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Consumer reaction on tumbling funds - Evidence from retail fund outflows during the financial crisis 2007/2008

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Abstract

Within this study we propose different measures to prove the influence of prior retail fund performance on fund flows. In contrast to previous literature, our work indicates that investors behave directly and in a selective manner by redeeming their shares of poor performing funds. By using a large data set of 1672 retail funds in Germany from March 2008 to April 2010 we are able to underscore that in general, both the prior performance of funds and the prior net redemptions have a statistically significant influence on outflows of funds. Moreover, it seems likely that investors react faster to market signals by withdrawing their shares in crisis situations than in previous decades that might be due to lower cost of information. Our findings can serve as a warning signal for policy-makers, regulatory authorities and the fund industry to establish a strong regulatory framework to prevent liquidity shortages of retail funds.

JEL Classification Numbers: G01, G23, G14, G28, D53

Keywords: Liquidity risk, financial fragility, bank run, mutual funds, fund flows, net redemptions of fund shares, fund performance, fund industry, risk sharing

1. Introduction

The focus of discussions during the economic crisis starting in 2008 was centered primarily on the destruction of capital in global stock markets as opposed to less important retail fund markets that have not been taken into account thus far.[1] Although an increased number of retail clients were investing for the purposes of wealth building

[1] In February 2011 the volume of retail fund markets in Germany were about 342.3 billion € in total. The biggest portion was accounted for equity funds (33.74%). Fixed income funds covered 16.26%, balanced funds 6.89% and money market funds 2.56% of total market volume. (Kapitalmarktstatistik der Bundesbank [2011]). Besides, open real estate funds counted a portion of 25.48%. For further research on open real estate funds see Sebastian and Tyrell (2006).

and retirement security, these markets paid little attention by researchers in the past, particularly concerning the regulation of retail fund markets and investors' behavior. In response to financial market crises, there has been a strong increase in research concerning incentive structures of individuals in financial markets (see e.g. Chevalier and Ellison [1997] or Diamond and Rajan [2009a]). In addition, the number of contributions to literature on contagion effects within financial industries increased. As a result, financial market instability is often thought to be connected with strategic \`herding\` behavior of investors who react depending on decisions of other investors, even if their decisions are not rational.[2] The model of Diamond and Dybvig (1983) offers a standard framework for such investors' behavior in financial markets and examines withdrawal of bank deposits by panicky consumers who lose confidence in the stability of their bank. Following Diamond and Dybvig, the problem of self-fulfilling, pessimistic expectations can be solved by deposit insurance. However, this leads to a moral hazard problem, as banks will show an increased appetite for risk knowing that their risks are covered by deposit insurance.[3] Concerning retail fund markets, there are a number of publications focusing on specific fund segments, however they disregard the risks of correlations between different fund categories and subsequent aggregate fund flows that may be the result of self-fulfilling pessimistic expectations under crisis situations.[4]

In contemporary research, the relationship between net flows and fund performance is described in different ways.[5] Early papers develop a positive linear connection but further research has proven a non-linear relationship between net flows and past performance (Chevalier and Ellison [1995] or Gruber [1996]). However, most researchers hold the opinion of a basically positive correlation between performance

[2] If incentive of an individual increases to carry out a certain action which he expects other investors will also make, a domino effect will follow. For further information see Morris and Shin (1998) or Abreau and Brunnermeier (2003).

[3] A large literature has been concentrating on this topic and examines the Diamond and Dybvig approach (see e.g. Morris and Shin [1998] or Abreau and Brunnermeier [2003]). Jacklin (1987) for example extends the model to an economy in which banks appear simultaneous to financial markets. Engineer (1989) develops a Diamond-Dybvig model with four periods and shows that in the long run, the suspension of convertibility with a bank run promises no success. More present research places the focus stronger on contagion effects. Allen and Gale (2000) and Freixas et al. (2000) for example extend the Diamond-Dybvig model by focusing on the dependence of different financial institutions and with that aggregated risk potentials.

[4] Warther (1995) for example delves into the specifically study of behavior of aggregate fund flows. Edelen and Warner (1999) consider the effects of past performance on return of mutual funds. Sebastian and Tyrell (2006) show that a run on shares of a fund does not always have to be ineffective. Rather it can also come to a market cleaning, so that wrong management of retail funds is punished and a market cleaning is given. They see rather the moral hazard problem in connection with efficient markets as an important focus and in this respect consider regulatory intervention, as postulated by Diamond and Dybvig (1983), more critically.

