BI Norwegian Business School-GRA19002 Master Thesis

MSc in Financial Economics

Empirical Study on Flow-Performance Relationship of Norwegian Mutual Funds:

Retail Investor versus Institutional Investor

Submission Date: 01.09.2011

Supervisor: Janis Berzins

Students:

Yifang Hua

Yajun Huang

This thesis is a part of the MSc programme at BI Norwegian Business School. The school takes no responsibility for the methods used, results found and conclusions drawn.

Abstract

In this paper we study the relationship between past performance and investor flows of Norwegian mutual funds by using a dataset from February, 2003 to May, 2007. We divide mutual fund investors into two subgroups-retail investors and institutional investors-to investigate the potential difference between these two kinds of investors in their reactions to past performance. Our results indicate that both types of investors would respond to sophisticated performance measure, and this response is asymmetric. Funds that are ranked higher based on recent performance would receive more net inflows from retail investors as well as institutional investors than funds in the lower ranks. Retail investors and institutional investors do not seem to behave very differently in the Norwegian mutual fund market.

Acknowledgement

We would like to thank our supervisor, Associate Professor Janis Berzins for providing us with the data for this thesis and giving us constructive guidance during our work. We appreciate the help and encouragement.

Table of Content

1. Introduction

With the notion that past performance is a signal of fund quality, a rational investor should react to this information. Therefore, a positive relationship between fund performance and flows is expected. Indeed, previous literatures show that there is a p ositive relationship between performance and flows in mutual fund market. Furthermore, the performance flow relationship (PFR) is not linear, but convex (Ippolito 1992, G oetzmann and Peles 1997, and Sirri and Tufano 1998). The convexity is the result of investors chasing past winners but failing to sell poorly performing funds due to disposition effect (Shefrin and Statman 1985). However, some studies assume such disposition effect is less likely to be subjected to sophisticated investor and further comparisons of PFR between mutual fund market and fund market dominated by sophisticated investors are conducted, which indicate a less convex PFR in the fund market dominated by sophisticated investors (Del Guercio and Tkac 2002 and Kaplan and Schoar 2005).

To the best of our knowledge, so far most previous studies of PFR are based on empirical data in U.S. and none have studied this relationship in a Norwegian setting. Therefore, the main contribution of our thesis is to study the PFR in Norwegian mutual fund market. Particularly, we separate mutual fund flows into flows from retail investors and those from institutional investors to investigate the potential differences in the PFR between these two types of investors. The reason why we do this is that we expect institutional investors to be more sophisticated investors and previous studies show that sophisticated investors behave differently.

Although mutual funds are typically retail businesses that attract many small investments, institutional investors' flows are increasing in recent years in the Norwegian mutual fund market**.** Data from the Norwegian fund and asset management associations (VFF) reveals that the institutional/retail split of fund assets in April 2011 was 54%/31%. On account of the big weight from institutional investors, we find it is of interest to compare retail investors with institutional investors within the mutual fund market at the same time.

Our study has two aims. First, we test whether there is a statically significant positive relationship between mutual fund performance and flows with the assumption that both retail investors and institutional investors consider past performance as a major factor in flow decision. We include various performance measures, such as historical raw return, Jensen's alpha and tracking errors, in our regression model to check the impact of financial sophistication on performance measure choice.

Second, if the results in our first part confirm that there is a statistically significant relationship between fund performance and flows, we further examine the shape of PFR by the investor type. We expect to find convexity of PFR by both retail investors and institutional investors, with institutional investors showing a less pronounced convexity of PFR because of financial sophistication and existence of agency problem. The analysis of the shape of PFR contributes to the growing literature linking fund managers behavior to their implicit incentive to increase assets under management. For example, Brown, Harlow and Starks (1996) argue that the notion of viewing mutual fund market as multi-period and multi-game tournament with a call option-like compensation scheme provides a sufficient condition for mutual fund managers to consider changing the risk of his or her portfolio before the end of the assessment period.

Through the application of linear regression analysis, we find both retail investors and institutional investors would respond to sophisticated performance measure (i.e. Jensen's alpha in our case), and this response is asymmetric. These two types of investors show the strongest reaction to funds ranked in the 4^{th} performance quintiles. In general, we document a similar PFR across the two types of investors.

The above two-step analysis allows us to understand whether there are potential differences in portfolio choice and investor behavior by comparing PFR of retail investors with that of institutional investors and gives us a more complete picture of the mutual fund market in Norway.

The remainder of our thesis is organized as follows: section 2 is the literature review part. Section 3 describes data and gives definitions of our main variables.

In section 4 we present models and regression methods used in our test. Section 5 presents our results and analysis. Section 6 shows the conclusion.

2. Literature Review

A general positive relationship between fund performance and flows in fund industry has been documented in previous studies. Smith (1978) contemplates the factor that influences the fund choice decision made by investors. He uses a sample of 74 mutual funds between 1966 and 1975 to test two hypotheses: (1) Growth hypothesis: Mutual funds that improve their performance in a given period experience a growth rate in assets under management during the next period that is no different from that of mutual funds that do not improve their performance; (2) New money hypothesis: Mutual funds that improve their performance in a given period experience a growth rate in outstanding shares during the next period that is no different from that of mutual funds that do not improve their performance. He obtains mixed results, the strongest of which is that net new money over the period relates positively to improvement in achieved risk-adjusted fund performance.

Lakonishok, Shleifer and Vishny (1992) address the question of what determines the movement of money under management between different firms. They study approximately 250 institutional money managers and represent net number of new accounts gained (in %) and net dollar value of new accounts gained (in %) as a function of three previous years equity returns from year 1987 to 1990. A univariate linear regression is carried out between these variables and the result of which is statistically significant positive relationship between them.

Besides the demonstrated positively relationship between net asset flow and past performance, several previous studies also examine the shape of flow-performance relationship and show a non-linearity between them. For example, Ippolito (1992) uses a sample of 143 open-ended mutual funds existing between 1965 and 1984 to examine investor reaction to recent fund performance. His measure of performance is risk-adjusted performance residual. By using pooled regression model and fixed-effects model respectively, he detects a statistically significant positive relationship between fund growth and recent investment performance. And more specifically, this relationship is asymmetric, which means investors respond more strongly to the funds that do better than the market than to

the funds that do worse.

In another study Sirri and Tufano (1998) utilize data of 690 equity mutual funds from December 1971 to December 1990 to do research. The flow is defined as the net growth in fund assets beyond reinvested dividends, and the performance is focused on rudimentary performance measures such as return rankings relative to other funds with a similar objective, whereas more formal portfolio performance measures such as Jensen's one-factor alphas are added in later tests for robustness purpose. They use a piecewise linear regression model as well as Fama-Macbeth method to estimate the sensitivity of fund growth to performance in each of performance quintiles, and find the strongest sensitivity in the top performers.

With the notion that sophisticated investors may use different criteria to choose fund managers, Del Guercio and Tkac (2002) further compare the relations between asset flow and performance in the retail mutual fund segment and fiduciary pension fund segment of the money management industry. They study the data of active domestic equity managers who control at least $20 million in tax-exempt assets in pension fund sector and of all-equity mutual funds with initial investment minimums less than $25,000 in the period from 1987 to 1994. The flow which is measured by annual net dollar flow and net percentage flow respectively is regressed on lagged excess return, one-factor Jensen's alpha and tracking errors, and the regressions include control variables for asset size, lagged flow, fund age and time-style interaction dummies. After using pooled OLS regression method, Del Guercio and Tkac (2002) document that raw return mainly explain the flows from retail investors whereas risk-adjusted returns mainly explain the flows from more sophisticated investors. By further using a piecewise linear regression framework, they provide evidence on convexity in the relation between flow and performance for both fund segments. However, a shape of less convexity in fiduciary pension fund segment is shown, and Chow test confirms an approximately linear relation in this segment.

