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Impact of capital flows on the performance of Norwegian mutual funds

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Problem description

This paper empirically investigates the relationships between excess return and capital flows of Norwegian mutual funds. As a method we use panel data regressions.

Preface

This Master's Thesis is written during the spring of 2015 at the Norwegian University of Science and Technology (NTNU), and it marks the end of our Master of Science degree in Industrial Economics and Technology Management. The thesis is written as an academic research paper in the article format, thus intended for publishing. The purpose of this paper is to evaluate the relationship between fund performance and past capital flows, allowing for the possible impact of past performance and fund size.

First and foremost, we would like to thank our supervisor Peter Molnar for his guidance, feedback and conversations that we have greatly benefited from. We would also like to thank Caroline Sesvold Tørring at the Norwegian Fund and Asset Management Association (VFF), Børsprosjektet NHH and Oslo Stock Exchange for generously providing us with data.

Trondheim, June 11, 2015

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Sammendrag

Denne oppgaven studerer sammenhengen mellom fondsprestasjon og tidligere kapitalstrømmer, samtidig som den tar høyde for mulig persistens i prestasjon og innvirkning av fondsstørrelse på prestasjon. Vi tar i bruk et unikt datasett bestående av daglig avkastning og månedlige kapitalstrømmer inn og ut av alle norske fond. Dette inkluderer aksje-, obligasjons- og pengemarkedsfond registrert og handlet på Oslo Børs i perioden 2006 - 2014. Datasettet er derfor uten overlevelsesskjevhet, og vårt hovedfokus er aksjefond. Vi finner kortsiktig persistens i prestasjon for norske fond samlet, og at størrelse på aksjefond er relatert til fondsprestasjon når man tar høyde for prestasjonspersistens. Vi finner imidlertid ikke signifikante bevis på at tidligere kapitalstrømmer kan påvirke fondsprestasjon.

Impact of Capital Flows on the Performance of Norwegian Mutual Funds

KAREN MOSEBØ HAUKELAND AND BERIT LUND*

June 11, 2015

Abstract

This study investigates the relationship between fund performance and past capital flows, allowing for the possible impact of past performance and fund size. We use a unique data set consisting of daily returns, monthly capital inflows and outflows for all Norwegian mutual funds. This includes all equity, bond and money market funds registered and traded at some point during 2006 - 2014 on Oslo Stock Exchange, making our data set free of survivorship bias. Our main focus is equity funds. We find strong evidence of short-term performance persistence for the full sample of Norwegian mutual funds, and we find that equity mutual fund size is significantly related to performance when accounting for performance persistence. However, we do not find any significant impact of past inflows, outflows or net flows on fund performance.

*Norwegian University of Science and Technology (NTNU), NO-7491 Trondheim, Norway. We especially thank Peter Molnar for his guidance, feedback and conversations that we have greatly benefited from. Also, we thank Børsprosjektet NHH, the Norwegian Fund and Asset Management Association (VFF) and Oslo Stock Exchange for generously providing us with the data.

1 Introduction

The high returns to mutual fund investors during the 1980s and '90s resulted in significant public attention towards the industry. Since then the industry has been growing tremendously; during the past decade the total net assets (TNA) of the Norwegian mutual fund market has almost tripled in size[2]. As a result, the predictability of mutual fund performance has become of great interest to investors and an important topic in finance.

The mutual fund literature has long recognized the positive relationship between past performance and net fund flows, indicating that high performance leads to increased capital inflows and low performance leads to increased capital outflows (Ippolito, 1992; Gruber, 1996; Sirri and Tufano, 1998). As the relationship between fund performance and successive capital fund flows has been established, it is natural to wonder whether the opposite relationship might also hold true. Can capital fund flows influence fund performance?

Berk and Green (2004) presents a theoretical model of active portfolio management addressing this issue. Based on the well known presumption that mutual fund investors chase past performance, they argue that new money will flow into previously outperforming funds. As a consequence, managers will increase the fund size to the point at which it will impact the manager's ability to generate superior returns and his expected future return will decrease. This process continues until investors are indifferent between investing with active managers or simply indexing, and equilibrium is achieved. As a result, Berk and Green (2004) argue that managerial ability to generate excess returns cannot be effectively employed at an arbitrarily large scale, meaning that funds experience diseconomies of scale in active management. They find that the reasoning described above also holds true for underperforming funds: investors withdraw their funds when the returns fall below the risk-adjusted benchmark. These withdrawals seem, at first, to harm managers, but the withdrawals also offer the managers the opportunity to improve the fund's performance again by concentrating on a smaller number of well-performing stocks.

Bessler et al. (2008) investigate the impact of fund flows and management turnover on investment performance of actively managed equity mutual funds over time. They find that future performance of past top performing funds strongly suffers from both the departure of skilled fund managers (internal governance) and even more from excessive inflows (external governance). The future performance of past loser funds benefits from a replacement of their unskilled or unlucky managers but does not benefit from capital outflows to the same degree. Bessler et al. find, consistent with the theory of Berk and Green (2004), that fund inflows in combination with decreasing returns to scale erode the superior performance of winner funds, while outflows gives loser funds the possibility to regain performance.

The theory of Berk and Green (2004) and findings of Bessler et al. (2008) motivates our study investigating whether such a flow-performance mechanism might exist in the Norwe-

[2] Norwegian Mutual Fund Association (VFF).

gian mutual fund market. We will refer to this effect as the "Berk and Green mechanism".

Influences leading to diseconomies of scale are further studied by Pollet and Wilson (2008). They hypothesize that when a fund experiences high capital inflow, management can either put more money into existing stocks and therefore incur higher transaction costs, or it can increase the number of stocks in the portfolio, having to select securities with lower expected returns. They find that management tends to choose the first option, rather than increase the number of investments. Whichever choice the managers make, the consequences seem to contribute to a lower rate of return of the fund in question.

Edelen et al. (2007) specifically investigates the role of trading costs as a source of diseconomies of scale in mutual funds. They conclude that trading costs are detrimental to performance as the fund's relative trade size increases, and they further suggest that trading costs are the primary source of diseconomies of scale. Contradictory to the findings of these studies, Christoffersen et al. (2007) find that large-cap mutual funds have lower trading costs than small-cap funds, and Chan et al. (2012) find that fund size has no significant impact on trading costs.

Alexander et al. (2007) provide further research on mutual fund's cost of liquidity, investigating how trading motivation of fund managers might affect fund performance. In line with Pollet and Wilson (2008) and Edelen et al. (2007), they point out that the structure of open-ended mutual funds sometimes forces fund managers to trade for liquidity reasons as unanticipated investor flows require managers to continually rebalance their portfolios. Alexander et al. (2007) argue that all trading that is not motivated by solely valuation beliefs is consistent with noise trading, and should underperform valuation-based trades. Hence, they argue that liquidity trading is detrimental to fund performance, and that fund managers are unable to beat the market when investors' flows forces them to invest excess cash or sell stocks they would have preferred to hold longer based on valuation beliefs. These findings are in line with those of Edelen (1999), who finds a statistically significant negative relation between investor flows and the returns that fund investors receive. Edelen (1999) also attributes this relationship to the cost of liquidity-motivated trading.

Inspired by Pollet and Wilson (2008), Edelen et al. (2007), and Alexander et al. (2007) we wish to investigate whether absolute net flows inevitably contribute to a decrease in performance due to transaction costs and liquidity motivated trading. We will refer to this effect as the "trading cost mechanism".

Another explanation of how flows might influence performance, is through the so-called "smart money effect". This mechanism is based on the idea that investors are "smart" if they are able to predict future fund performance beyond what can be predicted from past performance, and invest on this predictability. In contradiction to Ippolito (1992); Sirri and Tufano (1998); Chevalier and Ellison (1997), the smart money effect implies that investors' allocation of funds follow their ability to predict future performance. This prediction is based on other determinants than past performance, such as detecting the skill of a new fund manager that will improve the fund performance, having insider information about the expected future return of fund constituents, or possessing superior abilities to predict fund returns. These assumptions are in line with the findings of Zheng (1999), who conclude that smart money effect is not related to macro economic information or style effect, but rather fund specific information.

Gruber (1996) investigates the smart money effect by looking at risk-adjusted returns of newly invested money in actively managed mutual funds. He finds that the risk-adjusted return on new capital flow is higher than the average risk-adjusted return for all investors in these funds. Zheng (1999) looks further into this issue and finds that mutual fund investors in aggregate are able to make decisions on whether to invest or extract money from funds based on good assessment of short-term future performance of a fund.

In order to investigate the relationship between performance and past capital flows, certain conditions must be taken into account. As capital flows are found to follow performance, it can be argued that current flows act as proxies of past fund performance. If these capital flows further impact future performance, the codependent relationship between flow and performance might indirectly contain information about performance persistence. Based on this reasoning, we find it essential to investigate performance persistence in parallel to funds' impact on performance.

The subject of mutual fund performance persistence has received a great deal of attention in the literature of financial economics. Earlier studies such as Elton et al. (1996), Elton et al. (2012), Hendricks et al. (1993), Grinblatt and Titman (1992), and Brown and Goetzmann (1995) find persistence in performance of funds. However, these studies are based on monthly data, which only allow for analysis of performance persistence over longer horizons. This might be a disadvantage in performance studies as persistence can be a short-lived phenomenon (Bollen and Busse, 2005). These attributes are recognized by Gallefoss et al. (2015), who study performance persistence in Norwegian mutual equity funds based on daily returns. This is the first study on this topic utilizing daily data stemming from outside the US. They find that the performance of Norwegian top and bottom performing equity funds cannot be explained by luck, and that the performance of these funds persist for short horizons of up to one year. These findings are in accordance with results from the US on daily data (Busse, 1999; Bollen and Busse, 2005).

Even though performance persistence has been examined extensively, the majority of previous empirical work involves either common stock funds or funds that invest in both common stock and debt instruments (i.e. hybrid funds). Bond funds has grown immensely in the Norwegian mutual fund market during the last decade[3] and constitute a major part of

[3]Further information is provided in Section 2 and in Appendix 2.

the mutual fund industry, yet there is very little information on bond fund performance[4]. To the best of our knowledge, there are no studies on persistence in performance of Norwegian bond and money market funds.

Based on previous theory and findings in mutual fund literature, fund flows seems to trigger mechanisms that impact performance. However, this field of study is characterized by little consensus among academics as many studies present contradicting results. As empirical evidences are both diverging and few, we are motivated to contribute to the existing literature by providing new evidence from Norway. Despite the fact that the Norwegian economy is one of the most developed economies in the world, there are almost no studies of Norwegian mutual funds.

Our unique data set consists of individual funds' daily net asset values, monthly capital inflows and outflows, reinvested dividends, and number of customers for all Norwegian mutual funds registered and traded at some point in the period 2006 - 2014 on Oslo Stock Exchange (OSE). A great majority of the existing mutual fund research is based on monthly net asset values, simply because these data are usually the only data available. However, performance evaluation is problematic with solely monthly returns. Researchers can either utilize monthly returns, which is a noisy measure of fund performance, or they can evaluate performance over longer time horizons. Daily data allow for more precise performance evaluations, which in turn allow us to study flow-performance relationships on shorter time scale.

While most other mutual fund studies only have access to equity fund data, we have data on the entire Norwegian mutual fund market including equity, bond, money market and hybrid/other funds. Further, while most other studies are forced to approximate net flows from NAV, our data set contains inflows, outflows and net flows. Additionally, our capital flows are stated both as total flow and as flow from institutional, retail and foreign customers.

We are therefore able to investigate fund flows' influence on performance on a deeper and more detailed level than the majority of previous studies. This study therefore offers a new perspective on the impact of capital flows on mutual funds' performance, a perspective that may be of general economic interest as it provides additional insight as to what drives fund performance, and may be of specific economic interest to fund managers, investors, and other parties involved in the fund industry.

In order to investigate the problem at hand, we apply fixed effects panel data regression on individual mutual fund data to capture the possible correlations between fund performance and past performance, inflows and outflows. We focus particularly on equity funds due to two assumptions that lead us to believe that such a relationship might be more prevalent in equity funds than in bond and money market funds. First, the variety amongst

[4]Examples of studies that have investigated performance persistence in bond funds are Cornell and Green (1991) and Blake et al. (1993)

equity funds is greater than the variety of bond and money market funds which are often more similar to each other. Second, the performance of bond and money market funds is expected to be more influenced by interest rates than equity funds are.