[5] Net flows are calculated from the difference between inflows and outflows from funds.

and net flows.[6] Ippolito (1992), Sirri and Tufano (1998) and Del Guerico and Tkac (2002) emphasize this general position about a common positive correlation between prior fund performance and net flows, whereas Cashman et al. (2006) additionally prove a certain persistence of investors with regard to outflows of poor performing funds.[7] Accordingly, investors react immediately to well-performing funds by making further investments while waiting to sell their positions in poor performing funds. Existing analytical work concerning such investors' behavior has apparently led to different opinions in prior literature. As pointed out by Hendricks, Patel and Zeckhauser (1993), within the poorest performing funds the investors react generally persistently and do not immediately withdraw their shares. Carhart (1997) argues that costs to withdraw shares have an important influence on fund returns.[8] Brown and Götzmann (1995) do not find any explanation for the correlation between high fees and persistence of investors in poor performing funds.[9] Alternatively, in the more recent literature Berk and Xu (2004) or Frazzini and Lamont (2006) highlight that investors withdraw their shares in regularly traded funds with poor performance. [10]

This paper provides a contrary view, since our results show that investors react quickly to market signals and withdraw their investments in crisis situations in the short term. In contrast to existing findings, we show that investors in funds do not follow the persistence hypothesis, but a kind of 'flow – following - flow behavior'. Due to different market signals (as further clarified in chapter 2), investors anticipate strong withdrawing behavior of other investors and might react in panic. One may ask why in past literature researchers did not find these results under crisis circumstances? In our view such phenomena is due to the fact that the cost of information decreased during the last 20 years in such a way that even private investors can react based on any

[6] For example see Kane, Santini and Aber (1991), Patel, Zeckhauser and Hendricks (1991).

[7] Ippolito (1992) for example examines 143 open equity funds for the period from 1965 to 1984 and finds a positive linear relation between the growth rate of funds and the excess returns.

[8] Berk and Green (2004) on the other hand describe the characteristics of fund performance using a model with rationally acting investors and point out, that professional fund managers do not outperform passive traded benchmarks considering fees and taxes, so the influence is not that large.

[9] Besides, there is a mixed view to persistence of investors in well performing funds. Malkiel (1995) and Ibbotson and Götzmann (1994) find also positive performance persistence. Although some studies point to the fact that funds with higher tax and costs deliver an accordingly better performance to cover these costs (e.g. Ippolito 1989), newer studies argue that this is not the case (e.g. Elton et. al. [1993] and Ivkovic and Weisbenner [2006]).

[10] Berk and Xu (2004) take up the quality persistence from flow of funds and concern with the effects from fund flows on future returns. From their perspective there is a weakened respect between the past performances and capital flows in the fund market, which could originate from more special market frictions.

information in the short term that might induce strategically complementary dependencies.[11]

Existing literature seems to show that funds are confronted with the problem of carrying out cost-intensive and unprofitable trades in order to adapt the portfolio to new market situations.[12] Particularly in the event of unexpected outflows that have to be covered by liquidation of assets under 'fire sale' conditions profits appear to decrease. However, the majority of cash generating trades are carried out on the day after the withdrawal of fund shares by investors, so that the net asset value (NAV) of a fund will not completely transfer the real costs to the withdrawing investors but rather is carried by more patient investors who have remained in the fund. This leads to strategically complementary dependence. Therefore, the expectation of an increasing portion of withdrawing investors decreases the expectations of future returns so that the incentive for every investor to withdraw their shares rises with a liquidity shortage becoming a possible result.

Within this context, it is of major interest for the fund industry that investors who hold illiquid shares in a fund are faced with bigger complementary dependence than investors with more liquid assets that is due to higher costs of the liquidation with less liquid funds.[13] Regarding this, our empirical analysis considers the differences of outflows in dependence of fund categories. In general, we provide an empirical contribution with the aim of a better understanding of investors' behavior in crisis situations.[14] Specifically, we contribute some empirical evidence to literature focusing in the German fund markets since the main interest of the scientific literature deals with the US market[15] that may be due to the fact that during the last 50 years no crisis from retail funds took place in Germany[16]. In contrast, during the course of the financial crisis starting in 2007 and its evolving effects in 2008, a huge eruption and a negative balance of net flows occurred for the first time ever.[17] Generally, taking into account the fundamental influence of crises on the economic power of countries, it is important to

[11] On account of this fact a bigger fragility and uncertainty on the financial markets occurs, on the other side markets tends to be more perfect and less driven by large well informed institutions.
[12] See for example Edelen (1999) or Coval and Stafford (2006).
[13] Under normal conditions less market participants can be found which are willing to pay the adjusted market price.
[14] Standard reference in the section of investor behavior in crisis situation is given by Allen and Gale (1998), Gorton (1988) and for the fund market. Edelen (1999) for example provides applicable research.
[15] Tkac (2004) gives a general overview above the American fund market and goes into regulatory methods and results for the fund branch.
[16] Bannier, Fecht and Tyrell (2006) and Ber et al. (2011) are two of rare research papers that provide an empirical study of the German fund market.
[17] The net outflows for the German industry in 2008 were about 27.782 million €.

understand the consequences of such eruptions. Therefore we use data of different German retail fund categories in order to analyze investors' behavior depending upon fund category and prior performance.