However, all the conclusions driven in the above mentioned papers are based on the empirical data from U.S. market. Since differences in market structure and scale, a series of papers also employ the datasets from non-U.S. markets to test whether the same PFR exists in those markets. Kasanen, Lipponen and Puttonen

(2001) use monthly data from 17 equity mutual fund between January, 1994 and April, 1996 to study investor behavior as a response to fund past performance in selecting between Finnish equity funds. A pooled OLS regression analysis is adopted to analyze the effect of fund past performance on external fund growth. And for detecting asymmetries in investor behavior, they use a piecewise linear framework similar to the one in Sirri and Tufano (1998). Their findings on independent mutual funds are quite similar to those obtained from U.S. market. However, they point out that investors of mutual funds distributed through banks seem to be ignorant of prior performance, measured either in non-risk adjusted or risk adjusted terms.

Engström and Westerberg (2004) do the PFR analysis by using a d ataset of Sweden mutual funds that participate in the premium pension system. In their model, fund's net inflows are regressed on past raw return as well as management fee and three dummies representing information cost. Although they find a positive relation between fund past performance and flows, they show that this relation is statistically weak compared to the one between flows and information cost. Investors seem to prefer funds they are familiar with to funds with better performance.

In addition, Keswani and Stolin (2008) investigate the determinants of flows in U.K. mutual funds as a part of their paper. They divide investor flows into retail flows and institutional flows, which is similar to what we do in our master thesis, and find that both individuals and institutions would "chase" high returns.

3. Data and variable definitions

3.1 Sample description

All our data are monthly data and mainly from the Norwegian Central Securities Depository (VPS) and the Oslo Stock Exchange Data Service (OBI). VPS provides us monthly flow information for the Norwegian mutual funds. The data it covers by the time we do our analysis start from January, 1993 and end with May, 2007. Total 161 funds are in the dataset, of which the investment region is defined by Lipper as Nordic, Norway or Sweden. We get access to direct flow information such as cash inflow, cash outflow, and flow information in percentage terms from VPS. At each month for each fund, those flows are further divided into six mutually exclusive groups by investor types, that is, flows from financial corporation (including insurance companies), individuals, government, foreign investors, non-financial corporation (including non-profit organizations) and others. We also get total net asset value (TNA) from VPS[1].

OBI provides us historical raw return information for funds available in Norway. For funds' returns not available from OBI return dataset, OBI also provides a historical price (NAV) file which allows us to construct return series.

The two data sources provide survivorship bias free data.

To focus on a set of relatively homogeneous funds, we only analyze actively managed Norwegian mutual funds that mainly invest in Norway or Nordic equity. Specifically, we choose funds with geographical focus in Norway and Nordic and with asset type as equity, and exclude funds with names having the word "index". Since all the funds in VPS are covered by OBI dataset, we construct our sample based on VPS dataset. In order to have a balanced panel data, we further exclude those funds that have a short history and funds that no longer exist by May, 2007. Finally, our sample consists of 43 funds over the period February, 2003 to May, 2007, a total of 2,236 fund-month observations. Each fund in our final sample has

[1] Due to data access limitation, we obtain aggregate VPS data from our supervisor.

flows from both retail investors and institutional investors. For flows from institutional investors, we mean the combined flows from financial corporation and non-financial corporation in VPS categories.

One main problem of our final sample is that it subjects to potential survivorship bias. Survivorship bias is defined as the failure to detect a positive performance-flow relationship among the worst performing funds since poor performing funds tend to fade out and funds that died during the sample period are then excluded.

3.2 Measures of flow and performance

To be consistent with previous studies, we use net percentage flow as our flow measure. The net percentage flow is calculated as follows:

$$\frac{\text{Net Asset}_{i,t} - \text{Net Asset}_{i,t-1}(1+r_{i,t})}{\text{Net Asset}_{i,t-1}}$$

, where $\text{Net Asset}_{i,t-1}$ is the total net asset value of fund i at the end of period t-1.

When net cash flows are positively related to fund size, larger funds attract higher flows regardless of performance. Therefore, the use of net percentage flow as flow measure has the advantage of removing this effect.

As to performance measures, there are many literature discussing about the proper way of evaluating a mutual fund performance. However, the goal of our thesis is to infer what kinds of measures are important to retail investors and institutional investors respectively. Therefore, we include three measures of performance in our study which are deemed to be available and considered by the two kinds of investors in their decision makings of fund investment. Specifically, they are lagged excess return, Jensen's alpha and tracking error. Lagged excess return is the one-period lagged fund return over the market return at the same period and is expected to be used by less sophisticated investors. The other two more sophisticated measures, Jensen's alpha and tracking error, are calculated over past 36 months from CAPM model regression. We also include Fama-French alpha for robustness checking, which is calculated over past 36 months from the model shown below:

The performance measures we choose are also widely shown up in the previous studies of PFR, which allows for comparison with the findings in those studies. For example, Chevalier and Ellison (1997) and Gruber (1996) mention lagged excess return. Whereas, Krahnen, Schmid and Theissen (1997), Patel, Zeckhauser, and Hendricks (1994) and Ferreira et al. (2009) use Jensen's alpha in performance measures.

3.3 Summary statistics

To get a first grasp of PFR, we rank the 43 funds each month according to one performance measure, either lagged excess return or Jensen's alpha or tracking error, and then plot the average next month flows for those funds. Figure1 shows the results. The flow information is noisy. In general, we can see a positive relationship between net percentage flows and Jensen's alpha for both types of investors. However, it is hard to detect the exact trend of flows with any other two performance measures.

Further, in Table 1 we report the descriptive statistics for fund-month observations used in regression. Panel A of Table 1 contains summary information for retail investors, and Panel B has the information for institutional investors. All the information reported is based on a dataset that excludes influential observations to correct for heteroskedasticity problem.

4. Methodology

The first addressed question in our thesis is whether PFR holds in the Norwegian mutual fund market. In order to answer this question, we use the tool of linear regression analysis, and mainly follow the model proposed by Del Guercio and Tkac (2002), in which various kinds of performance measures are included since we are further interested in the difference in portfolio choice made by retail investors and institutional investors respectively due to financial sophistication and agency problem. All our data are in monthly frequency.

In particular, we use pooled OLS regression in our testing. The regression equation is shown as follows:

(1)

, where is the lagged excess return of fund i over the previous month, and stand for Jensen's alpha and tracking error respectively calculated over the previous 36 months from the market model.

The lagged excess return is included as the rudimentary performance measure used by retail investors, whereas Jensen's alpha and tracking error are representations of sophisticated performance measures considered by institutional investors. We expect Jensen's alpha and tracking error are significantly related to institutional investors' flows, whereas the lagged excess return explains retail investors' flows.

We only include the lagged excess return in the period t-1 in our study, whereas several studies also test effects of performance in even earlier periods on fund's flow. But these studies show that investors respond most strongly to the most recent fund return history (e.g. Chevalier and Ellison 1997 and Sirri and Tufano 1998).