As we measure performance as the risk-adjusted excess return of the fund, capital flows are measured as a percentage change of the fund's total net assets. We also study a set of explanatory variables potentially related to fund performance. These variables will be explained in greater detail later.

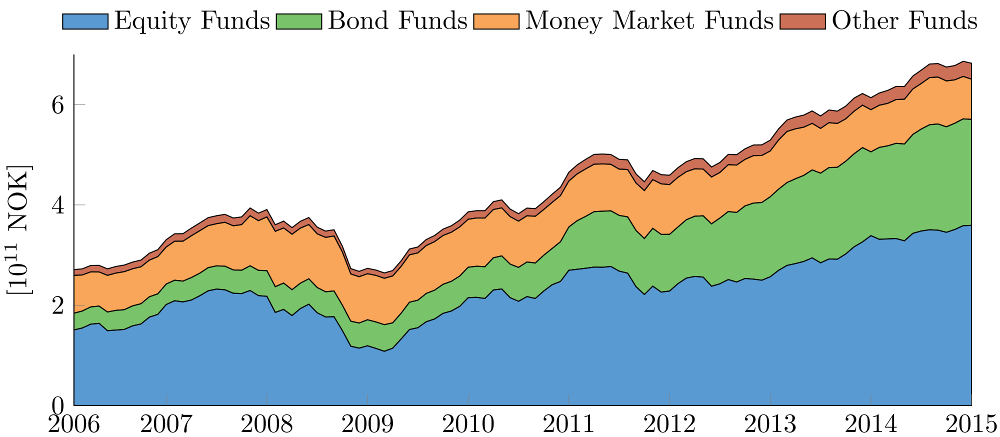
The remainder of this paper is organized as follows. Section 2 gives an overview of our data set. In Section 3 we present our regression model and its variables. Section 4 analyzes the regression results and robustness tests. Section 5 concludes.

2 Data

2.1 The Norwegian mutual fund market

During the last decade the Norwegian mutual fund market has grown tremendously. As seen from Figure 1, the capital in Norwegian mutual funds has almost tripled from the beginning of 2006 to the end of 2014.

Figure 1: Capital allocated in Norwegian mutual funds by fund category

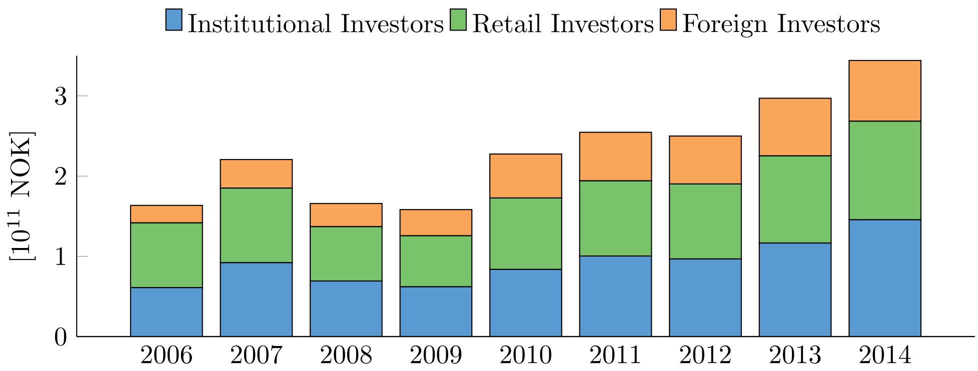


All mutual funds in the Norwegian fund market are organized into categories depending on their investments and risk exposure. The main fund categories are equity funds, bond funds, hybrid funds, money market funds, hedge funds/other funds, and other high yield funds. The Norwegian Fund and Asset Management Association (VFF) defines equity funds as mutual funds with 80-100 % exposure to the stock market, which will normally not invest in interest-bearing instruments. Equity funds are divided into groups depending on which investment universe the funds are placed within. These investment universes might be geographically limited, sector and industry specific, or a combination of these. The subgroups of equity funds and their benchmarks can be seen in Table 2, as well as bond and money market funds and their benchmarks. VFF's complete fund definitions and standards are provided in Appendix 1. Due to the fact that hybrid funds consist of both equity and bond components the regression results of hybrid funds and "other funds" are expected to be vague and ambiguous, and they are therefore excluded from our study.

Table 1: Capital in the Norwegian mutual fund market allocated among fund categories.

Fund category	Market share in 2006	Market share in 2014
Equity funds	57 %	52 %
Bond funds	13 %	31 %
Money market funds	25 %	13 %
Hedge funds/other funds	5 %	4 %

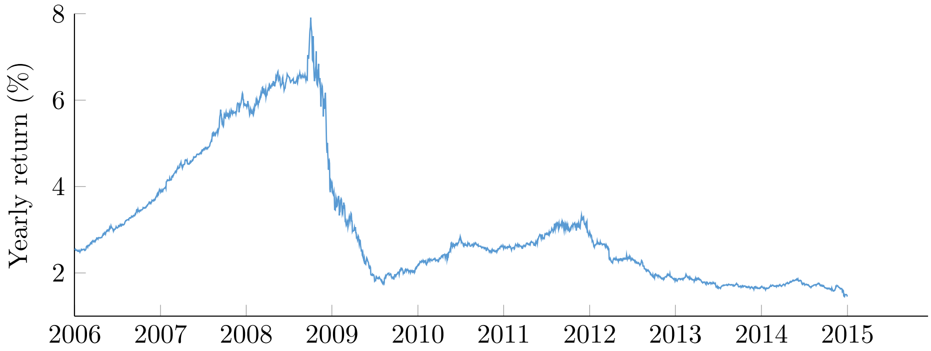
Figure 2: Capital allocated in equity funds by investor type



As seen from Figure 1 and Table 1, the three largest fund categories (measured by TNA) are equity funds, bond funds, and money market funds. Equity funds have during the last nine years constituted the largest group of funds, and its capital has steadily increased as seen from Figure 2. The capital allocated in money market funds has remained stable during the same period, while bond funds constitute the fund category that has increased the most during 2006 to 2014, both relative to previous TNA and in absolute terms. This is seen from Figure 1. The increase of capital allocated in bond and equity funds is presumably related to the decrease of the Norwegian risk-free rate of return (NIBOR), as seen from Figure 3. In an environment of low risk-free return, many investors allocate more capital to riskier investments as the bank alternative yield little or no return.

Inflows, outflows and net flows of aggregated equity funds, as well as a more detailed overview of the Norwegian mutual fund market are provided in Appendix 2.

Figure 3: Yearly risk-free rate of return (3 month NIBOR)



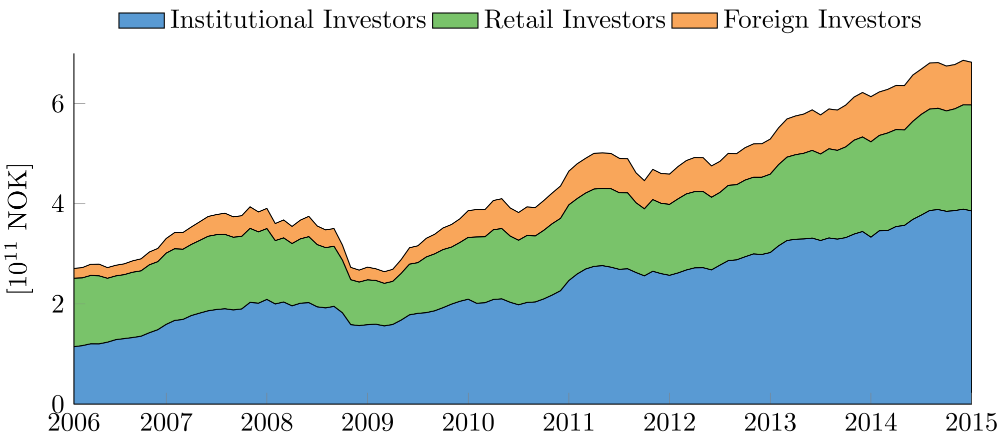
The Norwegian Fund and Asset Management Association (VFF) also distinguish between three different investor categories: Norwegian institutional investors, Norwegian retail investors, and foreign investors (both retail and institutional). Our study's capital flows are therefore stated both as total flows and as flows from each investor type. Since January 2013 retail investors have been split into two categories; Norwegian retail customers and pension funds. However, in order to compare fund data from 2013 and 2014 with data from previous years we continue to consider both retail investors and pension funds as one combined investor group.

As evident from Figure 4 and Table 2, the Norwegian fund market has become more influenced by institutional investor capital flows in 2014 than it was in 2006, when institutional and retail investors had almost the same amount of capital in Norwegian funds. This is mainly due to the increase of institutional capital in equity and bond funds, as the amount of retail capital has remained approximately the same.

Table 2: Capital in the Norwegian mutual fund market allocated among investors.

Investor category	Market share in 2006	Market share in 2014
Institutional investors	46 %	56 %
Retail investors	46 %	30 %
Foreign investors	8 %	14 %

Figure 4: Capital allocated in Norwegian mutual funds by investor type



2.2 Data description

Our data set combines information from two sources; VFF and Oslo Stock Exchange. Raw flow data from VFF has been organized, structured and matched against capital data from Oslo Stock Exchange. Fund return and risk-adjusted fund return (CAPM alpha) has been calculated from total net asset values (TNA).

Our data set is free of survivorship bias. Survivorship bias is the tendency for mutual funds with poor performance to be dropped by mutual fund companies, generally because of poor results or low asset accumulation. Many losing funds are closed and merged into other funds to hide poor performance. This phenomenon, which is widespread in the fund industry, results in an overestimation of the past returns of mutual funds. In order to take this important issue into account when analyzing past performance, we include all mutual funds traded during the period 2006 - 2014.

Due to the fact that we measure capital flows as a percentage of the fund's capital last month[5], we are faced with the issue of extreme flow values during the first months of a fund's lifetime, since the fund's capital is very small compared to inflows. As we wish to investigate the interaction between performance and previous flows during steady-state fund conditions, we exclude all fund data from a fund's start-up period, which we estimate to be three months long on average. This means that if a fund exists for 17 months we only make use of its latter 14 months of data.

When funds are liquidated the capital released from the fund is not included as fund outflows. This is because it is often the management of the fund and not its investors who

[5]Flow variables will be described in more detail in the next section.

choose to liquidate a fund, and so liquidation is not an outflow of the type we wish to describe.

2.2.1 Data requirements

Due to the longitudinal nature of our data, we introduce two requirements for individual fund flows before performing panel data regressions. The rationale behind these assumptions is to exclude funds with many monthly observations of zero flow (which usually are small funds with few customers) and to capture funds that are openly traded. Figure 5 and Figure 6 illustrate the consequences of these requirements.

Requirement 1

Number of monthly flow observations ≥ 12

Requirement 2

Average number of institutional customers ≥ 20, or
Average number of retail customers ≥ 100, or
Average number of total customers ≥ 20

The three restrictions above are set separately for each investor category, implying that a fund that does not satisfy one of the requirements can still be included if it satisfies one of the other requirements. As a result, only one of the requirements in "Requirement 2" needs to hold true for a fund to be included in the reduced fund subset.

With these data requirements, the initial sample of 468 equity funds, 66 bond funds and 56 money market funds is reduced. The new subset consists of 311 equity funds, 46 bond funds and 51 money market funds. This subset of equity funds is further reduced to 262 funds due to the fact that many equity funds are categorized as "other types of equity funds", without geographical or sector specific affiliation. This makes it difficult to compare them to a proper benchmark, and without a benchmark index we are unable to calculate the fund's excess rate of return (CAPM alpha). As a consequence, these funds are excluded from our study.

Figure 5: Inflow from institutional investors to the equity fund ODIN Norge II. With the requirement of a minimum number of average institutional customers, this fund is excluded.