The paper is organized as follows: In Chapter 2 we start with basically describing a microeconomic model to gain an idea of the structural cooperation of market participants. The second part of this chapter serves as a description of model-theoretical backgrounds of our empirical analysis. Chapter 3 contains the empirical analysis to test our hypotheses and includes robustness checks to substantiate our results. The paper ends with Chapter 4 that includes a summary of our findings.

2. Microeconomic model of net redemptions of fund shares

The Internet age has accelerated the interconnection and information transfer of markets and individuals in such a way that reactions of investors on potentially significant information are faster than ever before. In this sense it is important to understand the process of information transfer in order to visualize the investors' behavior and the movements of financial markets as a whole.

Following the model of Chen, Goldstein and Jiang (2010) we assume a model with three periods. In period t_0 N investors get a share of a retail fund. In t_1 investors, who want to withdraw, get R_1, as gross return of the fund after one period. In this respect, all investors decide at this time whether they withdraw their shares in t_1 or in t_2. For the simplification of this model we suppose that a certain number of investors $\bar{N} \in (0,1)$ leave the fund in t_1 to get paid out.

Assuming that there are not any inflows generated in t_1, withdrawing investors have to be paid by selling assets of the fund. Due to the verifiable illiquidity of fund shares with regard to transaction costs and asymmetrical information, shares cannot be sold at market price (NAV) in t_1. To be able to pay R_1 to withdrawing investors, a bigger portion of the fund must be sold depending on the level of illiquidity.

If the factor of illiquidity is > 0 , $R_1 * (1 + \lambda)$ shares of the fund will have to be sold to pay out R_1 to withdrawing investors. For the 1- N patient investors, who stay until t_2, there will be a payoff ratio of $\bar{N} < \frac{1}{1+\lambda}$. This failure or insolvency barrier ensures that repayments for patient investors are not smaller than zero. The model so far leads to a strategic complementary problem between patient and impatient investors.[18] Assuming that outflows of the fund results in poor performance, patient investors have to count on worse performance. By enhancing the model with a component of possible inflows at any time, the coordination problem of investors can be mitigated. Thus early withdrawing investors can be paid out using new capital flows into the fund.[19]

Furthermore, we assume that $I(R_1)$ is a rising function of inflows depending on past performance, so that investors react positively to prior generated fund performance and inflows will increase. Therefore the following payment arises with inclusion of steadily possible inflows for long-term investors:

$$\frac{1-(1+\lambda)max\left(0,\left(\bar{N}-I(R_1)\right)\right)}{1-max\left(0,\left(\bar{N}-I(R_1)\right)\right)}R_1R_2(\theta)$$

Investors have to decide whether they withdraw in period t_1 and receive the amount R_1 or wait until t_2 and obtain the amount calculated by the equation above, that demonstrates that payoffs for patient investors decreases with increasing $\bar{N}$ for $\bar{N} > I(R_1)$. However, if fundamental variable θ is increasing, patient investors will expect a higher performance by their fund shares. Within this context, we can find an optimal solution for $\bar{N}$. This solution depends on the fundamental variable θ and therefore on scarcely measurable basic conditions. Furthermore, in reality optimum decisions of actors arise out of reliance based on decisions of other actors. This proves the possibility of multiple balances. Thus, two threshold ranges of the variable should be additionally defined. The threshold $\underline{\theta}$ is defined as a lower bound for investors who early withdraw their shares.

Definition 1: If the realization of the fundamental variable θ lies below threshold $\underline{\theta}$, so that $\theta < \underline{\theta}$, all investors will withdraw their shares in period t_1 regardless of their opinion about behavior of other investors. Thus, it is $R_2(\underline{\theta}) = 1$. Similarly the upper bound can be defined.

[18] Depending of the actions of early withdrawing investors, the patient investors have to adjust their investment behavior, so a coordination problem results. With rising portion of early withdrawing investors, the payment decreases in t_2.

[19] Therefore, depending on the volume of capital inflows there has to be sold less or in the best case, no fund shares to finance the withdrawing investors. Under these circumstances, the influence of the illiquidity factor on the payment amount decreases. The necessary condition on inflows exists in a higher inflow rate if the fund has performed better in the past.