The regression equation also contains a vector of control variables which is represented by the letter C. In detail, they are asset size (log), fund age

(log) and lagged flows. is scaled in million NOK, and is scaled in months.

Our dataset exhibits heteroskedasticity, which means OLS estimates of standard errors are biased. Therefore, we correct for heteroskedasticity problem by excluding influential observations. An observation is said to be influential if removing the observation substantially changes the estimate of coefficients.

Our second question refers to what is the shape of PFR by investor type. In order to answer this question, a piecewise linear regression model similar to the one adopted by Sirri and Tufano (1998) is used. As those regression results of equation (1) do not show investor response to lagged excess return and tracking error, the two variables are removed in this part of analysis. Specifically, we rank funds into a fractional number between 0 and 1 each month according to Jensen's alpha, with 1 represents the best performing fund. We then construct quintiles based on the fractional rank sorted by Jensen's alpha. In detail, the quintiles ( ) are constructed as follows:

= Min { , 0.2},

= Min { , 0.2},

= Min { , 0.2},

= Min { , 0.2},

= Min { , 0.2},

where is the fractional rank of fund i. Therefore, if a fund is ranked 95 percentile compared with other funds at the corresponding month, all Q1, Q2, Q3 and Q4 will get the value of 0.2, with Q5 being 0.15.

Finally, we run the piecewise linear regression based on the model shown below:

where s are quintile variables that indicate fund relative performance ranking, and C stands for the controls same as in equation (1).

After all these steps we can get the coefficient of each quintile representing the slope of PFR within that quintile and have an idea what the shape is of PFR.

Since retail investors and institutional investors both show response to Fama-French alpha in our robustness checking in part one analysis, we also replace Jensen's alpha with Fama-French alpha to do the same regression again.

In order to confirm the possible nonlinear shape, we further conduct a Chow test to show whether the piecewise linear regression slopes are equivalent across all performance quintiles.

5. Results and analysis

5.1 Reaction to past performance measures

Results from estimation of equation (1) are reported in Table 2. We indeed document a positive relationship between fund flows and past performance for both types of investors. However, different from what we expect, retail investors seem to chase risk-adjusted return rather than raw return. Coefficient of lagged excess return is negative and not significant. However, the coefficient of Jensen's alpha is positive and significant at 1% level. Specifically, controlling for the rest, 1% more in Jensen's alpha induces a 0.36% increase in the next month net percentage flow from retail investors.

However, the estimation result for institutional investors is in general consistent with our expectation. Only Jensen's alpha shows positive and significant (at 1% level) effect on the net percentage flow, i.e. 1% increase in Jensen's alpha implies 1.12% increase in the next month fund growth. Moreover, our additional test confirms that in comparison with retail investors investment decisions from institutional investors are influenced much stronger by Jensen's alpha (p-value<0.05).

Although we do not expect that retail investors would react to more sophisticated performance measures, our finding of retail investors chasing past Jensen's alpha is also documented in earlier literature. For example, Sirri and Tufano (1998) and Del Guercio and Tkac (2002) both find retail investors would chase risk-adjusted performance measures such as Jensen's alpha. However, Del Guercio and Tkac (2002) further explain that this relationship maybe due to the high correlation between Jensen's alpha and Morningstar's star rating, a widely available summary performance measure for funds.

In order to confirm whether retail investors would react to sophisticated performance measures, we replace one-factor Jensen's alpha with Fama-French alpha and do the testing again. Results can be found in Table 3 and do not show much difference. The coefficient of Fama-French alpha for retail investors is still

significant at 1% level, and the sign is positive. Therefore, we cannot make conclusion based on our regressions that retail investors in the Norwegian mutual fund market consider rudimentary performance measures. One possible explanation to the results is that a considerable part of individual investors use the help of financial advisors to make their final investment decisions. Further, Ferreira et al. (2009) conclude in their paper that mutual fund investors in developed countries are more sophisticated due to greater development of financial market and higher education level.

One interesting result from the regressions is that neither retail investors nor institutional investors seem to punish those funds with high deviation from the benchmark. The coefficients of tracking error for retail investors and institutional investors are both positive as well as statistically insignificant. This result does not consist with the finding by Del Guercio and Tkac (2002), who document that corporate insider may evaluate fund managers relative to the benchmark.

Another thing worthy of noting is that the Adjusted in the regressions for institutional investors are obviously smaller than those for retail investors. A similar case can be found in Del Guercio and Tkac (2002) that Adjusted in regressions for pension fund sample are also much smaller than those for mutual fund sample. In our case this may be due to the additional explanatory power from lagged flows as shown in the regressions for retail investors. Specifically, the coefficient of lagged flows from retail investors is 0.13 and significant at 1% level. In comparison, this figure for institutional investors is negative as well as statistically insignificant. The fact that retail investors' flows in our sample show autocorrelation but not institutional investors' flows is consistent with the conclusion from Keswani and Stolin (2008) by using a U.K. dataset. And in total it is reasonable to say that institutions have focus on diversification of their fund investment and other strategic objectives, therefore would not trade just based on short-term performances and past flows. On the other hand, individuals are more concentrated on just a few funds, if not one, hence more sensitive to short-term performances and past flows.

5.2 The shape of performance-flow relationship

Our first part of analysis does not shown much difference between retail investors and institutional investors in their reactions to past performance. In this part we further analyze whether this similarity would extend to the area called disposition effect (Shefrin and Statman 1985).

Our results from running regressions on e quation (2) are reported in Table 4, where performance quintiles are constructed based on Jensen's alpha. In line with previous studies, we document a nonlinear form of PFR for both types of investors. Specifically, net percentage flows from the two kinds of investors are associated strongest with the 4^{th} performance quintile, while the relationship in other performance quintiles is economically and statistically weaker.

To get a better sense of the form of PFR, we then plot the regression results in graph (see Figure 2-Graph A). In detail, we depict expected monthly net percentage flows as a function of having performance in a certain performance quintile. Therefore, the effect of being in one performance quintile is expressed by the sum of the regression coefficients of that performance quintile and all lower quintiles. From the graph we can see that the forms of PFR for retail investors and institutional investors are similar, which show concave shape in the bottom quintile, then convexity in the middle quintile, and concave again in the top quintile. However, the reaction to past performance from institutional investors is much stronger compared with retail investors.

Although our regression results show the similarity between retail investors and institutional investors, the Chow tests tell a different story. That is, we can reject the hypothesis of linearity at 1% level for retail investors, but cannot reject this hypothesis for institutional investors.

We also repeat the analysis by regressing net percentage flows on Fama-French quintiles. The results are presented in Table 5 and Figure 2-Graph B. Same as the results obtained by using Jensen's alpha quintiles, the coefficient of the 4^{th} quintile is statistically significant and highest among coefficients of all the five quintiles for both types of investors. Furthermore, the shape of PFR for retail

investors and institutional investors respectively remains similar with each other, with concave in the bottom quintile, convexity in the middle quintile and finally concave in the top quintile.

We also conduct the Chow tests to check linearity. The hypothesis that the form is linear can be rejected at 10% level for retail investors. However, we cannot reject asymmetry for institutional investors.

6. Conclusions

In this master thesis we investigate the performance and flow relationship (PFR) in the Norwegian mutual fund market. Especially, we divide mutual fund investors into two subgroups- retail investors and institutional investors. Our aim is to show whether the PFR for institutional investors would be different due to the financial sophistication and agency problem.