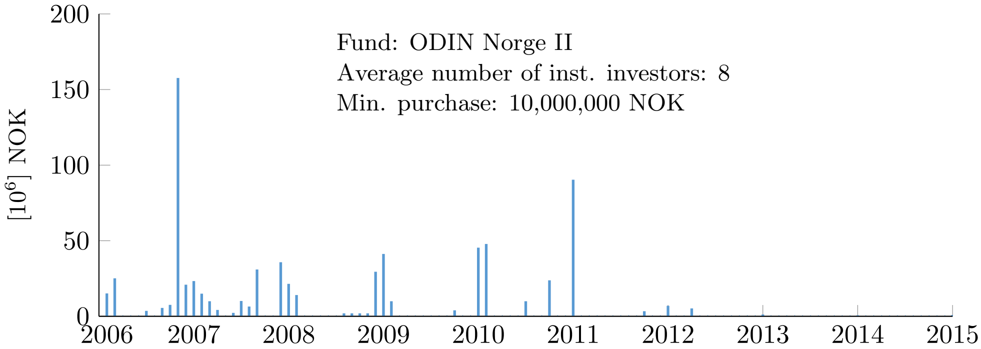
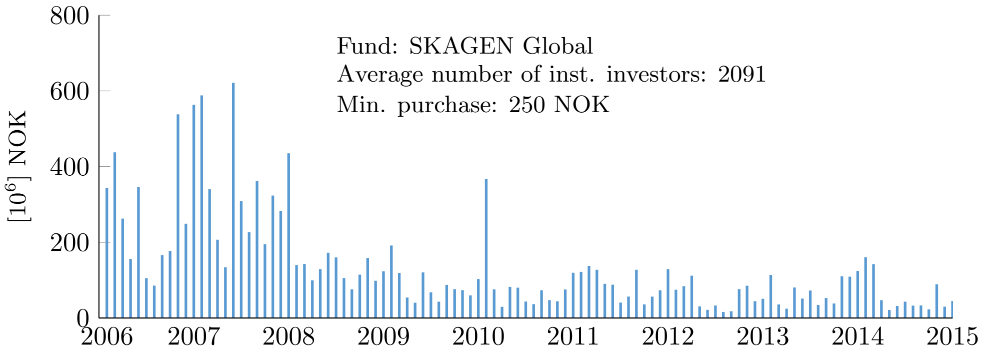


Figure 6: Inflow from institutional investors to the equity fund SKAGEN Global. With the requirement of a minimum number of average institutional customers, this fund is still included.



3 Definition of variables and methodology

The core of our study is to investigate the relationship between performance and past capital flows of mutual funds. In order to preserve the individual differences between funds caused by fund-specific characteristics such as relative performance and idiosyncratic volatility, we perform regressions on individual mutual funds. Inspired by Spiegel and Zhang (2013), Huang et al. (2011) and Li et al. (2013), we utilize fixed effects panel data regressions to incorporate the longitudinal nature of the data. Our data set is regarded as an unbalanced panel, as individual funds are observed different numbers of times. The Hausman test (Hausman, 1978) confirms the suitability of fixed effects panel regression on our data set. We also use robust standard errors to deal with the possible issues of heteroskedasticity, and we include time dummies to control for time or month-varying effects. However, these dummies are omitted from our regression results.

Our fundamental panel data regression for individual mutual funds is given below. We believe that if a relationship between risk-adjusted performance and past capital flow exists, the power of explanation lies in the near past. Hence, inflows and outflows are lagged with one month. Inspired by the recent findings of Gallefoss et al. (2015), we include one, two and three-months lagged performance in order to allow for short-term performance persistence. This model is expanded with explanatory variables where suitable, which will be further explored and elaborated on in the result section.

$$\alpha_{i,t} = \beta_0 + \beta_1 \alpha_{i,t-1} + \beta_2 \alpha_{i,t-2} + \beta_3 \alpha_{i,t-3} + \beta_4 IN_{i,t-1} + \beta_5 OUT_{i,t-1} \tag{1}$$

where α is the CAPM risk-adjusted Jensen's alpha, and IN and OUT are capital inflows and outflows, respectively. These variables are defined below.

3.1 Dependent variables

In order to evaluate and compare fund performances, we calculate performance as the monthly risk-adjusted excess return of each fund, or Jensen's alpha. Monthly alpha is regressed from the one-factor Capital Asset Pricing Model (CAPM) using daily return observations.

$$r_{i,t} - r_{f,t} = \alpha_{i,t} + \beta_{i,t}(r_{m,t} - r_{f,t}) + \epsilon_{i,t} \tag{2}$$

The fund's return, $r_{i,t}$, minus the risk-free rate of return (the return of 3-month government bond index), $r_{f,t}$, constitutes the excess return of the fund; the risk premium for holding the fund rather than risk-free assets. A fund's rate of return is obtained from changes in daily net asset value (NAV) per share provided by Oslo Stock Exchange (OSE). NAV is adjusted for dividend payments.

The rate of return of a fund's appropriate market index or benchmark, $r_{m,t}$, minus the risk-free return is the excess return of the benchmark that the fund is compared with. The benchmarks corresponding to the various categories of mutual funds can be seen in Table 3.

$\alpha_{i,t}$ should intuitively be zero as we expect to receive the same rate of excess return for owning assets in a fund as we would do by being exposed to the same amount of risk in the market. If alpha is positive, the fund provides the investor with an abnormal rate of return given the risk level.

Table 3
Benchmarks used for the various categories of mutual funds. Equity funds are given benchmarks based on their geographical, sector or industry specific investment universe. Bond funds are divided into groups depending on their expected interest rate sensitivity: 0-2, 2-4, or interest rate sensitivity higher than 4. Low (high) interest rate sensitivity give governmental bond index with shorter (longer) duration as benchmarks. Money market funds are bond funds that can solely invest in interest-bearing instruments with remaining fixed interest of 365 days or less. Money arket funds are therefore given the benchmark of 6 month duration governmental bond index, egardless of their interest rate sensitivity.

Mutual funds	No. of funds	Benchmark
Norwegian funds	62	OSE Fund Index (OSEFX) (NOK)
Global funds	59	MSCI World ($)
European funds	23	MSCI Europe ($)
Nordic funds	27	MSCI Nordic ($)
North American funds	13	MSCI USA ($)
Asia excluding Japan funds	11	MSCI Asia Pac. Excl. Japan ($)
Emerging markets funds	16	MSCI Emerging Markets ($)
Japanese funds	10	MSCI Japan ($)
Eastern European funds	5	MSCI EM Eastern Europe ($)
Chinese funds	6	MSCI China ($)
Swedish funds	3	MSCI Sweden ($)
Latin America funds	3	MSCI EM Latin America ($)
Indian funds	2	MSCI India ($)
Sector funds - Finance	2	MSCI ACWI Financials ($)
Sector funds - Health Care	10	MSCI ACWI Health Care ($)
Sector funds - Technology	10	MSCI ACWI IT ($)
All equity funds	**262**	
Bond funds 0-2	14	Gov. bond index 1 year (ST3X)
Bond funds 2-4	29	Gov. bond index 3 years (ST4X)
Bond funds 4+	3	Gov. bond index 3 years (ST4X)
All bond funds	**46**	
Other short m.m. funds	24	Gov. bond index 6 months (ST2X)
Other long m.m. funds	6	Gov. bond index 6 months (ST2X)
Short m.m. funds - low credit risk	19	Gov. bond index 6 months (ST2X)
Long m.m. funds - low credit risk	2	Gov. bond index 6 months (ST2X)
All money market funds	**51**	

3.2 Independent variables

We define fund flows as a fraction relative to the fund's previous month's TNA. This can be interpreted as the percentage growth in assets beyond return and reinvested dividends. The flow variables are summarized in Table 4.

Table 4: Flow variables for panel data regression

Description	Abbreviation	Math. expression
Inflow	$IN^c_{i,t}$	$\frac{Inflow^c_{i,t}}{TNA_{i,t-1}}$
Outflow	$OUT^c_{i,t}$	$\frac{Outflow^c_{i,t}}{TNA_{i,t-1}}$
Net flow	$NET^c_{i,t}$	$\frac{Netflow^c_{i,t}}{TNA_{i,t-1}}$

$$
\begin{aligned}
C &= \{\text{Retail investors, institutional investors, all investors (total)}\} \\
I &= \{\text{Set of mutual funds}\} \\
IN^c_{i,t} &= \text{Capital inflow for fund } i \text{ in month } t \text{ for investor category } c \\
OUT^c_{i,t} &= \text{Capital outflow for fund } i \text{ in month } t \text{ for investor category } c \\
NET^c_{i,t} &= \text{Capital net flow for fund } i \text{ in month } t \text{ for investor category } c \\
TNA^c_{i,t} &= \text{Total net assets of fund } i \text{ in month } t \text{ for investor category } c
\end{aligned}
$$

Explanatory variables

Inflow times two-months lagged alpha: $IN^c_{i,t-1}\alpha_{i,t-2}$

The magnitude and sign of α_{t-2} reflect the fund's excess performance during month $t-2$. We use the new variable, $IN^c_{i,t-1} \cdot \alpha_{i,t-2}$, to check whether the impact of inflows on fund performance differs depending on whether the fund was previously top or bottom performing. This variable will therefore investigate the Berk and Green mechanism, as this mechanism predicts that previous top performing funds perform worse as a consequence of high inflows, and previous bottom performing funds perform better as a consequence of high outflows.

Outflow times two-months lagged alpha: $OUT^c_{i,t-1}\alpha_{i,t-2}$

The magnitude and sign of α_{t-2} reflect the fund's excess performance during month $t-2$. We use the new variable, $OUT^c_{i,t-1} \cdot \alpha_{i,t-2}$, to check whether the impact of outflows on fund performance differs depending on whether the fund was previously top or bottom performing. This variable will therefore investigate the Berk and Green mechanism, as this mechanism predicts that previous top performing funds perform worse as a consequence of high inflows, and previous bottom performing funds perform better as a consequence of high outflows.

Capital of the fund: $log(TNA)^c_{i,t-1}$

The logarithm of the total net assets of the fund i at time $t-1$, for investor category c.

Inflow times fund capital: $IN^c_{i,t-1}log(TNA)^c_{i,t-1}$

Inflow times logged capital of the fund is included in order to check whether inflow has an impact on performance through capital size.

Outflow times fund capital: $OUT^c_{i,t-1}log(TNA)^c_{i,t-1}$

Outflow times logged capital of the fund is included in order to check whether outflow has an impact on performance through capital size.

Absolute total net flows: $|NET^c_{i,t-1}|$

This is the absolute value of capital net flows for fund i in month $t-1$ for investor category c. This variable is included to check for the transaction costs effect, which is present in our data set if absolute net flows deteriorate performance.

4 Analysis and results

In this section, we present and discuss the findings from our study of capital flows' possible impact on equity, bond and money market fund performance. We use fixed effects panel data regression with Equation 1 as our starting point, which we extend further in order to evaluate this relationship from different points of view.

As elaborated on earlier, there are multiple possible explanations for why a relationship between performance and past capital flows can exist. Three such possible explanations are the Berk and Green mechanism, the transaction costs effect, and the smart money effect. We are curious to not only investigate the relationship between performance and past capital flows in general, but also take a closer look at the possible presence of these mechanisms in the Norwegian mutual fund market. Table 5 presents a simplified summary of the empirical predictions that must hold true in order for the different flow-performance mechanisms to exist. More thorough explanations of the mechanisms are given subsequently.

Table 5: Summary of possible mechanisms where flow influence performance

Short name	**Mechanism**	**Empirical prediction**
B&G mechanism	High fund performance leads to high inflows, and high inflows decrease fund performance due to diseconomies of scale.	$\uparrow \alpha_{t-2} + \uparrow inflow_{t-1} \Rightarrow \downarrow \alpha_t$
	Low fund performance leads to high outflows, and high outflows increase fund performance due to diseconomies of scale.	$\downarrow \alpha_{t-2} + \uparrow outflow_{t-1} \Rightarrow \uparrow \alpha_t$
Trans. costs	High absolute net flows lead to increased transaction costs, hence decreased alpha.	$\lvert netflow_{t-1} \rvert \Rightarrow \downarrow \alpha_t$
Smart money	High inflow can indicate investors' ability to predict superior performance beyond what past performance predicts.	$\uparrow inflow_{t-1} \Rightarrow \uparrow \alpha_t$
	High outflow can indicate investors' ability to predict inferior performance beyond what past performance predicts.	$\uparrow outflow_{t-1} \Rightarrow \downarrow \alpha_t$

The results from regressing Equation 1 on equity, bond and money market funds are presented in Table 6, Table 7 and Table 8, respectively. The regression results provide us with three findings.

