual fund management companies. Intuition suggests that investors investing in bank related funds may be less sophisticated than investors investing in independent funds. Therefore, this section investigates

27 White (1980)

TABLE 12. The effect of relative prior performance rankings, management fee, load fees, advertising, and service level of a fund on monthly external fund growth for Finnish equity funds in the period 1st January, 1994 to 31st April, 1996.

$\log(1+EFG_{i,t}) = a + b_1 \times \log(1+EFCG_t) + b_2 \times \log(AUM_{i,t-1}) + c_1 \times NPER_{i,t-1} + c_2 \times BANK_i \times NPER_{i,t-1} + c_3 \times NPER(H20\%)_{i,t-1} + c_4 \times BANK_i \times NPER(H20\%)_{i,t-1} + d_1 \times MFEE_{i,t} + d_2 \times FLFEE_{i,t} + d_3 \times BLFEE_{i,t} + e_1 \times \log(ADV_{i,t}) + e_2 \times EFCG(-)_t \times \log(ADV_{i,t}) + f_1 \times SER_{i,t} + e_{i,t}$

Services:	$SER_{i,t}$		
	0.157b		
	(1.981)		
Advertising:	$\log(ADV_{i,t})$	$EFCG(-)_t \times \log(ADV_{i,t})$	
	0.012a	**–0.014a**	
	(3.138)	**(–3.557)**	
Back-end load fee:	$BLFEE_{i,t}$		
	–0.374		
	(–1.400)		
Front-end load fee:	$FLFEE_{i,t}$		
	–0.644		
	(–1.209)		
Management fee:	$MFEE_{i,t}$		
	0.673		
	(1.734)		
Performance ranking:	$NPER(H20\%)_{i,t-1}$	$BANK_i \times NPER(H20\%)_{i,t-1}$	
(1-month raw return)	**0.105**	**–0.124**	
	(1.223)	**(–1.451)**	
Performance ranking:	$NPER_{i,t-1}$	$BANK_i \times NPER_{i,t-1}$	
(6-month Jensen's alpha)	**0.018a**	**–0.004**	
	(2.704)	**(–0.427)**	
Other:	**Intercept**	$\log(1+EFCG_t)$	$\log(AUM_{i,t-1})$
	0.022	**0.909a**	**–0.016a**
	(1.408)	**(3.691)**	**(–4.996)**
Adjusted R^2 = 0.277	**N = 398**	**F-value = 12.283**	

a Significant at the 1% level **b Significant at the 5% level**

also potential asymmetries in investor reaction to prior performance attributable to the type of distribution channel of a fund in order to develop a more detailed description of investor reaction to prior performance.

In order to differentiate external fund growth sensitivity to prior performance between funds distributed through banks and independent mutual fund management companies, we introduce a dummy variable, $BANK_i$. It equals one, if the fund is distributed through the office network of a bank. Thus, the coefficients of performance variables $NPER_{i,t-1}$ and $NPER(H20\%)_{i,t-1}$ represent the relationship between prior performance ranking and external fund growth among inde-

pendent funds. On the other hand, the sum of the coefficient of a performance variable and the coefficient of $BANK_i$ dummy variable multiplied with the performance variable represents the relationship between prior performance ranking and external fund growth among bank related funds.

Consistent with the previously reported results, external fund category growth ($EFCG_t$) is positively related to external fund growth at the 1% level. In addition, consistent with previous analyses, the size of a fund measured as assets under management at the beginning of month ($AUM_{i,t-1}$) is negatively related to external fund growth at the 1% level.

The regression coefficient of $NPER(H20\%)_{i,t-1}$ which equals 0.105 is economically substantially higher than the coefficient of $NPER_{i,t-1}$. However, after correcting for heteroscedasticity it is not statistically significant. As a result, we cannot conclude that investors react asymmetrically even to very recent prior performance. Moreover, we found no statistically significant evidence of asymmetry in investor response to prior performance, calculated over longer periods than 1 month.

However, failing to reject symmetry in investor response to prior performance, calculated over prior 1-month period, is not in line with the graphical observation that the relationship between above average external fund growth and prior performance ranking among independent funds resembles the convex payoff diagram of a long call option position (Figure 1).