However, our regression results do not show much difference between these two kinds of investors. Both retail investors and institutional investors seem to respond to sophisticated performance measures. Moreover, this response is asymmetric, i.e. their flows are associated strongest with the 4^{th} performance quintile in our piecewise linear regression. Funds ranked in the 4^{th} quintile seem to attract more assets under management than funds in other performance quintiles. We further conduct Chow tests to confirm our results. Although we can reject the linear shape of PFR for retail investors, we cannot confirm the nonlinear shape for institutional investors.

One main problem of our results is that they may subject to the potential survivorship bias. Although three studies have confirmed that survivorship bias does not affect inferences on the PFR (Sirri and Tufano 1998, Chevalier and Ellison 1997, and Goetzmann and Peles 1997), this leaves room for further study by focusing on a survivorship bias free sample.

References

Brown, Keith C., W. V. Harlow and Laura T. Starks. 1996. Of tournaments and temptations: An analysis of managerial incentives in the mutual fund industry. *Journal of Finance*, 51(1): 85-110.

Chevalier, Judith and Glenn Ellison. 1997. Risk taking by mutual funds as a response to incentives. *Journal of Political Economy*, 105(6): 1167-1200.

Del Guercio, D. and P. A. Tkac. 2002. The determinants of the flow of funds of managed portfolios: Mutual funds vs. pension funds. *Journal of Financial & Quantitative Analysis*, 37(4): 523-557.

Engström**,** Stefan and Anna Westerberg. 2004. Information costs and mutual fund flows. *SSE/EFI Working Paper Series in Economics and Finance No555.*

Ferreira, Miguel A., Aneel Keswani, Antonio F., Miguel and Sofia B. Ramos. 2009. The flow-performance relationship around the world. *Working Paper.*

Goetzmann, W. N. and N. Peles. 1997. Cognitive dissonance and mutual fund investors. *Journal of Financial Research*, 20(2): 145.

Gruber, Martin J.. 1996. Another puzzle: The growth in actively managed mutual funds. *Journal of Finance*, 51(3): 783-810.

Ippolito, R. A.. 1992. Consumer reaction to measures of poor quality: Evidence from the mutual fund industry. *Journal of Law & Economics*, 35(1): 45-70.

Kaplan, Steven N. and Antoinette Schoar. 2005. Private equity performance: Returns, persistence, and capital flows. *Journal of Finance*, 60(4): 1791-1823.

Kasanen, E., Ville Lipponen, and Vesa Puttonen. 2001. What determines mutual fund growth: Evidence from Finland. *The Finnish Journal of Business Economics*, 50: 227-259.

Keswani, Aneel and David Stolin. 2008. Which money is smart? Mutual fund buys and sells of individual and institutional investors. *Journal of Finance*, 63(1): 85-118

Krahner, Jan Pieter, Frank Schmid and Erik Theissen. 1997. Performance and market share: A study of the German mutual fund industry. *Working Paper No. 97/01.*

Lakonishok, Josef, Andrei Shleifer and Robert W. Vishny. 1992. The structure and performance of the money management industry. *Brookings Papers on Economic Activity. Microeconomics*, 1992: 339-391.

Patel, Jayendu, Richard J. Zeckhauser and Darryll Hendricks. 1994. Investment flows and performance: Evidence from mutual funds, cross-border investments and new issues. In *Japan, Europe, and international financial markets: Analytical and empirical perspectives*, edited by Ryuzo Sato, Rama V. Ramachandran and Richard M. Levich. USA**:** Cambridge University Press.

Shefrin, H. and M. Statman. 1985. The disposition to sell winners too early and ride losers too long: Theory and evidence. *Journal of Finance*, 40(3): 777-790.

Sirri, E. R. and P. Tufano. 1998. Costly search and mutual fund flows. *Journal of Finance*, 53(5): 1589-1622.

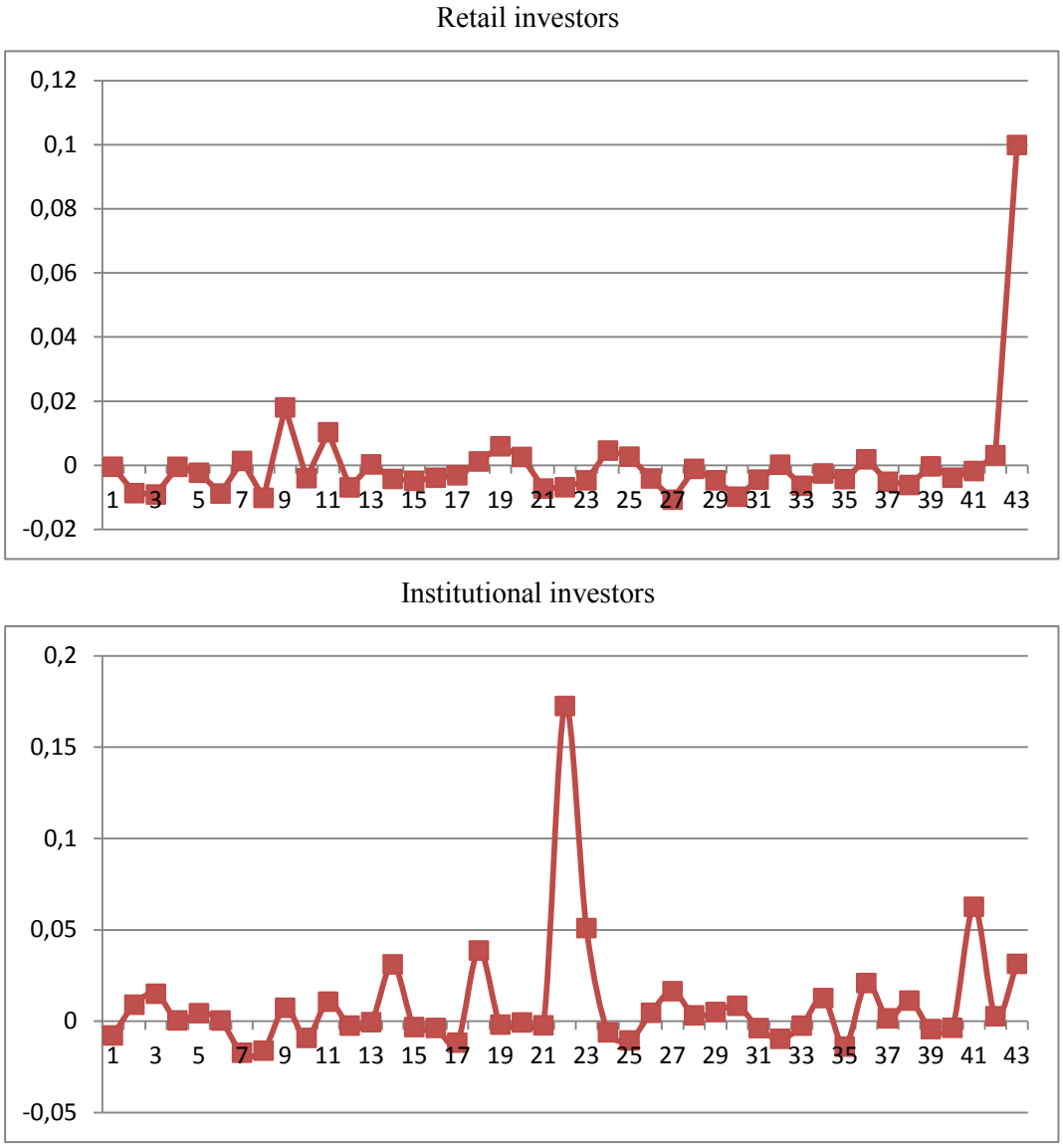
Smith, K. V.. 1978. Is fund growth related to fund performance? *Journal of Portfolio Management*, 4(3): 49-54.