Our first finding is the existence of short-term performance persistence. As evident from Table 6, one-month lagged alpha is consistently positive and significant for all regression variations, implying robust short-term persistence for equity funds. Due to the fact that two and three-months lagged alphas are consistently insignificant in Table 6, we conclude that the performance in equity funds is only persistent for one month in our data set.

The regression results in Table 7 and Table 8 indicate a longer-lasting performance persistence for bond and money market funds. As evident from the regressions coefficients, both one, two and three-months lagged alphas are significant, although two-months lagged alpha is somewhat less consistent. The coefficients of previous alphas in bond and money market funds are negative, which indicates that performance is mean-reverting for these funds.

Table 6

Alpha, regression coefficients for equity fund flows from all investors: This table reports the regression coefficients of fixed effects panel data regression on one month risk-adjusted excess return, $\alpha_{i,t}$, and different explanatory variables. Fund is represented by i, month represented by t. The left column represents the different lagged variables of return, flow and size used in the regressions. Different variations of explanatory variables (more detailed explanations are provided in Section 3) are added in the regressions. N is the number of observations used in each panel data regression.

	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$
$\alpha_{i,t-1}$		0.1215***	0.1237***	0.1233***	0.1234***	0.1211***	0.1209***	0.1228***	0.1233***
		(7.37)	(6.33)	(6.28)	(6.28)	(7.36)	(7.34)	(6.25)	(6.26)
$\alpha_{i,t-2}$		0.0254	0.0252	0.0251	0.0250	0.0253	0.0249	0.0250	0.0246
		(1.56)	(1.56)	(1.55)	(1.54)	(1.55)	(1.53)	(1.54)	(1.52)
$\alpha_{i,t-3}$		-0.0091	-0.0092	-0.0091	-0.0092	-0.0092	-0.0094	-0.0094	-0.0096
		(-0.99)	(-1.00)	(-0.99)	(-0.99)	(-0.99)	(-1.01)	(-1.03)	(-1.04)
$IN^{tot}_{i,t-1}$	-0.0008	0.0002	0.0074	0.0081	0.0243	-0.0162	0.0427	0.0323	0.0893
	(-1.54)	(0.65)	(1.20)	(1.26)	(0.37)	(-0.80)	(0.86)	(0.61)	(1.23)
$IN^{tot}_{i,t-1}\alpha_{i,t-2}$			0.0187	0.0210	0.0195			0.0290	0.0266
			(1.19)	(1.28)	(1.25)			(1.05)	(0.99)
$IN^{tot}_{i,t-1}log(TNA)^{tot}_{i,t-1}$						0.0019	0.0008	-0.0024	-0.0031
						(0.80)	(0.34)	(-0.49)	(-0.62)
$OUT^{tot}_{i,t-1}$	0.0048	0.0894	0.0989	0.0951	0.0919	0.8459*	0.8905**	0.8228*	0.8742**
	(1.52)	(1.33)	(1.45)	(1.36)	(1.42)	(2.45)	(2.95)	(2.39)	(2.89)
$OUT^{tot}_{i,t-1}\alpha_{i,t-2}$			-0.1119	-0.1147	-0.1211			-0.1078	-0.1274
			(-0.51)	(-0.50)	(-0.52)			(-0.47)	(-0.55)
$OUT^{tot}_{i,t-1}log(TNA)^{tot}_{i,t-1}$						-0.0665*	-0.0714**	-0.0633*	-0.0686**
						(-2.39)	(-2.88)	(-2.26)	(-2.75)
$\lvert NET^{tot}_{i,t-1}\rvert$					-0.0168		-0.0501		-0.0520
					(-0.26)		(-1.27)		(-1.28)
$log(TNA)^{tot}_{i,t-1}$				-0.0232***	-0.0233***	-0.0212***	-0.0214***	-0.0210***	-0.0213***
				(-5.00)	(-5.02)	(-4.75)	(-4.78)	(-4.71)	(-4.75)
Constant	-0.0197	-0.1986***	-0.1999***	0.0793	0.0812	0.0580	0.0611	0.0545	0.0577
	(-1.11)	(-9.33)	(-9.35)	(1.30)	(1.33)	(0.98)	(1.03)	(0.91)	(0.97)
N	20177	19873	19873	19867	19867	19867	19867	19867	19867
R^2	0.303	0.316	0.316	0.317	0.317	0.317	0.317	0.317	0.317

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7

Alpha, regression coefficients for bond fund flows from all investors: This table reports the regression coefficients when we use fixed effects panel data regression to regress one month risk-adjusted excess return, $\alpha_{i,t}$, on different explanatory variables. Fund is represented by i, month represented by t. The left column represents the different lagged variables of return, flow and size used in the regressions. Different variations of explanatory variables (more detailed explanations are provided in Section 3) are added throughout the regressions. The number N is the number of observations used in each panel data regression.

	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$
$\alpha_{i,t-1}$		-0.0098***	-0.0098***	-0.0098***	-0.0099***	-0.0099***	-0.0099***	-0.0099***	-0.0099***
		(-275.97)	(-271.45)	(-271.21)	(-125.24)	(-107.31)	(-85.15)	(-106.64)	(-84.78)
$\alpha_{i,t-2}$		-0.0098***	0.2213	0.2213	0.1740	-0.0098***	-0.0097***	0.1950	0.1647
		(-337.09)	(0.89)	(0.89)	(0.83)	(-168.50)	(-82.67)	(0.82)	(0.78)
$\alpha_{i,t-3}$		-0.0098***	-0.0098***	-0.0098***	-0.0098***	-0.0099***	-0.0099***	-0.0099***	-0.0099***
		(-43.97)	(-43.85)	(-43.95)	(-33.08)	(-31.82)	(-27.87)	(-31.75)	(-27.83)
$IN^{tot}_{i,t-1}$	-969.9771	-946.6873	-945.3004	-937.9942	-15718.2278	5103.4699	-6254.2342	5100.2277	-6253.4587
	(-0.76)	(-0.75)	(-0.75)	(-0.75)	(-0.94)	(0.49)	(-0.52)	(0.49)	(-0.52)
$IN^{tot}_{i,t-1}\alpha_{i,t-2}$			-1.9814	-1.9751	-1.8857			-1.9905	-1.9250
			(-1.07)	(-1.07)	(-1.06)			(-1.05)	(-1.04)
$IN^{tot}_{i,t-1}log(TNA)^{tot}_{i,t-1}$						-463.3818	-399.3736	-463.0272	-398.9662
						(-0.53)	(-0.44)	(-0.53)	(-0.44)
$OUT^{tot}_{i,t-1}$	-10354.7070	-10465.5833	-10462.9281	-10481.3361	-21708.4456	100427.4266	78249.9412	100426.2023	78264.6616
	(-0.94)	(-0.94)	(-0.94)	(-0.94)	(-0.95)	(0.99)	(0.98)	(0.99)	(0.98)
$OUT^{tot}_{i,t-1}\alpha_{i,t-2}$			2.0055	1.9795	2.9101			2.7718	3.3333
			(1.75)	(1.75)	(1.43)			(1.41)	(1.34)
$OUT^{tot}_{i,t-1}log(TNA)^{tot}_{i,t-1}$						-9264.1073	-8079.3933	-9263.8463	-8080.2588
						(-0.99)	(-0.98)	(-0.99)	(-0.98)
$\lvert NET^{tot}_{i,t-1}\rvert$					15819.7389		11264.8143		11259.8171
					(0.94)		(0.90)		(0.90)
$log(TNA)^{tot}_{i,t-1}$				-27.4945	59.4236	323.0738	339.7703	323.8224	340.5967
				(-0.13)	(0.27)	(0.82)	(0.84)	(0.83)	(0.84)
Constant	300.7688	588.9599	589.4236	944.0275	258.3345	-3177.8267	-3134.4719	-3186.9257	-3144.5926
	(0.39)	(0.86)	(0.86)	(0.35)	(0.09)	(-0.61)	(-0.61)	(-0.61)	(-0.61)
N	4181	4120	4120	4120	4120	4120	4120	4120	4120
R^2	0.025	0.025	0.025	0.025	0.026	0.026	0.026	0.026	0.026

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8

Alpha, regression coefficients for money market fund flows from all investors: This table reports the regression coefficients when we use fixed effects panel data regression to regress one month risk-adjusted excess return, $\alpha_{i,t}$, on different explanatory variables. Fund is represented by i, month represented by t. The left column represents the different lagged variables of return, flow and size used in the regressions. Different variations of explanatory variables (more detailed explanations are provided in Section 3) are added throughout the regressions. The number N is the number of observations used in each panel data regression.

	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$
$\alpha_{i,t-1}$		-0.0522***	-0.0522***	-0.0523***	-0.0514***	-0.0505***	-0.0498***	-0.0505***	-0.0498***
		(-109.55)	(-109.51)	(-149.85)	(-41.53)	(-22.85)	(-17.16)	(-22.82)	(-17.15)
$\alpha_{i,t-2}$		-0.0527***	-0.0103	0.0073	-0.0650*	-0.0525***	-0.0521***	0.2569	0.1803
		(-410.29)	(-0.15)	(0.08)	(-2.06)	(-181.00)	(-84.93)	(0.74)	(0.65)
$\alpha_{i,t-3}$		-0.0529***	-0.0529***	-0.0531***	-0.0529***	-0.0532***	-0.0530***	-0.0532***	-0.0530***
		(-157.51)	(-157.51)	(-102.05)	(-185.42)	(-84.20)	(-114.39)	(-84.13)	(-114.27)
$IN^{tot}_{i,t-1}$	-10111.7607	-10964.3308	-10964.5782	-10771.9957	-25510.1725	-114028.7070	-137472.2916	-114093.1593	-137508.6178
	(-0.98)	(-0.98)	(-0.98)	(-0.98)	(-1.00)	(-0.92)	(-0.95)	(-0.92)	(-0.95)
$IN^{tot}_{i,t-1}\alpha_{i,t-2}$			0.0000	0.0000	0.0000			0.0000	0.0000
			(.)	(.)	(.)			(.)	(.)
$IN^{tot}_{i,t-1}log(TNA)^{tot}_{i,t-1}$						7930.3433	8663.4236	7935.2197	8666.7086
						(0.91)	(0.94)	(0.91)	(0.94)
$OUT^{tot}_{i,t-1}$	24579.0788	25420.5319	25422.3199	25367.8175	23241.2593	384547.5166	366683.3498	384847.0058	366917.5225
	(0.99)	(0.99)	(0.99)	(0.99)	(1.00)	(0.96)	(0.95)	(0.96)	(0.95)
$OUT^{tot}_{i,t-1}\alpha_{i,t-2}$			-0.6146	-0.8727	0.1841			-4.4896	-3.3724
			(-0.61)	(-0.69)	(0.40)			(-0.89)	(-0.85)
$OUT^{tot}_{i,t-1}log(TNA)^{tot}_{i,t-1}$						-27260.8590	-26060.1416	-27282.5994	-26077.0911
						(-0.96)	(-0.95)	(-0.96)	(-0.95)
$\lvert NET^{tot}_{i,t-1}\rvert$					27923.7369		25776.8388		25763.5484
					(1.00)		(1.00)		(1.00)
$log(TNA)^{tot}_{i,t-1}$				-904.4023	-519.6529	-133.2460	124.7807	-134.6846	123.5670
				(-0.99)	(-0.95)	(-0.37)	(0.37)	(-0.37)	(0.37)
Constant	-1336.1428	-814.0271	-814.4018	11668.2336	5363.6985	1878.8567	-2677.4746	1896.7097	-2661.7150
	(-0.71)	(-0.56)	(-0.56)	(1.04)	(1.02)	(0.40)	(-0.52)	(0.40)	(-0.52)
N	4714	4659	4659	4659	4659	4659	4659	4659	4659
R^2	0.024	0.031	0.031	0.032	0.034	0.037	0.038	0.037	0.038

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Our finding of short-term performance persistence in equity funds support the recent findings of Gallefoss et al. (2015), who observe short-term performance persistence in Norwegian equity mutual funds for up to one year. As there are no studies on performance persistence in Norwegian bond and money market funds (to the best of our knowledge), there are no findings in the Norwegian mutual fund market to directly compare our findings with. Internationally, however, our regression results support those of Elton et al. (2012), Elton et al. (1996), Hendricks et al. (1993). Our finding contradicts those of Blake et al. (1993), who find no predictability in bond fund performance. As we utilize daily returns as opposed to the monthly data of Blake et al. (1993), we suspect that we might observe persistence of shorter time periods than what they are able to.