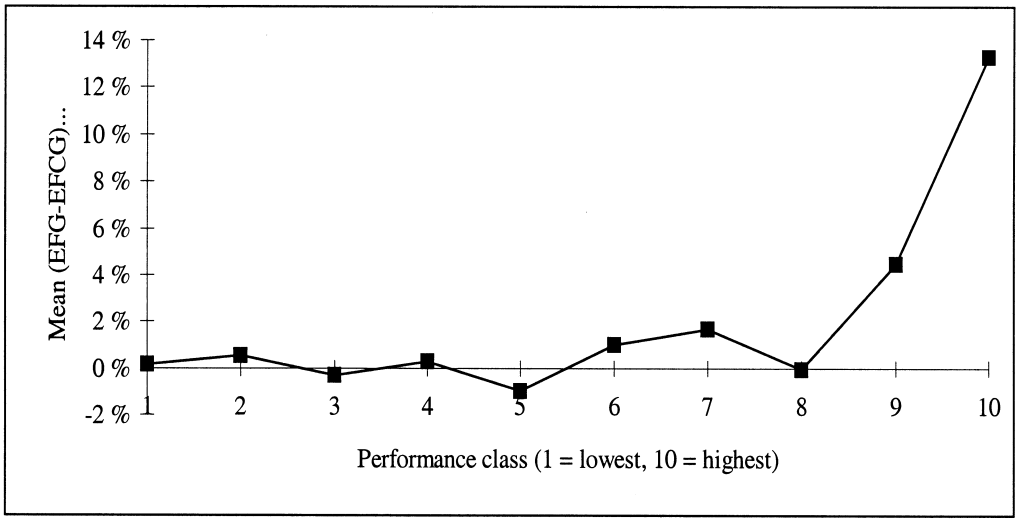
It is possible that failing to reject the linear specification has resulted in a type II error i.e., the linear specification may have been accepted incorrectly due to very small size of the data set utilized in this study compared to earlier papers. Therefore, potential causes of the seemingly (statistically insignificant) asymmetric relationship presented in Figure 1 are discussed further.

The visual observation of asymmetry in investor response to very recent prior performance among independent funds may be cast as a search for quality.[28] In other words, one could argue that investors believe that top ranking, based on prior month's performance, signals superior performance in the future. Investors, however, do not seem to respond equally vigorously to inferior performance. Therefore, it is questionable whether the search for quality, defined as expected superior future performance relative to other funds, is the sole explanation to the convexity of the graph presented in Figure 1.

Rather, the possible asymmetry in investor behavior is likely due to the visibility of top performers.[29] Therefore, the economically on average very large inflows of capital from mutual fund investors to the top performing independent funds are likely to be associated with de-

28 See Ippolito (1992)
29 Sirri and Tufano (1993)

FIGURE 1. The mean monthly percentage external fund growth in excess of external fund category growth of Finnish independent equity funds as a function of their prior performance in the period 1st January, 1994 to 31st April, 1996. Funds are ranked by their raw return, calculated over prior 1-month period, and divided into ten equal classes (1 = bottom 10% etc.) based on their relative performance.



creased search costs on the part of investors due to the marquee value associated with publicity. In addition, a high ranking even over a short period is presumably used effectively by the mutual fund suppliers in convincing investors of superior fund quality in the future.

Figure 1 may be interpreted as if mutual fund investors of independent funds implicitly granted a free call option on the amount of assets under management to the mutual fund suppliers. However, the statistical analysis using a piecewise specification fails to confirm the visual observation of convexity in the relationship between external fund growth and prior performance among independent mutual funds. In addition, the visual observation of convexity remains similar also if funds are divided into performance classes based on very recent prior performance, adjusted for systematic risk. Therefore, we cannot conclude, based on Figure 1 alone, that the mutual fund suppliers of independent funds have adverse economic incentives to manipulate the risk of their funds.

The regression coefficient of $NPER_{i,t-1}$ equals 0.018 (Table 12). In line with the previously reported results, it is positive and statistically significant at the 1% level. The results are also robust to using performance rankings based on Jensen's alpha, Sharpe's index, and raw return, calculated over most other lengths of period. Consequently, in this multi-attribute setting, either the hypothesis that investors of independent mutual funds adjust returns for risk or the

hypothesis that investors of independent funds do not adjust for risk at all cannot be rejected. This is in line with expectations, because earlier evidence from the Finnish mutual fund market suggests that rankings based on different measures of performance are very highly correlated.[30] However, the hypothesis that investors of *independent* mutual funds are ignorant of prior performance when allocating their capital between funds can be rejected at 99% confidence level.