Appendices

Figure 1

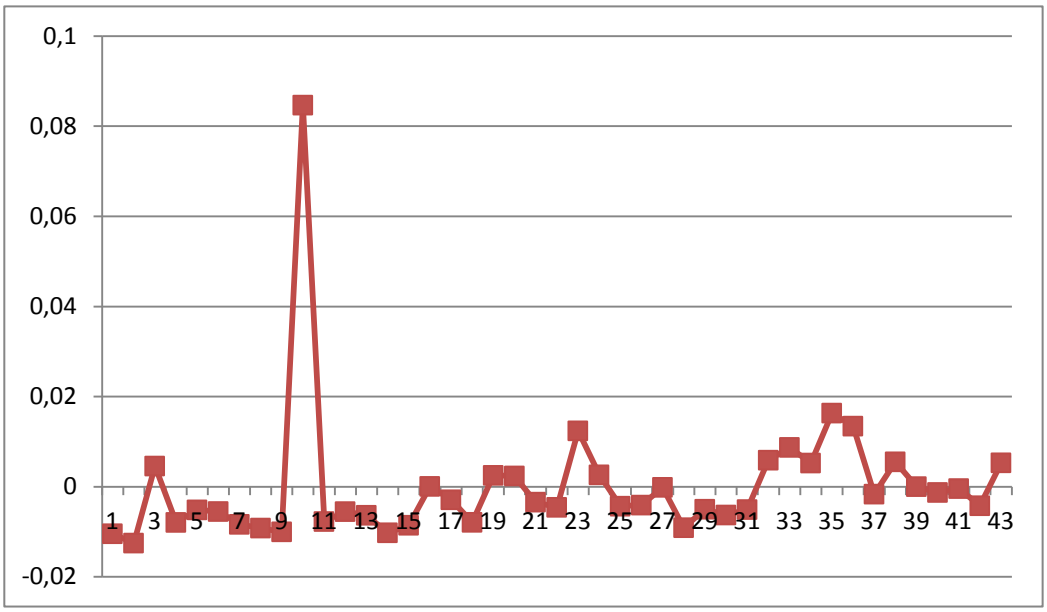
The figure depicts the mean net percentage flows as a function of past performance over the sample period February, 2003-May, 2007. The horizontal axis lists funds ranked according to one performance measure (lagged excess return, Jensen's alpha or tracking error), on which the rightmost fund has the highest rank. The vertical axis represents net percentage flows from retail investors or institutional investors. Panel A reports the results based on lagged excess return ranking. Panel B and C show the relationship sorted by Jensen's alpha and tracking error respectively.