Our second finding is that fund size is significantly related to performance in equity mutual funds when accounting for performance persistence. This is evident from Table 6, where the log value of fund capital has a negative and significant coefficient throughout all regression variations for equity funds. Possible explanations for why fund size might have a detrimental impact on performance are given by previous fund literature. Gruber (1996) and Berk and Green (2004) claim that large equity funds face challenges of scale ability of investments, Cremers and Petajisto (2009) show that small funds are more active while larger funds tend to move closer to indices, and Chen et al. (2004) observe that larger funds must trade larger volumes of stock, attracting the attention of other market participants and therefore suffering higher price impact costs.

The logged capital coefficient is insignificant for bond and money market funds (as seen in Table 7 and Table 8), indicating that size does not impact performance in bond and money market funds, after accounting for performance persistence. These observations might be attributed to the fact that bond and money market funds are more scalable than equity funds.

Our third finding is that we do not observe consistent tendencies of capital flows impacting performance. As seen from Table 6, inflows and outflows are insignificant in the first variations of the regression. However, when we allow flow variables to depend on fund size in order to explain whether flows can impact performance through capital size (we introduce $IN^{tot}_{i,t-1}log(TNA)^{tot}_{i,t-1}$ and $OUT^{tot}_{i,t-1}log(TNA)^{tot}_{i,t-1}$ in the regression), the results change. Now, both $OUT^{tot}_{i,t-1}log(TNA)^{tot}_{i,t-1}$ and $OUT^{tot}_{i,t-1}$ have significant coefficients, and we observe that equity outflows may have an impact on performance through capital size.

However, in order to conclude that outflows indeed influence performance through capital size, these observations must be robust for the different investor types.

Due to lack of significant flow coefficients in the bond and money market regressions, we arrive at the same conclusion as we do for equity funds: the impact of flow on performance is very weak or inexistent in the Norwegian fund market.

The relationship between performance and past capital flows in equity funds is further illustrated in Table 9, Table 10, Table 11 and Table 12. The matrices in these tables are constructed in the following way. Every month, we rank all active funds by their performance during that month, creating one top, middle and bottom performing fund portfolio. We call this month the ranking month. We then calculate the average alpha of these portfolios, resulting in one average alpha for the top portfolio, one for the medium portfolio, and one for the bottom portfolio. Every month, funds are re-ranked and three new portfolios are created. After doing this for all months in our data set (108 months), we calculate the average of the 108 top, medium and bottom average portfolio alphas. This gives us three alphas, presented as "month $t-1$" average alphas in Table 9.

As we are interested in observing how these top, medium and bottom performing funds perform in the month subsequent to their ranking month, we gather the alphas of the funds from the original portfolios *in the subsequent month* and average these subsequent alphas. These average alphas are again averaged over the 108 subsequent months, resulting in "month t" average alphas in Table 9. To sum up, the average alphas of month $t-1$ are the alphas of top, medium and bottom performing funds ranked in that month, while the alphas of month t are the alphas of funds that was ranked as top, medium or bottom performing in the ranking month.

In order to illustrate how flow impacts these fund portfolios from one month to the next, we further divide the top, medium and bottom funds into subgroups, ranked by their capital inflows, outflows and net flows in month $t-1$ (as seen in Table 10, 11 and 12, respectively). If a fund is both top performing and receiving high inflows in the ranking month, it is put in the "top alpha, top inflow" portfolio. As a fund is ranked both in regards to performance (top, medium or bottom) and flow (high, average or low inflow, outflow or net flow), we are provided with 18 portfolios each month. We calculate these portfolios' average alphas for month $t-1$ (ranking month) and month t (subsequent month) in the same way as described above.

By studying Table 9, we observe that the average alphas of the three different performance ranked fund portfolios in month t (the ranking month) differ quite a bit. The average of the same funds in the subsequent month, however, have moved towards each other and the extremeties have been smoothed out. Our finding from the regression results is therefore confirmed when Table 10, 11 and 12 display the average impact of high, medium and low capital inflows on future performance. It is evident that, on average, a fund's performance is much more dependent on whether the fund was a winner or loser fund in its ranking month rather than the size and timing of its capital flows. This underpins the main finding of our study, namely that flows do not impact performance significantly.

As seen from these alpha-flow matrices, top alpha funds decrease on average from its ranking month to the next, and bottom alphas improve. We also observe that the average of the previous top performing funds still perform better in the next month than the average of the previous medium and bottom performing funds. This implies one-month performance persistence in equity funds, which support our findings from the regression results.

Table 9: Average alphas in month $t-1$ and t

	Av alpha, month t-1	Av alpha, month t
Average top alpha	0,417	0,144
Average medium alpha	0,056	0,099
Average bottom alpha	-0,189	0,062

Table 10: Average alphas in month $t-1$ and t, categorized by inflow

(a) Average alphas of top, medium and bottom performing fund portfolios in the ranking month, $t-1$.

	High inflow	Medium inflow	Low inflow
Top performing funds	0.434	0.409	0.408
Medium performing funds	0.059	0.056	0.053
Bottom performing funds	-0.186	-0.197	-0.183

(b) Average alphas of top, medium and bottom performing fund portfolios in the month following the ranking month, t.

	High inflow	Medium inflow	Low inflow
Past top performing funds	0.156	0.130	0.142
Past medium performing funds	0.096	0.104	0.098
Past bottom performing funds	0.061	0.069	0.055

Table 11: Average alphas in month $t-1$ and t, categorized by outflow

(a) Average alphas of top, medium and bottom performing fund portfolios in the ranking month, $t-1$.

	High outflow	Medium outflow	Low outflow
Top performing funds	0.423	0.452	0.375
Medium performing funds	0.054	0.055	0.058
Bottom performing funds	-0.205	-0.189	-0.172

(b) Average alphas of top, medium and bottom performing fund portfolios in the month following the ranking month, t.

	High outflow	Medium outflow	Low outflow
Past top performing funds	0.159	0.143	0.127
Past medium performing funds	0.108	0.093	0.099
Past bottom performing funds	0.059	0.064	0.063

Table 12: Average alphas in month $t-1$ and t, categorized by net flow

(a) Average alphas of top, medium and bottom performing fund portfolios in the ranking month, $t-1$.

	High net flow	Medium net flow	Low net flow
Top performing funds	0.423	0.407	0.422
Medium performing funds	0.059	0.053	0.055
Bottom performing funds	-0.183	-0.184	-0.199

(b) Average alphas of top, medium and bottom performing fund portfolios in the month following the ranking month, t.

	High net flow	Medium net flow	Low net flow
Past top performing funds	0.146	0.135	0.148
Past medium performing funds	0.108	0.097	0.094
Past bottom performing funds	0.067	0.064	0.056

4.1 Berk and Green mechanism

When investigating the Berk and Green mechanism, certain tendencies must be present in order to exist. As Berk and Green's model argues, top performing funds will attract so much new capital that it will impact the fund manager's ability to generate superior return, and future performance will decrease. The opposite is found for bottom performing funds, namely that the low return will drive investors to withdraw their money, making it possible for the fund manager to regain control of the fund and its performance. In our model, this mechanism is observed if high inflow deteriorates the performance of previous outperforming funds, giving the coefficient of $IN_{i,t-1}\alpha_{i,t-2}$ a significant negative sign, and vice versa, that high outflow improves the future performance of previous underperforming funds, giving the coefficient of $OUT_{i,t-1}\alpha_{i,t-2}$ a significant positive sign.

The results from our main regression presented in Table 6 indicate that there is no such flow-performance relationship in our data set. The alpha-flow matrices in Table 9, 10, 11 and 12 underpin this finding. Berk and Green (2004) claim that top performing funds receiving high inflows are expected to perform worse than top performing funds receiving medium or low inflow, and that bottom funds experiencing high outflow should perform better than bottom funds experiencing medium or low outflow. Neither of these tendencies are observed in the alpha-flow matrices as high and low flows create marginal differences in the average alphas.

All in all, we are unable to find statistically significant confirmation of Berk and Green's flow-performance mechanism in our data set.

4.2 Transaction costs effect

When a mutual fund receives positive net flows, hence larger inflows than outflows, the fund has several opportunities. It can either accumulate cash, increase the fraction of existing positions, purchase securities it does not currently own, or simply invest in its benchmark. However, when a fund experiences negative net flows the mutual fund only has two options: prey on its cash reserves or liquidate positions. This is due to the fact that mutual funds are prevented from raising money by short selling. As it is very costly for a mutual fund to maintain a large cash buffer, we make a simplifying assumption that all large absolute net flows lead to transactions, and hence transaction costs. Following this rationale, we view all flow-induced trading as liquidation motivated trading, which is equivalent to noise trading and ergo should underperform valuation-based trades (Alexander et al., 2007).

Based on this assumption, we expect the transaction cost mechanism to decrease future performance whenever absolute net flows are high. As evident from our regression results in Table 6, we do not observe a significant relationship between absolute net capital flows and performance, and so we dismiss the presence of transaction costs effect in our data set.

4.3 Smart money effect

The smart money effect is based on the idea that investors are able to predict future fund performance beyond what previous performance predicts, and invest on this predictability. Investors are considered to be "smart" if they are well-informed (e.g. have private information about the fund managers' ability to generate superior returns, or inside information on the expected performance of the fund), or in some other way posses the ability to place capital in future top performing funds. This way, capital flows can encapsulate information about smart investors.

In order to observe the smart money effect in our regressions, capital flows must impact performance after accounting for performance persistence. As evident from Table 6, we do not observe such a relationship in the Norwegian mutual fund market.

4.4 Robustness tests

To ensure that our results are robust, we perform several regressions on variables and measures not included in our main study. This will help us to ensure that our results are not simply consequences of misspecifications. The different variables that are tested for robustness and their results are presented below, while a full overview of the regression coefficients is provided in Appendix 3.

4.4.1 Capital flows from institutional and retail investors

As explained previously, our data set consists of flow data stated both as total flows and flows from institutional, retail and foreign investors. In order to check that there is no additional information latent in the capital flows from different investor groups, we perform the regressions presented in Table 6 for each investor type. Foreign investors will not be studied separately as the number of observations is limited. Additionally, foreign investors constitute a of mix of institutional and retail investors, therefore the results will be difficult to interpret. However, when results are presented for investors overall, foreign investors are included. The results for institutional and retail investor flows are presented in Table 15 and Table 14, respectively.

Based on the regression results in Table 15 and 14, we conclude that performance persistence is robust and that including private and institutional flows separately does not change this conclusion.

We also study whether different investor flows collectively can predict performance. We suspect that each investor flow incorporate different information that can impact fund performance, and so we regress all investors flows in one joint regression. This regression is presented in Table 13.

We observe the same tendencies when we regress alpha on individual investor flows as we do when we regress alpha on total flows (Table 6). Hence, running regressions on flows fed by different types of investors do not alter our main findings, and our results are robust.

4.4.2 Historical rate of return

While our study uses the CAPM alpha as the measure of a fund's excess return, excess return can also be measured as the historical rate of return of a fund minus the average historical return of the fund's specific fund group. As an example, instead of using the monthly Oslo Stock Exchange Mutual Fund index (OSEFX) as the benchmark for the Norwegian fund "DNB Norge" and calculate the fund's alpha by regression, we can use the average historic return of all Norwegian funds during that month and find DNB Norge's deviation from this average. This way, DNB Norge is still comparable to other Norwegian funds, and we are able to tell whether DNB Norge is performing better or worse than the fund group average.

In order to check our return measure for robustness, we perform the regressions presented in Table 6 with excess historic rate of return as dependent variable. It is evident from Table 16 with retail flows, Table 17 with institutional flows, and Table 18 with total flows that performance persistence is also found with historical excess return as return measure. However, using excess historic return yields a positive significance in up to three-months lagged alpha, two months more than we obtain with alpha as return measure. This is due to the fact that excess historical return is a more noisy measure of performance than alpha is. As averaging a noisy measure over several periods can help cancel out noise, our conclusion of one-month performance persistence in equity funds is not contradicted by these regression results.

The regression results on flows from institutional investors (Table 17) and all investors (Table 18) both have negative and significant coefficients for logged capital, which is consistent with the regressions using CAPM alpha as excess return measure. Regressions on flows from retail investors (Table 16) suggest significant first-lagged inflow. This is also found in the regression on retail flows using alpha as return measure in Table 14. However, due to the fact that significant coefficients are expected when regressing with very few variables, and that the inflow coefficients are diminishingly small, we do not find these results very robust.