The dependent variable, $EFG_{i,t}$, is specified in logarithmic form (Table 12). Therefore, the results, regarding to investor response to prior performance among independent funds, may be interpreted as a sign of convexity in the relationship between prior net performance ranking and external fund growth. However, the levels of significance are approximately the same, if the dependent variable is specified in non-logarithmic form. Thus, consistent with investor reaction to very recent prior performance, we cannot conclude that investors react asymmetrically to longer term prior performance of independent Finnish equity funds. This contradicts to the evidence provided by some earlier papers that find strong evidence of asymmetric investor response to prior performance, independent of the length of period over which the performance is measured.[31]

A graphical examination of the relationship between above average external fund growth and prior performance, calculated over prior 6-month period, could be interpreted as a sign of asymmetric investor behavior (Figure 2).

The sum of the regression coefficients of $NPER_{i,t-1}$ and $BANK_i \times NPER_{i,t-1}$ equals 0.014 (Table 12). It is positive as expected, but it is not statistically significant. The finding is also robust to using any other performance measure, calculated over any length of period used in this study. As a result, the hypothesis that prior net performance of funds distributed through *banks* is not related to external fund growth cannot be rejected.

A graphical examination of the relationship between above average external fund growth and prior performance among bank related funds is in line with the results from the statistical analysis (Figure 3). The figure does not confirm the assumption that prior performance is positively related to external fund growth. Rather, unlike with independent funds, the magnitude of above average external fund growth in different performance classes seems merely random.

The sum of the regression coefficients of $NPER(H20\%)_{i,t-1}$ and $BANK_i \times NPER(H20\%)_{i,t-1}$ equals –0.019 (Table 12). Unlike expected, the figure is negative. However, it is not statistically significant. As a result, as with independent funds, we do not find statistically significant evidence of asymmetry in investor reaction even to very recent prior performance among funds distributed through banks. This finding is also robust to using any other performance measure used in this study.

30 Liljeblom and Löflund (1995)
31 See e.g. Chevalier and Ellison (1995), Ippolito (1992), Sirri and Tufano (1993)

FIGURE 2. The mean monthly percentage external fund growth in excess of external fund category growth of Finnish independent equity funds as a function of their prior performance in the period 1st January, 1994 to 31st April, 1996. Funds are ranked by their Jensen's alpha, calculated over prior 6-month period, and divided into ten equal classes (1 = bottom 10% etc.) based on their relative performance.

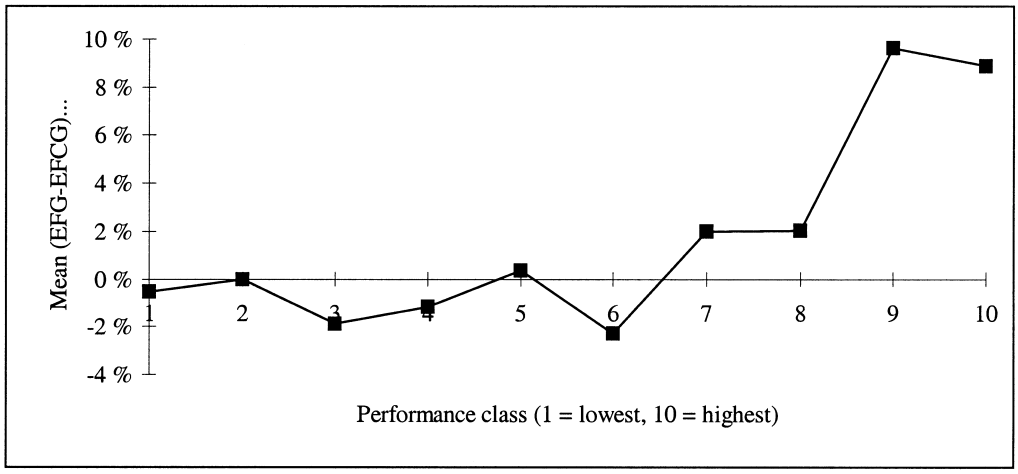
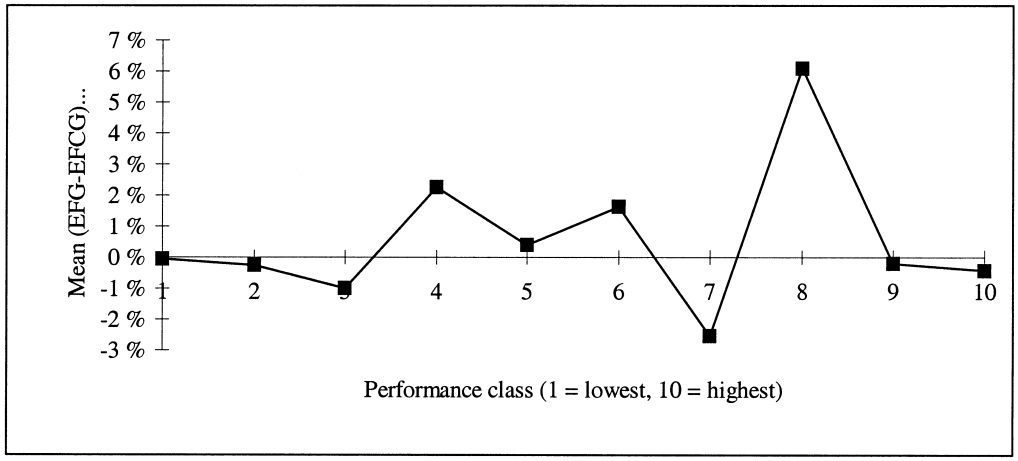