Panel A

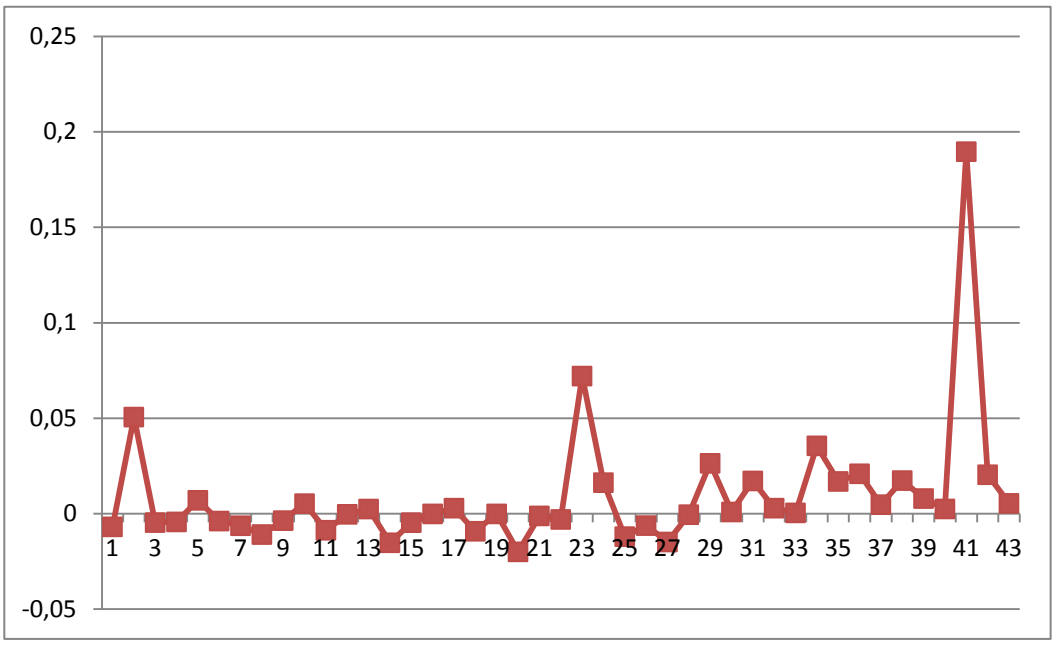


Panel B

Retail investors

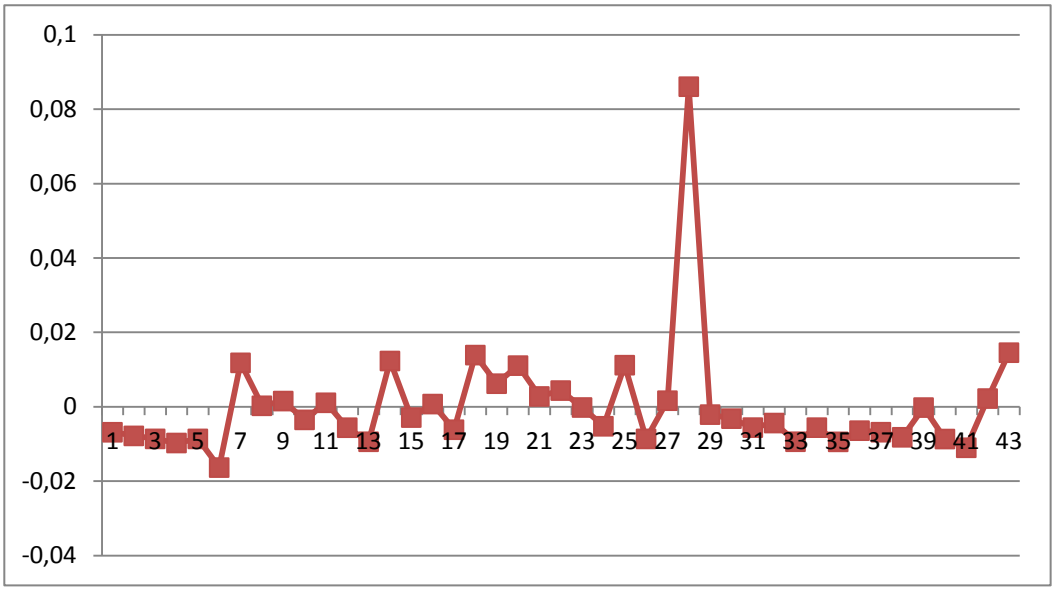


Institutional investors



Panel C

Retail investors



Institutional investors

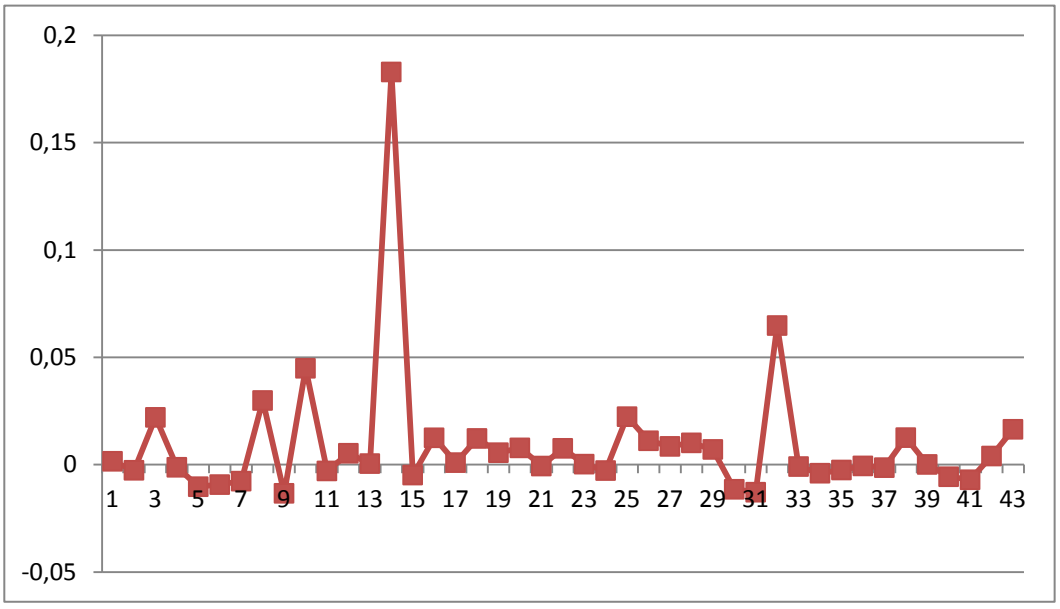
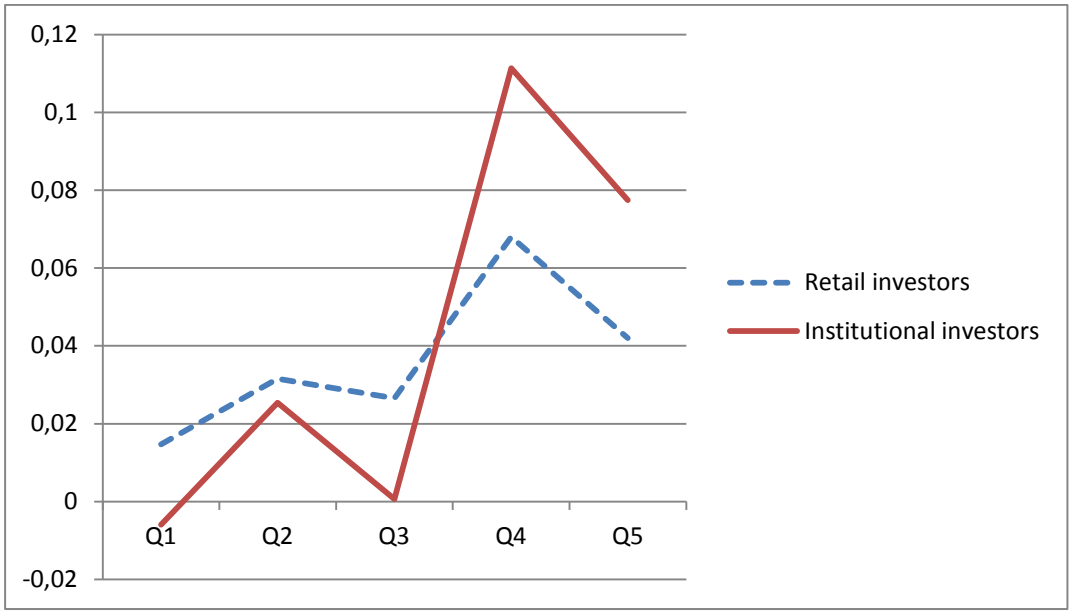


Figure 2

The figure summarizes the results reported in Table 4 and 5. Graph A shows the relationship between net percentage flows and Jensen's alpha quintiles. Graph B shows the relationship between net percentage flows and Fama-French alpha.

A.



B.

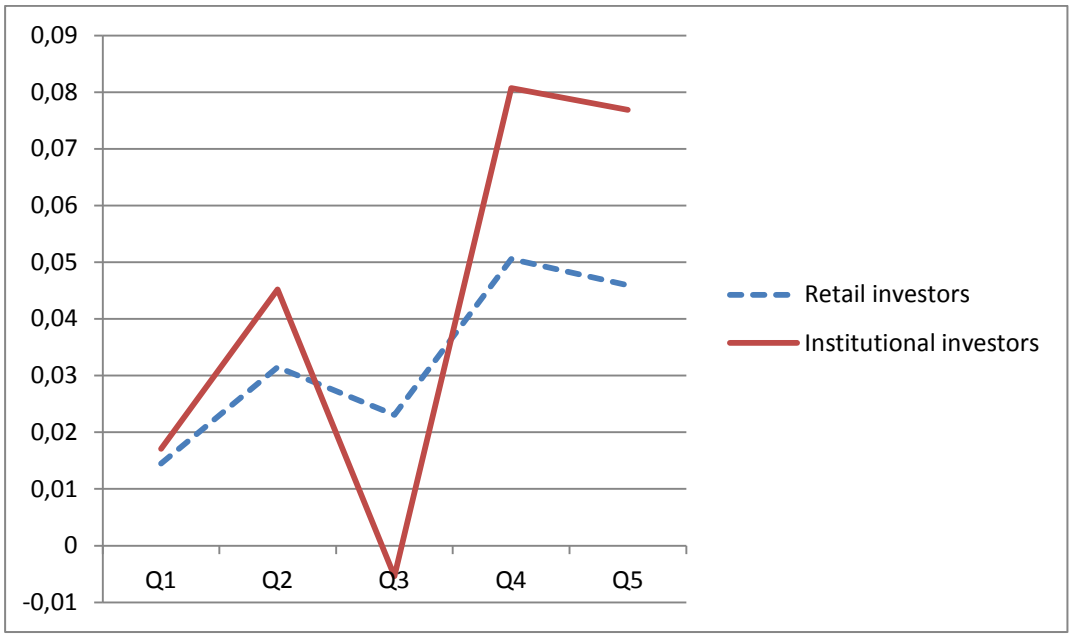


Table 1

The table presents summary statistics for all fund-month observations used in the later regressions. Panel A contains data information for retail investors, and Panel B shows data information for institutional investors. The data for flows and various kinds of performance are in decimal terms. And asset size is the natural logarithm of total net assets scaled in million NOK, whereas fund age is defined as natural logarithm of age scaled in months.