Overall, these findings draw in the same direction as our main regression results with alpha as return measure, implying that using excess historic rate of return will lead us to the same conclusion we arrive at when using alpha as return measure. Hence, we conclude that our choice of CAPM alpha as return measure is robust.

Table 13

Alpha, regression coefficients for equity fund flows from all investor types: This table reports the regression coefficients when we use fixed effects panel data regression to regress one month risk-adjusted excess performance, $\alpha_{i,t}$, on different explanatory variables. Fund is represented by i, month represented by t. The left column first represents the independent lagged variables of risk-adjusted excess performance and one month lagged variables of flow. Then different variations of explanatory variables (more detailed explained in Definition of variables and methodology) are added throughout the regressions. We regress flows from different investor types together in order see if they collectively can predict performance. The number N is the number of observations used in each panel data regression.

	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$
$\alpha_{i,t-1}$		0.1214***	0.1207***	0.1206***	0.1206***	0.1206***	0.1210***	0.1210***	0.1217***	0.1214***
$\alpha_{i,t-2}$		0.0253	0.0251	0.0249	0.0250	0.0250	0.0143	0.0143	0.0082	0.0088
$\alpha_{i,t-3}$		-0.0090	-0.0108	-0.0108	-0.0106	-0.0106	-0.0134	-0.0135	-0.0154	-0.0157
$IN^{tot}_{i,t-1}$			0.0016	0.0267					-0.0284	0.0474
$IN^{tot}_{i,t-1}\alpha_{i,t-2}$									0.0902*	0.0907*
$IN^{tot}_{i,t-1}log(TNA)^{tot}_{i,t-1}$									0.0020	0.0017
$IN^{ret}_{i,t-1}$			-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0223	-0.0208	0.0241	0.0243
$IN^{ret}_{i,t-1}\alpha_{i,t-2}$							0.0211	0.0197	-0.0228	-0.0230
$IN^{ret}_{i,t-1}log(TNA)^{ret}_{i,t-1}$							0.0017	0.0016	-0.0018	-0.0018
$IN^{ins}_{i,t-1}$			0.0023	0.0024	0.0021	0.0019	0.0091	0.0098	0.0088	0.0086
$IN^{ins}_{i,t-1}\alpha_{i,t-2}$							0.0179	0.0179	0.0051	0.0051
$IN^{ins}_{i,t-1}log(TNA)^{ins}_{i,t-1}$							-0.0009	-0.0010	-0.0008	-0.0008
$OUT^{tot}_{i,t-1}$			0.0813	0.0753					0.3281	0.3566
$OUT^{tot}_{i,t-1}\alpha_{i,t-2}$									0.1392	0.0566
$OUT^{tot}_{i,t-1}log(TNA)^{tot}_{i,t-1}$									-0.0218	-0.0199
$OUT^{ret}_{i,t-1}$			0.0100	0.0108	0.0178	0.0176	-0.0860	-0.0789	-0.1230	-0.1576
$OUT^{ret}_{i,t-1}\alpha_{i,t-2}$							0.1347	0.1351	0.0565	0.0572
$OUT^{ret}_{i,t-1}log(TNA)^{ret}_{i,t-1}$							0.0115	0.0106	0.0127	0.0164
$OUT^{ins}_{i,t-1}$			-0.0069	-0.0073	-0.0038	-0.0035	-0.0031	-0.0028	0.0102	0.0457
$OUT^{ins}_{i,t-1}\alpha_{i,t-2}$							-0.0201	-0.0194	0.0036	0.0565
$OUT^{ins}_{i,t-1}log(TNA)^{ins}_{i,t-1}$							-0.0004	-0.0004	-0.0027	-0.0088
$\lvert NET^{tot}_{i,t-1}\rvert$	-0.0000	0.0003		-0.0278		0.0031		0.0113		-0.0772
$log(TNA)^{tot}_{i,t-1}$			-0.0259***	-0.0261***	-0.0262***	-0.0262***	-0.0261***	-0.0260***	-0.0248***	-0.0252***
Constant	-0.0193	-0.1950***	0.1072	0.1105	0.1137	0.1135	0.1102	0.1086	0.0952	0.0986
N	20177	19873	19574	19574	19574	19574	19561	19561	19561	19561
R^2	0.303	0.315	0.319	0.319	0.318	0.318	0.320	0.320	0.321	0.321

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5 Conclusion

This study investigates the relationship between fund performance and past capital flows, allowing for the possible impact of past performance and fund size. We use a unique data set consisting of daily returns, monthly capital inflows and outflows for all Norwegian mutual funds. This includes all equity, bond and money market funds registered and traded at some point during 2006-2014 on Oslo Stock Exchange, making our data set free of survivorship bias. We examine both the relationship in general as well as three examples of possible flow-performance mechanisms: the Berk and Green mechanism, the transaction costs effect, and the smart money effect.

Our chosen method of investigation is fixed effects panel data regression, where the CAPM risk-adjusted rate of return (alpha) is regressed on previous return, capital flows, logged fund capital and several other explanatory variables. We also perform regressions on flows from institutional and retail investors, and construct alpha and flow matrices to gain further insight as to how past flows and performance are related.

Based on the results from our regressions and tests, we present three findings. Our first finding is that the performance of all Norwegian mutual funds is persistent for a short time period. The performance persistence is positive for equity funds and negative for bond and money market funds, implying mean reversion in bond and money market funds. This finding confirms the discoveries of Gallefoss et al. (2015) on Norwegian equity mutual funds, and contributes to the existing mutual fund literature with new findings on Norwegian bond and money market funds.

The second finding is that equity mutual fund size is significantly related to performance when accounting for performance persistence. Fund capital is consistently negative and significant through all regressions, indicating a detrimental relationship between equity mutual fund size and performance. We do not observe the same tendencies in bond and money market funds, which we attribute to the scalability of bond and money market funds.

Our third finding is that we do not find a relationship between performance and past capital flows. This is due to insignificant and inconsistent flow coefficients, at best indicating a vague connection between lagged outflow and performance. As a consequence, the flow-performance mechanisms of Berk and Green, the transaction cost effect and the smart money effect are unobservable in Norwegian equity, bond and money market funds.

We encourage future research to further investigate two of our findings. First, we believe it is of interest to deepen our study of the flow-performance relationship using more sophisticated models. Second, given recent findings of short-term performance persistence in Norwegian equity funds (Gallefoss et al., 2015) and our findings of short-term performance persistence in all Norwegian mutual funds, we believe it is of great interest to use our unique data set for more thorough studies of performance persistence in bond and money market funds.

6 Appendices

6.1 Appendix 1 - Definitions and standards for fund classification

The industry standards for fund classification by The Norwegian Fund and Asset Management Association (VFF) (2015):

Definition of equity funds:

A mutual fund with 80-100 % exposure to the stock market, and will normally not invest in interest-bearing instruments. Equity funds are further divided into groups depending on which investment universe the funds are placed within. The investment universe might be limited by geography, sectors and industry, or combinations of these.

Definition of hybrid funds:

A mutual fund with less than 80 % exposure to the stock market, and remaining holdings invested in interest-bearing instruments. Life cycle fund is a type of hybrid fund where the proportion of shares and bonds within the fund vary through the life of the fund.

Definition of other mutual funds:

All mutual funds that do not categorize as equity funds, bond funds, or hybrid funds (e.g. hedge funds or funds that use a lot of derivatives).

Definition of money market fund:

A bond fund that can solely invest in interest-bearing instruments with remaining fixed interest of 365 days or less. A money market fund must have an interest rate sensitivity of 1 or less. If a money market fund has an interest rate sensitivity of 0.5 or less, it is a low risk money market fund. If the fund invests in interest-bearing instruments denoted in another currency than Norwegian kronas (NOK), it is an international money market fund.

Definition of bond funds:

All bond funds that invest in Norwegian interest-bearing instruments. Bond funds are divided into three groups, depending on their expected interest rate sensitivity: 0-2, 2-4, or interest rate sensitivity higher than 4. Bond funds investing in instruments denoted in another currency than NOK qualifies as an internation bond fund.

Definition of other bond funds:

All bond funds that do not meet the requirements of the groups mentioned above.

6.2 Appendix 2 - Illustrations of the Norwegian fund market

6.2.1 Capital allocated in equity, bond and money market funds

Figure 7: Capital allocated in equity funds by investor type

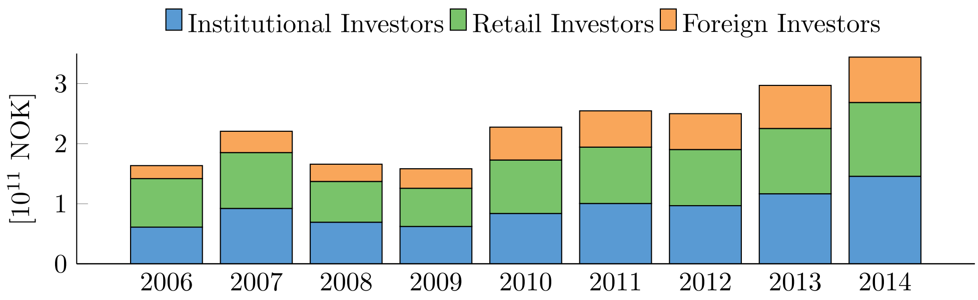


Figure 8: Capital allocated in bond funds by investor type

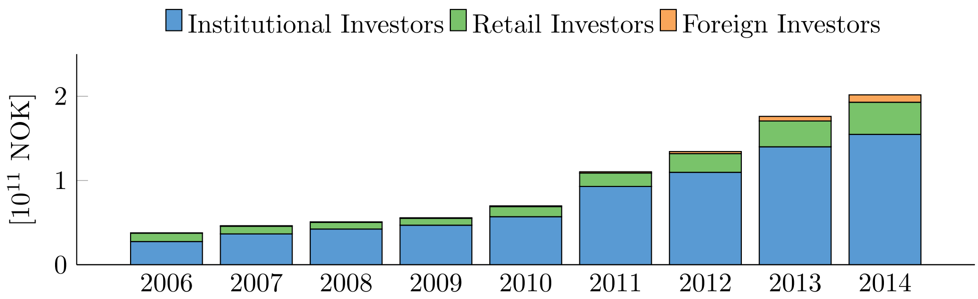
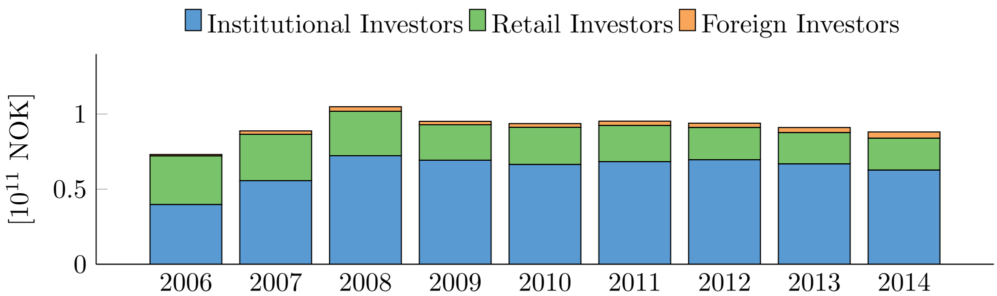