FIGURE 3. The mean monthly percentage external fund growth in excess of external fund category growth of Finnish bank related equity funds as a function of their prior performance in the period 1st January, 1994 to 31st April, 1996. Funds are ranked by their Jensen's alpha, calculated over prior 6-month period, and divided into ten equal classes (1 = bottom 10% etc.) based on their relative performance.



The results suggest that investors investing in mutual funds distributed through banks are rather ignorant of prior performance. This is strikingly inconsistent with the behavior of investors investing in independent funds. A possible intuitive explanation to the lack of investor responsiveness among bank related funds lies in the assumption that investors who invest small amounts of capital, are less willing to expend resources possibly in terms of effort when allocating their capital between funds. Rather, they presumably on average invest in a fund managed by the bank with which they already have an existing customer relationship.

It is impossible, however, to categorize the lack of investor responsiveness to prior performance among bank related funds as irrational. The mutual fund investors of bank related funds and potential new small investors may face, in addition to high search costs, a constraint in choosing an independent fund over a bank related fund due to a typically higher initial investment requirement of independent funds.

Evidence from earlier papers suggests that the average performance, measured in either non-risk adjusted or risk adjusted terms, of Finnish bank related mutual funds is indeed statistically significantly inferior compared to the performance of independent funds.[32] This may be due to the lack of investor responsiveness to prior performance. It does not necessarily, however, support the view that the mutual fund suppliers of bank related funds actively support the other divisions of the bank at the expense of the mutual fund investors. Rather, the performance differential may be merely consistent with the lack of investors exercising control over the mutual fund suppliers by not reacting to prior performance. This ignorance among investors of bank related funds may simply result in a lack of incentives for the fund managers to expend resources possibly in terms of effort to produce higher performance.

In addition, the mutual fund suppliers are required by the Finnish mutual fund legislation to act in the best interest of the mutual fund investors in their decision making[33], thus prohibiting the mutual fund suppliers of bank related funds from acting according to the economic incentives implied by the lack of investor responsiveness to prior performance of a fund. Finally, from the investor standpoint there is a need for better understanding of mutual fund supplier reaction to the implicit economic incentives that are implied by mutual fund investor reaction to prior performance.

4.2 Investor response to the level of fees

Unlike expected, the regression coefficient of $MFEE_{i,t}$ is positive (Table 12). However, it is not statistically significant. As a result, we do not find evidence supporting rejection of the hy-

32 Hecht and Vuolteenaho (1996)
33 Sijoitusrahastolaki 34 §

pothesis that investors believe that fund management can add value to offset the incremental expenses charged of investors in the form of higher management fee. This is interesting, because there is evidence of a statistically significant negative relationship between the level of management fee and net performance in the Finnish mutual fund market.[34] By adversely affecting the net performance ranking of a fund the level of management fee, however, may be negatively related to external fund growth indirectly.

The regression coefficient of $FLFEE_{i,t}$ is negative as expected. However, after correcting for heteroscedasticity, it is not statistically significant. As a result, the hypothesis that the level of front-end load fee is not related to external fund growth cannot be rejected.

Consistent with the coefficient of front-end load fee, the regression coefficient of $BLFEE_{i,t}$ is negative. However, it is not statistically significant either. As a result, the hypothesis that the level of back-end load fee is not related to external fund growth cannot be rejected.