Panel A

Retail investors

Variable	N	Mean	Maximum	Minimum	Std Dev	Median	Skewness	Kurtosis
Net percentage flow	2217	-0.003	0.190	-0.249	0.023	-0.002	0.802	20.301
Lagged excess return	2217	-0.002	0.118	-0.131	0.025	-0.002	-0.062	2.040
Tracking error	2217	0.023	0.056	0.012	0.008	0.022	0.753	0.397
Jensen's alpha	2217	-0.001	0.019	-0.016	0.005	-0.001	0.502	1.221
Fama-French alpha	2217	-0.001	0.017	-0.016	0.004	-0.002	0.481	1.848
Asset size	2217	5.489	9.526	-0.991	1.459	5.534	-0.265	2.056
Fund age	2217	4.500	5.645	2.303	0.543	4.543	-0.466	0.308
Lagged flows	2174	-0.002	0.655	-0.255	0.036	-0.002	7.528	127.177

Panel B

Institutional investors

Variable	N	Mean	Maximum	Minimum	Std Dev	Median	Skewness	Kurtosis
Net percentage flow	2218	-3.141E-6	0.557	-0.627	0.053	0.000	0.576	38.560
Lagged excess return	2218	-0.002	0.118	-0.131	0.025	-0.002	-0.061	2.052
Tracking error	2218	0.023	0.056	0.012	0.008	0.022	0.760	0.427
Jensen's alpha	2218	-0.001	0.019	-0.016	0.005	-0.001	0.509	1.233
Fama-French alpha	2218	-0.001	0.017	-0.016	0.004	-0.002	0.483	1.867
Asset size	2218	5.485	9.526	-0.011	1.458	5.531	-0.230	1.899
Fund age	2218	4.499	5.645	2.303	0.546	4.543	-0.470	0.284
Lagged flows	2175	0.009	9.619	-0.704	0.237	0.000	32.370	1261.070

Table 2

	(1) Retail investors	(2) Institutional investors
Intercept		
	(8.43)	(3.61)
Lagged excess return	-0.01	0.01
	(-0.56)	(0.23)
Jensen's alpha		
	(3.11)	(3.93)
Tracking error	0.04	0.10
	(0.58)	(0.68)
Control variables included in each regression	Asset size, fund age and lagged flow	
Adjusted	0.110	0.016
N	2174	2175

Table 2 reports the results of pooled OLS regression of monthly percentage flow on fund performance measures for the sample. Coefficients and t-statistics (in the parentheses) are presented in the table. For the sake of parsimony, we do not report the estimation for control variables. Each column represents a separate regression. We also include Adjusted and number of observations used (N) for each specification.

*, **, *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

Table 3

	(1) Retail investors	(2) Institutional investors
Intercept		
	(8.71)	(4.00)
Lagged excess return	-0.01	0.02
	(-0.53)	(0.48)
Fama-French alpha		
	(3.60)	(2.84)
Tracking error	0.00	0.01
	(0.02)	(0.09)
Control variables included in each regression	Asset size, fund age and lagged flow	
Adjusted	0.112	0.012
N	2174	2175

Table 3 reports the results of pooled OLS regression of monthly percentage flow on fund performance measures for the sample. Coefficients and t-statistics (in the parentheses) are presented in the table. For the sake of parsimony, we do not report the estimation for control variables. Each column represents a separate regression. We also include Adjusted and number of observations used (N) for each specification.

*, **, *** i ndicate statistical significance at the 10%, 5%, and 1% levels respectively.

Table 4

	(1) Retail investors	(2) Institutional investors
Intercept		
	(6.37)	(3.22)
Bottom performance quintile	0.01	-0.01
	(0.93)	(-0.16)
2nd performance quintile	0.02	0.03
	(1.46)	(1.16)
3rd performance quintile	-0.00	-0.02
	(-0.44)	(-0.94)
4th performance quintile		
	(3.64)	(4.13)
Top performance quintile		-0.03
	(-1.90)	(-1.05)
Control variables included in each regression	Asset size, fund age and lagged flow	
Adjusted	0.117	0.027
N	2174	2175

Table 4 reports the results of piecewise pooled OLS regression of monthly percentage flow on Jensen's alpha quintiles for the sample. Coefficients and t-statistics (in the parentheses) are presented in the table. For the sake of parsimony, we do not report the estimation for control variables. Each column represents a separate regression. We also include Adjusted and number of observations used (N) for each specification.

*, **, *** i ndicate statistical significance at the 10%, 5%, and 1% levels respectively.

Table 5

	(1) Retail investors	(2) Institutional investors
Intercept		
	(6.20)	(3.19)
Bottom performance quintile	0.01	0.02
	(0.93)	(0.47)
2nd performance quintile	0.02	0.03
	(1.47)	(1.04)
3rd performance quintile	-0.01	
	(-0.75)	(-1.91)
4th performance quintile		
	(2.42)	(3.22)
Top performance quintile	-0.00	-0.00
	(-0.35)	(-0.12)
Control variables included in each regression	Asset size, fund age and lagged flow	
Adjusted	0.112	0.019
N	2174	2175

Table 5 reports the results of piecewise pooled OLS regression of monthly percentage flow on Fama-French alpha quintiles for the sample. Coefficients and t-statistics (in the parentheses) are presented in the table. For the sake of parsimony, we do not report the estimation for control variables. Each column represents a separate regression. We also include Adjusted and number of observations used (N) for each specification.

*, **, *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

BI Norwegian School of Management-GRA19002 Preliminary Thesis

MSc in Financial Economics

Empirical Study on Flow-Performance Relationship of Norwegian Mutual Funds:

Retail Investor versus Institutional Investor

Thesis Preliminary Project

Submission Date: 17.01.2010

Supervisor: Janis Berzins

Students:

Yifang Hua

Yajun Huang

Table of Content

Introduction

Previous literatures show that there is a positive relationship between performance and flows in mutual fund. Furthermore, the performance flow relationship (PRF) is not linear, but convex (e.g.Sirri and Tufano(1998) and Del Guercio and Tkac (2002)). The convexity is the result of investors chasing past winners but failing to sell poorly performing funds due to disposition effect (Shefrin and Statman (1985)). Some studies show such disposition effect is less likely to be subjected to sophisticated investor and a comparison of PRF between mutual fund market and pension fund market is conducted which indicates a less convex PFR in pension fund market dominated by sophisticated investors. (Del Guercio and Tkac(2002). However, we found most previous studies of PRF are based on empirical data in U.S and different fund markets like mutual fund market versus pension fund market.

In our thesis, we focus our study of PRF particularly in mutual fund market in Norway. We study both the retail mutual fund segment and institutional mutual fund segment. Although Norwegian mutual fund market was relatively underdeveloped by the end of 1998 (Klapper, Sulla and Vittas (2004)), it is expected to experience increasing growth rate. According to Norwegian Fund and Asset Management Association by November 2010, the total fund capital of Norwegian institutional investors managed by Norwegian mutual fund sector is 3.85 billion NOK compared with fund capital 11.68 billion NOK of Norwegian retail investors.

Firstly, we test whether there is a statically significant positive relationship between fund flows and performance in Norwegian mutual fund market with the assumption of both retail investors and institutional investors considering past performance as a major factor in flow decision. We consider rudimentary performance measures, such as historical raw return, Jensen's alpha and tracking errors in our test to check the impact of financial sophistication on performance measure choice.

In addition, we are also concerned with the shape of PRF in both segments. The analysis of the shape of flow-performance relationship contributes to the growing

literatures linking fund managers behavior to their implicit inventive to increase assets under management. We expect to find convexity of PRF in both retail segment and institutional segment.