Figure 9: Capital allocated in money market funds by investor type



6.2.2 Inflow, outflow and net flow to equity funds

Figure 10: Inflow to equity funds by investor type

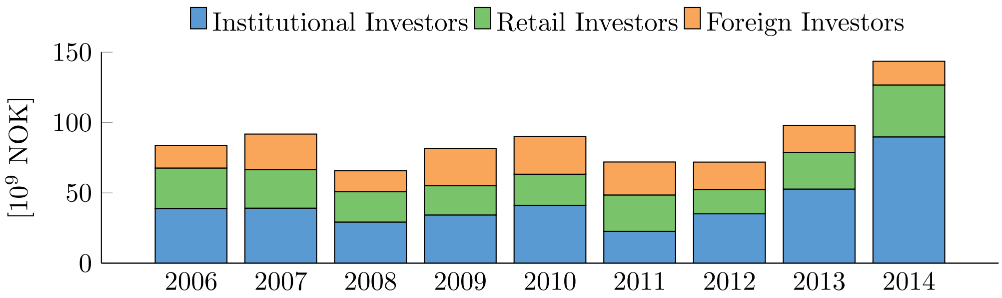


Figure 11: Outflow of equity funds by investor type

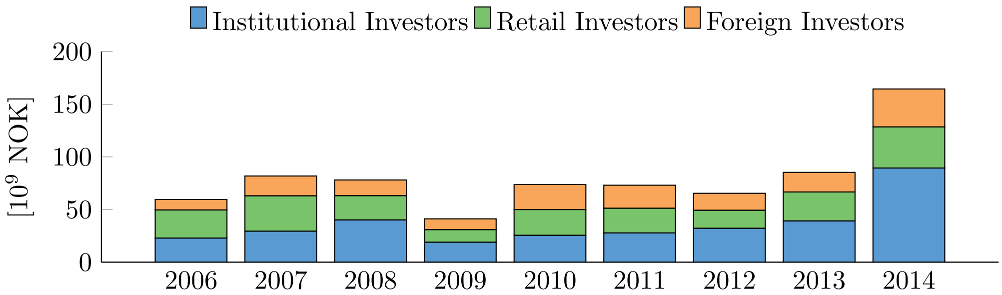
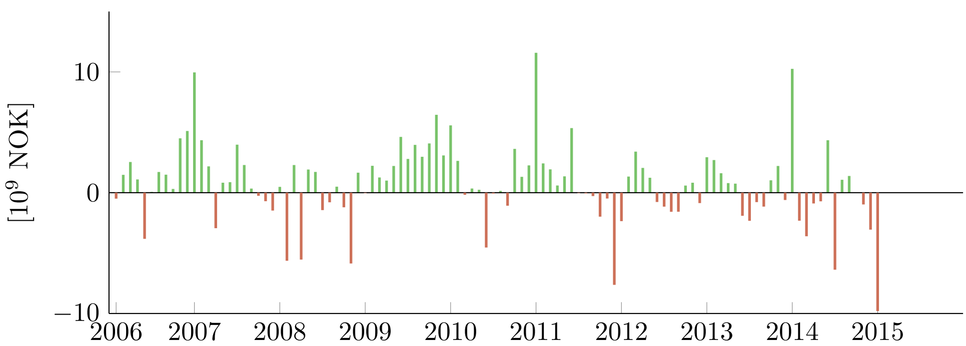


Figure 12: Net flow of equity funds



6.2.3 Customers in equity, bond and money market funds

Figure 13: Number of customers in equity funds by investor type

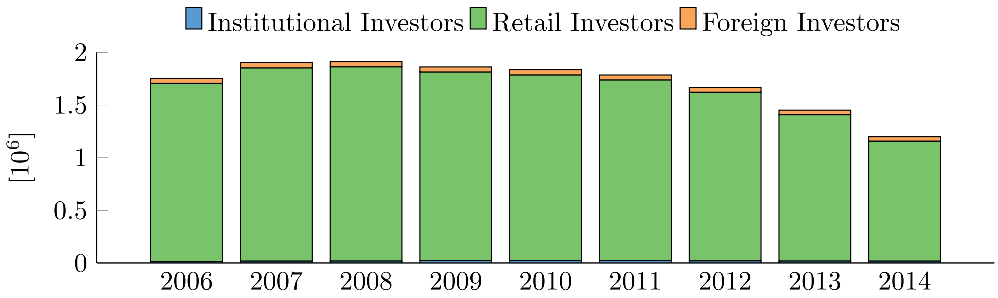


Figure 14: Number of customers in bond funds by investor type

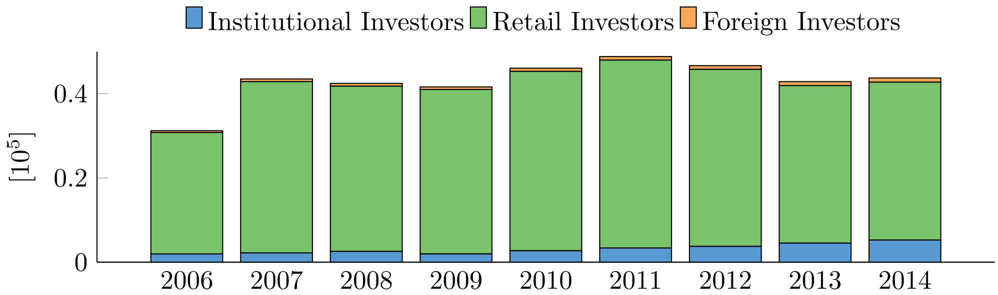
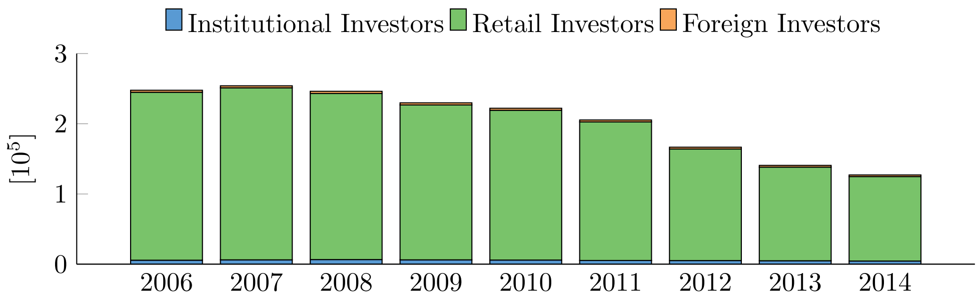


Figure 15: Number of customers in money market funds by investor type



6.3 Appendix 3 - Robustness regressions

Table 14: Retail investor flows in equity funds

Table 15: Institutional investor flows in equity funds

Table 16: Excess historical return, retail investor flows in equity funds

Table 17: Excess historical return, institutional investor flows in equity funds

Table 18: Excess historical return, total investor flows in equity funds

Table 14

Alpha, regression coefficients for equity fund flow from retail investors: This table reports the regression coefficients when we use fixed effects panel data regression to regress one month risk-adjusted excess return, $\alpha_{i,t}$, on different explanatory variables. Fund is represented by i, month represented by t. The left column represents the different lagged variables of return, flow and size used in the regressions. Different variations of explanatory variables (more detailed explained in Section 3) are added throughout the regressions. The number N is the number of observations used in each panel data regression.

	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$
$\alpha_{i,t-1}$		0.1205***	0.1207***	0.1209***	0.1209***	0.1207***	0.1207***	0.1209***	0.1209***
		(7.25)	(7.23)	(7.24)	(7.23)	(7.25)	(7.25)	(7.24)	(7.23)
$\alpha_{i,t-2}$		0.0247	0.0203	0.0202	0.0180	0.0245	0.0244	0.0188	0.0162
		(1.51)	(1.21)	(1.20)	(1.07)	(1.49)	(1.49)	(1.14)	(0.97)
$\alpha_{i,t-3}$a		-0.0079	-0.0080	-0.0081	-0.0083	-0.0081	-0.0082	-0.0079	-0.0081
		(-0.86)	(-0.85)	(-0.87)	(-0.89)	(-0.88)	(-0.88)	(-0.84)	(-0.86)
$IN^{ret}_{i,t-1}$	-0.0000***	-0.0000***	-0.0000***	-0.0000	0.0449	-0.0000	0.0057	-0.0264*	0.0223
	(-3.93)	(-6.78)	(-5.57)	(-1.02)	(1.86)	(-1.49)	(0.34)	(-1.99)	(0.81)
$IN^{ret}_{i,t-1}\alpha_{i,t-2}$			-0.0000	-0.0000	-0.0000			0.0250*	0.0263*
			(-0.03)	(-1.86)	(-1.82)			(1.99)	(2.07)
$IN^{ret}_{i,t-1}log(TNA)^{ret}_{i,t-1}$						0.0000	0.0000	0.0020*	0.0021*
						(1.24)	(1.24)	(1.99)	(2.07)
$OUT^{ret}_{i,t-1}$	0.0001	0.0196	0.0150	0.0139	-0.0056	0.1077	0.1055	-0.0910	-0.2152
	(0.45)	(0.89)	(1.01)	(0.94)	(-0.37)	(0.30)	(0.30)	(-0.38)	(-0.98)
$OUT^{ret}_{i,t-1}\alpha_{i,t-2}$			0.1416	0.1417	0.2029*			0.1311	0.2058*
			(1.62)	(1.61)	(2.46)			(1.51)	(2.39)
$OUT^{ret}_{i,t-1}log(TNA)^{ret}_{i,t-1}$						-0.0098	-0.0098	0.0122	0.0234
						(-0.25)	(-0.25)	(0.47)	(1.00)
$\|NET^{ret}_{i,t-1}\|$					-0.0449		-0.0057		-0.0501*
					(-1.86)		(-0.34)		(-2.10)
$log(TNA)^{ret}_{i,t-1}$				-0.0102*	-0.0104*	-0.0100*	-0.0101*	-0.0108*	-0.0114*
				(-2.07)	(-2.10)	(-2.12)	(-2.13)	(-2.30)	(-2.38)
Constant	-0.0220	-0.2016***	-0.2023***	-0.0906	-0.0878	-0.0909	-0.0904	-0.0843	-0.0781
	(-1.21)	(-9.40)	(-9.41)	(-1.55)	(-1.49)	(-1.60)	(-1.59)	(-1.49)	(-1.36)
N	19929	19636	19636	19621	19621	19621	19621	19621	19621
R^2	0.305	0.317	0.318	0.318	0.318	0.318	0.318	0.318	0.318

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 15

Alpha, regression coefficients for equity fund flow from institutional investors: This table reports the regression coefficients when we use fixed effects panel data regression to regress one month risk-adjusted excess return, $\alpha_{i,t}$, on different explanatory variables. Fund is represented by i, month represented by t. The left column represents the different lagged variables of return, flow and size used in the regressions. Different variations of explanatory variables (more detailed explained in Section 3) are added throughout the regressions. The number N is the number of observations used in each panel data regression.

	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$	$\alpha_{i,t}$
$\alpha_{i,t-1}$		0.1219***	0.1222***	0.1216***	0.1218***	0.1214***	0.1215***	0.1216***	0.1217***
		(7.38)	(7.38)	(7.36)	(7.37)	(7.35)	(7.36)	(7.35)	(7.36)
$\alpha_{i,t-2}$		0.0257	0.0209	0.0208	0.0209	0.0256	0.0258	0.0204	0.0205
		(1.56)	(1.43)	(1.42)	(1.43)	(1.56)	(1.57)	(1.39)	(1.40)
$\alpha_{i,t-3}$		-0.0116	-0.0145	-0.0143	-0.0143	-0.0114	-0.0113	-0.0143	-0.0142
		(-1.29)	(-1.60)	(-1.59)	(-1.57)	(-1.27)	(-1.25)	(-1.58)	(-1.57)
$IN^{ins}_{i,t-1}$	0.0022	0.0019	0.0018	0.0020	-0.0138	0.0091	-0.0072	0.0089	-0.0089
	(1.25)	(1.02)	(0.66)	(0.72)	(-0.68)	(1.69)	(-0.34)	(1.03)	(-0.41)
$IN^{ins}_{i,t-1}\alpha_{i,t-2}$			0.0182	0.0183	0.0183			0.0183	0.0183
			(1.39)	(1.41)	(1.41)			(1.40)	(1.40)
$IN^{ins}_{i,t-1}log(TNA)^{ins}_{i,t-1}$						-0.0009	-0.0009	-0.0009	-0.0009
						(-1.70)	(-1.73)	(-0.93)	(-0.94)
$OUT^{ins}_{i,t-1}$	-0.0034	-0.0030	-0.0023	-0.0030	0.0121	-0.0059	0.0106	-0.0027	0.0167
	(-0.98)	(-0.79)	(-0.43)	(-0.57)	(0.59)	(-0.58)	(0.45)	(-0.17)	(0.62)
$OUT^{ins}_{i,t-1}\alpha_{i,t-2}$			-0.0287	-0.0285	-0.0277			-0.0149	-0.0114
			(-1.50)	(-1.53)	(-1.49)			(-0.68)	(-0.50)
$OUT^{ins}_{i,t-1}log(TNA)^{ins}_{i,t-1}$						0.0001	0.0000	-0.0005	-0.0008
						(0.10)	(0.02)	(-0.29)	(-0.44)
$\lvert NET^{ins}_{i,t-1}\rvert$					0.0159		0.0165		0.0179
					(0.78)		(0.81)		(0.87)
$log(TNA)^{ins}_{i,t-1}$				-0.0119***	-0.0116***	-0.0115***	-0.0112***	-0.0116***	-0.0113***
				(-3.88)	(-3.79)	(-3.77)	(-3.68)	(-3.79)	(-3.68)
Constant	-0.0191	-0.1958***	-0.1976***	-0.0708	-0.0747	-0.0720	-0.0761	-0.0731	-0.0775
	(-1.07)	(-9.11)	(-9.06)	(-1.70)	(-1.79)	(-1.74)	(-1.84)	(-1.75)	(-1.85)
N	20103	19813	19813	19807	19807	19807	19807	19807	19807
R^2	0.304	0.316	0.316	0.317	0.317	0.316	0.316	0.317	0.317

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 16

Excess historical return, regression coefficients for equity fund flow from retail investors: This table reports the regression coefficients when we use fixed effects panel data regression to regress one month excess historical return, $r_{i,t} - \bar{r}_{i,t}$, on different explanatory variables. Fund is represented by i, month represented by t. The left column represents the different lagged variables of return, flow and size used in the regressions. Different variations of explanatory variables (more detailed explained in Section 3) are added throughout the regressions. The number N is the number of observations used in each panel data regression.