4.3 Investor response to fund advertising

Interestingly, the regression coefficient of $\log(ADV_{i,t})$ is positive (Table 12). It is also statistically significant at the 1% level. As a result, the hypothesis that fund advertising is not related to external fund growth during positive external fund category growth can be rejected at 99% confidence level.

On the other hand, the sum of the regression coefficients of $\log(ADV_{i,t})$ and $EFCG(-)_t \times \log(ADV_{i,t})$ is negative (table 11). However, it is not statistically significant. As a result, the hypothesis that fund advertising is not related to external fund growth during negative external fund category growth cannot be rejected.

Intuitively the demand for independent funds may be more sensitive to advertising due to the lack of an extensive distribution channel. Therefore, we also tested the hypothesis that investors of bank related funds and investors of independent funds react differently to fund advertising. The results of this separate analysis, however, do not produce statistically significant evidence of a positive relationship between fund advertising and external fund growth for either group of funds.

The results presented here may be interpreted so that the mutual fund suppliers do not have an incentive to use advertising during periods when they anticipate that the aggregate flow of capital to the mutual fund category is negative. Rather, advertising seems to be effective in generating fund demand only during positive external fund category growth.

34 Liljeblom and Löflund (1995)

4.4 Investor response to services provided by a fund

The regression coefficient of $SER_{i,t}$ is positive as expected, and it is statistically significant at the 5% level (Table 12). In other words, funds that grew faster than expected during the previous period are likely to experience higher than expected external fund growth during current period. As a result, the hypothesis that the service level of a fund is not related to external fund growth can be rejected at 95% confidence level.

This indirect type of test on the effect of services provided by a fund on external fund growth, however, has the unfortunate aspect that any number of alternative reasons may cause the serial correlations.[35] As a result, the evidence of a positive relationship between services provided by a fund and external fund growth should be considered very tentative. The presence of autocorrelation, however, may result in inefficient estimates of the regression coefficients. Therefore, independent of the factors causing the autocorrelation it is necessary to use $SER_{i,t}$ as an independent variable in order to avoid autocorrelation of the error terms within funds.

5. CONCLUSIONS

Only few earlier international papers have focused on the mutual fund supplier standpoint by studying mutual fund investor behavior in selecting between funds. Consequently, the focus of this study was to contribute to the knowledge of mutual fund investor behavior by studying the micro level relationship between demand for mutual fund shares and prior performance, fees, advertising, as well as services of a fund in the newly emerged Finnish equity fund market.

The results suggest that the demand for mutual funds distributed through banks is not related to either short or long term prior performance, measured either in non-risk adjusted or risk adjusted terms. In other words, investors of bank related funds seem to be ignorant of prior performance of a fund. In contrast, investors of independent mutual funds seem to put emphasis on relative short term prior performance. A graphical examination of the relationship between prior performance ranking and fund demand among independent mutual funds seems asymmetric so that the top ranking funds on average reap the greatest rewards in terms of higher demand for fund shares. The poorest performing funds, however, do not seem to be penalized in an off-setting manner for inferior performance.

Neither the level of management fee nor the level of load fees are related to the demand for fund shares. The evidence also suggests that the amount of advertising is positively related to fund demand during positive aggregate fund demand, but unrelated to fund demand during

35 Woerheide (1982)

negative aggregate fund demand. In addition, the results provide very tentative evidence of a positive relationship between services provided by a fund and fund demand.

The lack of investor responsiveness to prior performance among bank related funds provides the mutual fund suppliers of bank related funds with incentives to take into consideration the interests of the whole bank at the expense of the mutual fund investors. On the other hand, the analysis fails to detect asymmetry in investor response to prior performance among independent funds. Therefore, the mutual fund suppliers of independent funds do not seem to have adverse incentives to manipulate the risk of their funds, not in order to maximize the risk adjusted return of mutual fund investors, but rather in order to maximize the future management fee income of the mutual fund suppliers.

Because the time series utilized in this study is relatively short, some potentially existing relationships between fund specific attributes and fund demand may have been left undetected. This could, however, be examined only by repeating the study with a larger data set in the future. It may be interesting to study investor behavior also in other fund categories. In addition, the effect of the elements of marketing communication mix on generating fund demand in different segments of clientele may prove to be a useful subject of study from the mutual fund practitioner standpoint. Finally, the mutual fund supplier response to the economic incentives, implied by mutual fund investor behavior in selecting a fund, could be studied from the mutual fund investor standpoint. ■

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