Finally, we compare shapes of PRF in respective investor segment and try to find the implications of the differences. We expect a less pronounced convexity of PRF for institutional investors because of financial sophistication and existence of agency problem.

Understanding differences in portfolio choice and investor behavior by comparing PFR of retail investors with that of institutional investors allows for a more complete picture of the mutual fund industry in Norway.

Literature Review

A general positive relationship between fund flow and performance in fund industry has been documented in previous studies. Smith (1978) contemplates the factor that influences the fund choice decision made by investors. He uses a sample of 74 mutual funds between 1966 and 1975 to test two hypotheses: (1) Growth hypothesis: Mutual funds that improve their performance in a given period experience a growth rate in assets under management during the next period that is no different from that of mutual funds that do not improve their performance; (2) New money hypothesis: Mutual funds that improve their performance in a given period experience a growth rate in outstanding shares during the next period that is no different from that of mutual funds that do not improve their performance. He obtains mixed results, the strongest of which is that net new money over the period relates positively to improvement in achieved risk-adjusted fund performance.

Lakonishok, Shleifer and Vishny (1992) address the question of what determines the movement of money under management between different firms. They study approximately 250 institutional money managers and represent net number of new accounts gained (in %) and net dollar value of new accounts gained (in %) as a function of three previous years equity returns from year 1987 to 1990. A univariate linear regression is carried out between these variables and the result of which is statistically significant positive relationship between them.

Besides the demonstrated positively relationship between net asset flow and past performance, several previous studies also examine the shape of flow-performance relationship and show a non-linearity between them (Ippolito (1992), Goetzmann and Peles (1997), and Sirri and Tufano (1998)). Sirri and Tufano (1998) study the data of 690 open-end funds from December 1971 to December 1990. The flow is defined as the net growth in fund assets beyond reinvested dividends, and the performance is focused on rudimentary performance measures such as return rankings relative to other funds with a similar objective, whereas more formal portfolio performance measures such as Jensen's one-factor alphas are added in later tests for robustness purpose. The explanatory variables of flow in period t are past return, riskiness and expenses, and variables such as the

growth of the fund objective category in period t and fund size in the previous period are added in the regression model as controls.

Del Guercio and Tkac (2002) further compare the relations between asset flow and performance in the retail mutual fund segment and fiduciary pension fund segment of the money management industry. They study the data of active domestic equity managers who control at least $20 million in tax-exempt assets in pension fund sector and of all-equity mutual funds with initial investment minimums less than $25,000 in the period from 1987 to 1994. The flow which is measured by annual net dollar flow and net percentage flow respectively is regressed on lagged excess return, one-factor Jensen's alpha and tracking errors, and the regressions include control variables for asset size, lagged flow, fund age and time-style interaction dummies. Del Guercio and Tkac (2002) document a shape of less convexity in fiduciary pension fund segment, and Chow test confirms an approximately linear relation in this segment.

Methodology

We use pooled, time series cross sectional regressions to examine the relationship between performance and fund flows of mutual fund as well as other variables that might influence fund flows. Our dependent variable is fund flow which is defined by annual net kroner flow. We follow literature Del Guercio and Tkac (2002) and compute the measure as:

Measure of annual net kroner flow:

=

where is fund i's total net assets at time t and is its rate of return over prior year.

The independent variable in our regressions is performance. There are several previous literatures discussing about evaluation of mutual fund performance. The goal of our thesis is to infer which measures are important and appropriate to different types of investors. Due to distinctive characteristics of individual investor and institutional investor, there are totally 5 measures of performance in our thesis in which historical return and return ranking are important to retail investors, while risk adjusted performance like Jensen's alpha, performance relative to benchmark like excess return and tracking error are supposed to be important to institutional investors.

As previous studies document that non-performance related variables are also important when explaining fund flows and their sensitivity to performance, in our linear regressions we introduce a large number of non-performance related fund attributes as control variables. Asset size is firstly considered since large mutual funds attract flow approximately in proportion to their size (Del Guercio and Tkac (2002)). We also use fund annual fees as a control variable, as a lot of studies shows that these fees concerning purchasing cost influence fund flows (Gil-Bazo and Ruiz Verdu(2009)). In addition, we include another two control variables in our thesis, one is interest rate and the other is market performance. Santini and Aber (1998) show that there is a negative relationship between fund flow and lagged interest rate which indicating that the increase of investment cost leads decrease of investment. They also show in their paper that in bull market investors

are encouraged to buy more mutual funds. Multicollinearity among these variables will be checked by applying pearson pairwise correlation test in our regression.

A piecewise linear regression similar to the one adopted by Sirri and Tufano (1998) is carried out to investigate the shape of flow-performance relationship in two different fund segments of the money management industry. We expect a shape of less convexity in the institutional investors segment. At last robustness test is applied. We use net percentage flow to replace annual net kroner flow in our empirical model to examine how robust our results are. Measure of net percentage flow is computed as:

$$=$$ _____

Data

All data of mutual fund in Norway is provided by our supervisor. Our data comprises both time series and cross-sectional elements and such a d ataset is known as a panel of data or longitudinal data (Chris Brooks (2008)). Our sample period is built from year 1994 to year 2004. We use special codes to classify data by two distinct types of investors and only actively managed all equity mutual funds are considered. Since the number of mutual fund is relatively small because of limited age and size of Norwegian mutual fund market, we use quarterly data instead of yearly data in order to generate more samples in our regressions. Besides, we exclude all fund observations with 5% top of fund flow as data in these cases often seems questionable. We also exclude all mutual funds for which not all information required in our regression model is available. However the data we collect will still face both survivorship bias and limitation sample bias.

References

Chris Brooks (2008). Introductory Econometrics for Finance. Cambtidge Univesity Press

Del Guercio, D. and P. A. Tkac (2002). "The Determinants of the Flow of Funds of Managed Portfolios: Mutual Funds vs. Pension Funds." Journal of Financial & Quantitative Analysis **37**(4): 523-557.

Gil-Bazo, J., and P. Ruiz-Verdu, 2009, T he relation between price and performance in the mutual fund industry, Journal of Finance **64**, 2153-2183

Goetzmann, W. N. and N. Peles (1997). "COGNITIVE DISSONANCE AND MUTUAL FUND INVESTORS." Journal of Financial Research **20**(2): 145.

Ippolito, R. A. (1992). "CONSUMER REACTION TO MEASURES OF POOR QUALITY: EVIDENCE FROM THE MUTUAL FUND INDUSTRY." Journal of Law & Economics **35**(1): 45-70.

Klapper, L., V. Sulla, et al. (2004). "The development of mutual funds around the world." Emerging Markets Review **5**(1): 1.

Lakonishok, J., A. Shleifer, et al. (1992). "The Structure and Performance of the Money Management Industry." Brookings Papers on Economic Activity. Microeconomics **1992**: 339-391.

Santini, Donald L., and Jack W. Aber, 1998, "Determinants of Net New Money Flows to the Equity Mutual Fund Industry", Journal of Economics and Business **50**, 419-429

Shefrin, H. and M. Statman (1985): "The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory and Evidence", Journal of Finance **40**, pp.777-90.

Sirri, E. R. and P. Tufano (1998). "Costly Search and Mutual Fund Flows." Journal of Finance **53**(5): 1589-1622.

Smith, K. V. (1978). "Is fund growth related to fund performance?" Journal of Portfolio Management **4**(3): 49-54.