	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$
$r_{i,t-1} - \bar{r}_{i,t-1}$		0.0590***	0.0590***	0.0597***	0.0597***	0.0595***	0.0595***	0.0595***	0.0595***
		(6.75)	(6.75)	(6.80)	(6.81)	(6.77)	(6.78)	(6.78)	(6.78)
$r_{i,t-2} - \bar{r}_{i,t-2}$		0.0264***	0.0253**	0.0262**	0.0262**	0.0267***	0.0268***	0.0265**	0.0264**
		(3.46)	(2.60)	(2.66)	(2.66)	(3.50)	(3.50)	(2.75)	(2.75)
$r_{i,t-3} - \bar{r}_{i,t-3}$		0.0354***	0.0353***	0.0354***	0.0355***	0.0354***	0.0355***	0.0354***	0.0354***
		(4.32)	(4.32)	(4.32)	(4.34)	(4.32)	(4.33)	(4.31)	(4.33)
$IN^{ret}_{i,t-1}$	-0.0000	-0.0000	0.0000***	0.0000***	-0.0007	-0.0000***	-0.0007	0.0001	-0.0006
	(-1.56)	(-1.54)	(12.49)	(5.77)	(-0.52)	(-5.03)	(-0.52)	(0.44)	(-0.43)
$IN^{ret}_{i,t-1}(r_{i,t} - \bar{r}_{i,t})$			0.0001***	0.0001***	0.0001***			0.0021	0.0025
			(13.06)	(6.32)	(6.33)			(0.45)	(0.55)
$IN^{ret}_{i,t-1}log(TNA)^{ret}_{i,t-1}$						0.0000***	0.0000***	-0.0000	-0.0000
						(4.78)	(4.78)	(-0.43)	(-0.53)
$OUT^{ret}_{i,t-1}$	-0.0000	0.0028	0.0030	0.0029	0.0031	0.0181	0.0183	0.0179	0.0182
	(-0.44)	(1.48)	(1.17)	(1.08)	(1.35)	(0.62)	(0.63)	(0.66)	(0.66)
$OUT^{ret}_{i,t-1}(r_{i,t} - \bar{r}_{i,t})$			0.0388	0.0198	0.0217			0.0049	0.0068
			(0.21)	(0.10)	(0.11)			(0.03)	(0.04)
$OUT^{ret}_{i,t-1}log(TNA)^{ret}_{i,t-1}$						-0.0017	-0.0017	-0.0017	-0.0017
						(-0.55)	(-0.54)	(-0.59)	(-0.58)
$\lvert NET^{ret}_{i,t-1}\rvert$					0.0007		0.0007		0.0007
					(0.52)		(0.51)		(0.56)
$log(TNA)^{ret}_{i,t-1}$				-0.0009	-0.0009	-0.0008	-0.0008	-0.0008	-0.0008
				(-1.57)	(-1.57)	(-1.52)	(-1.52)	(-1.52)	(-1.51)
Constant	0.0018	0.0003	0.0003	0.0099	0.0099	0.0095	0.0094	0.0095	0.0094
	(0.63)	(0.07)	(0.06)	(1.16)	(1.16)	(1.12)	(1.11)	(1.11)	(1.11)
N	19923	19625	19625	19610	19610	19610	19610	19610	19610
R^2	0.001	0.007	0.007	0.008	0.008	0.008	0.008	0.008	0.008

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 17

Excess historical return, regression coefficients for equity fund flow from institutional investors: This table reports the regression coefficients when we use fixed effects panel data regression to regress one month excess historical return, $r_{i,t} - \bar{r}_{i,t}$, on different explanatory variables. Fund is represented by i, month represented by t. The left column represents the different lagged variables of return, flow and size used in the regressions. Different variations of explanatory variables (more detailed explained in Section 3) are added throughout the regressions. The number N is the number of observations used in each panel data regression.

	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$
$r_{i,t-1} - \bar{r}_{i,t-1}$		0.0596***	0.0599***	0.0595***	0.0595***	0.0590***	0.0590***	0.0593***	0.0593***
		(6.82)	(6.84)	(6.78)	(6.78)	(6.74)	(6.74)	(6.77)	(6.78)
$r_{i,t-2} - \bar{r}_{i,t-2}$		0.0272***	0.0288***	0.0286***	0.0286***	0.0270***	0.0271***	0.0289***	0.0288***
		(3.55)	(3.72)	(3.71)	(3.71)	(3.55)	(3.56)	(3.73)	(3.72)
$r_{i,t-3} - \bar{r}_{i,t-3}$		0.0346***	0.0347***	0.0347***	0.0347***	0.0346***	0.0347***	0.0347***	0.0347***
		(4.25)	(4.26)	(4.23)	(4.24)	(4.23)	(4.24)	(4.24)	(4.24)
$IN^{ins}_{i,t-1}$	0.0001	0.0001	0.0001	0.0002	-0.0008	0.0008	-0.0005	0.0010***	0.0001
	(0.84)	(0.77)	(0.76)	(0.89)	(-0.65)	(1.73)	(-0.45)	(4.51)	(0.08)
$IN^{ins}_{i,t-1}(r_{i,t} - \bar{r}_{i,t})$			-0.0016	-0.0019	-0.0019			-0.0044**	-0.0044**
			(-0.84)	(-0.97)	(-0.96)			(-3.21)	(-3.21)
$IN^{ins}_{i,t-1}log(TNA)^{ins}_{i,t-1}$						-0.0001	-0.0001	-0.0001***	-0.0001***
						(-1.84)	(-1.86)	(-4.31)	(-4.42)
$OUT^{ins}_{i,t-1}$	-0.0002	-0.0003	0.0004	0.0003	0.0012	-0.0007	0.0006	-0.0016**	-0.0006
	(-0.67)	(-0.71)	(1.22)	(0.90)	(0.98)	(-0.81)	(0.45)	(-2.64)	(-0.45)
$OUT^{ins}_{i,t-1}(r_{i,t} - \bar{r}_{i,t})$			-0.0396***	-0.0359***	-0.0338***			-0.0379*	-0.0343*
			(-3.91)	(-3.63)	(-3.52)			(-2.24)	(-2.22)
$OUT^{ins}_{i,t-1}log(TNA)^{ins}_{i,t-1}$						0.0000	0.0000	0.0002*	0.0002*
						(0.37)	(0.32)	(2.07)	(2.24)
$\lvert NET^{ins}_{i,t-1}\rvert$					0.0010		0.0013		0.0010
					(0.74)		(1.04)		(0.74)
$log(TNA)^{ins}_{i,t-1}$				-0.0013***	-0.0013***	-0.0013***	-0.0012***	-0.0013***	-0.0012***
				(-4.47)	(-4.36)	(-4.33)	(-4.19)	(-4.34)	(-4.23)
Constant	0.0024	0.0009	0.0009	0.0146*	0.0144*	0.0145*	0.0142*	0.0144*	0.0142*
	(0.87)	(0.20)	(0.20)	(2.48)	(2.40)	(2.44)	(2.35)	(2.43)	(2.36)
N	20097	19801	19801	19795	19795	19795	19795	19795	19795
R^2	0.001	0.007	0.007	0.008	0.008	0.008	0.009	0.009	0.009

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 18

Excess historical return, regression coefficients for equity fund flow from all investors: This table reports the regression coefficients when we use fixed effects panel data regression to regress one month excess historical return, $r_{i,t} - \bar{r}_{i,t}$, on different explanatory variables. Fund is represented by i, month represented by t. The left column represents the different lagged variables of return, flow and size used in the regressions. Different variations of explanatory variables (more detailed explained in Section 3) are added throughout the regressions. The number N is the number of observations used in each panel data regression.

	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$	$r_{i,t} - \bar{r}_{i,t}$
$r_{i,t-1} - \bar{r}_{i,t-1}$		0.0602***	0.0602***	0.0603***	0.0601***	0.0600***	0.0597***	0.0600***	0.0597***
		(6.92)	(6.91)	(6.92)	(6.93)	(6.90)	(6.87)	(6.89)	(6.88)
$r_{i,t-2} - \bar{r}_{i,t-2}$		0.0269***	0.0296**	0.0306***	0.0307***	0.0275***	0.0270***	0.0317***	0.0320***
		(3.55)	(3.23)	(3.33)	(3.36)	(3.62)	(3.56)	(3.60)	(3.65)
$r_{i,t-3} - \bar{r}_{i,t-3}$		0.0349***	0.0350***	0.0356***	0.0355***	0.0354***	0.0352***	0.0356***	0.0354***
		(4.32)	(4.32)	(4.36)	(4.36)	(4.35)	(4.34)	(4.35)	(4.34)
$IN^{tot}_{i,t-1}$	-0.0001***	-0.0001***	0.0008	0.0010	0.0042	-0.0034	0.0032	0.0007	0.0064
	(-3.39)	(-3.94)	(0.84)	(1.17)	(0.82)	(-1.45)	(0.70)	(0.21)	(1.25)
$IN^{tot}_{i,t-1}(r_{i,t} - \bar{r}_{i,t})$			-0.0076	-0.0101	-0.0078			-0.0105	-0.0068
			(-1.01)	(-1.36)	(-1.02)			(-1.14)	(-0.72)
$IN^{tot}_{i,t-1}log(TNA)^{tot}_{i,t-1}$						0.0004	0.0003	0.0000	0.0000
						(1.38)	(0.94)	(0.13)	(0.10)
$OUT^{tot}_{i,t-1}$	0.0008**	0.0077	0.0070	0.0066	0.0057	0.0596*	0.0646**	0.0587*	0.0652**
	(3.14)	(1.48)	(1.29)	(1.20)	(1.15)	(2.07)	(2.80)	(2.04)	(2.72)
$OUT^{tot}_{i,t-1}(r_{i,t} - \bar{r}_{i,t})$			-0.0787	-0.0948	-0.1100			-0.1247	-0.1558
			(-0.53)	(-0.63)	(-0.77)			(-1.02)	(-1.30)
$OUT^{tot}_{i,t-1}log(TNA)^{tot}_{i,t-1}$						-0.0046*	-0.0052**	-0.0045*	-0.0052*
						(-2.00)	(-2.65)	(-1.98)	(-2.59)
$\|NET^{tot}_{i,t-1}\|$					-0.0034		-0.0056		-0.0060
					(-0.65)		(-1.58)		(-1.59)
$log(TNA)^{tot}_{i,t-1}$				-0.0025***	-0.0025***	-0.0024***	-0.0024***	-0.0024***	-0.0024***
				(-4.50)	(-4.53)	(-4.26)	(-4.30)	(-4.27)	(-4.31)
Constant	0.0025	0.0008	0.0007	0.0306***	0.0310***	0.0292**	0.0296***	0.0291**	0.0295***
	(0.88)	(0.17)	(0.15)	(3.49)	(3.52)	(3.32)	(3.36)	(3.31)	(3.35)
N	20171	19861	19861	19855	19855	19855	19855	19855	19855
R^2	0.001	0.007	0.008	0.010	0.010	0.010	0.010	0.010	0.010

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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