Definition 2: If investors anticipate that the fundamental variable θ lies above threshold $\underline{\theta}$, they will remain in the fund until period t_2 regardless of the possible behavior of the other investors, so that:

$$R_2(\overline{\theta}) = \frac{1 - max\{0, (\overline{N} - I(R_1))\}}{1 - (1 + \lambda)max\{0, (\overline{N} - I(R_1))\}}$$

Assuming that R_1, as a variable of historical performance of the fund, has influence on the portion of early withdrawing investors, the threshold $\bar{R}_1$ is defined as $I(\bar{R}_1) = \overline{N}$, where I is the extent of the inflows. If redeeming of shares in period t_1 is smaller than inflows, the upper bound will lie above the lower bound:

$$\bar{\theta}(R_1) > \theta \; if \; R_1 < \bar{R}_1$$

However, if the redeemed value of fund shares is higher than the amount of inflows, the upper and lower bound will be at the same level:

$$\bar{\theta}(R_1) = \theta \; if \; R_1 \geq \bar{R}_1$$

If $\theta < \underline{\theta}$ is true, investors will withdraw their shares early. In contrast, if $\theta > \underline{\theta}$ is true, investors will wait until period t_2. In the case that $R_1 < \bar{R}_1$ is valid, we get equilibrium $\underline{\theta} \leq \hat{\theta} \geq \bar{\theta}(R_1)$. In general, within such a threshold range, two equilibriums arise. One equilibrium is characterized by investors withdrawing early and another equilibrium is observable where patient investors hold their shares until period t_2. To solve the problem of multiple equilibrium, we now suppose that realization of θ is not generally known to everyone in t_1. Instead of this, investors receive an individual signal about θ in t_1. Therefore, we assume that every investor i receives a signal $\theta_i = \theta + \sigma\varepsilon_i$ with $\sigma > 0$ as a parameter which expresses the strength of the signal, and ε_i for the idiosyncratic noise term which is determined by a distribution function $g(.)$ (with cumulative distribution function $G(.)$)[20]

We now consider the critical value $\hat{\theta}$, that provides the threshold where investors are indifferent in their behavior being patient or withdrawing early in period t_1. Following Chen et. al (2010) this implies:

[20] Then this signal can be understood as information which investors receive by a rating or public known information about a market or company for example, however, they individually evaluate this information and therefore generate different θ_i for investment strategy.

$$\int_{-\infty}^{\infty} \frac{1\infty(1+\lambda)max\left\{0,\left(G\left(\frac{\hat{\theta}-\theta}{\sigma}\right)\overline{N}-I(R_1)\right)\right\}}{1-max\left\{0,\left(G\left(\frac{\hat{\theta}-\theta}{\sigma}\right)\overline{N}-I(R_1)\right)\right\}} R_2(\theta)\frac{1}{\sigma}g\left(\frac{\hat{\theta}-\theta}{\sigma}\right)d\theta = 1$$

with the proportion of investors who face a signal below $\hat{\theta}$ and withdraw their funds in period t_1 denoted as $G(\frac{\hat{\theta}-\theta}{\sigma})\overline{N}$ and $\frac{1}{\sigma}g\left(\frac{\hat{\theta}-\theta}{\sigma}\right)$ as an expression for the posterior density over θ. Using the conditions from above, we can define the critical threshold for investors facing individual signals as follows:

Definition 3: Under the condition of $\overline{N} \in N$ investors, who withdraw their funds early (in t_1), receiving an individual signal θ which influences their investment behavior, we find a critical signal threshold $\hat{\theta}$, where investors are indifferent investing in the long term or withdrawing early so that:

$$R_2(\hat{\theta}) = \frac{1}{\int_0^1 \frac{1-(1+\lambda)max\{0,(\alpha\overline{N}-I(R_1))\}}{1-max\{0,(\alpha\overline{N}-I(R_1))\}}d\alpha} \; with\; \alpha = G\left(\frac{\hat{\theta}-\theta}{\sigma}\right).$$

Therefore, our microeconomic model provides a theoretical basis for the behavior of investors: It appears that individuals react to signals with their reactions varying depending upon different circumstances.

3. Data and Methodologies

Our sample consists of 35.895 monthly observations from 1.672 German retail funds from March 2008 to April 2010. We included 1.672 funds to our sample that are assigned to a corresponding fund category. In detail, we examined695 'equity funds', 367 'fixed income funds', 540 'balanced funds', 58 'money market funds', 11 'mortgage funds' and 17 'convertible funds'. The related fund categories, net asset values, and monthly flows of funds were reported to Deutsche Bundesbank by German asset management companies.[21] We excluded all funds from our sample that were closed, merged with other retail funds or reported a net asset value less 1 Mio. € during our observation period. The monthly net redemptions of a fund *j* with NAV (Net Asset Value) at month *i* are calculated with equation

[21] We thank the German Association of Investment and Asset Management (BVI) for their friendly support on this data issue.

$$net\ redemptions_{ij} = \frac{inflows_{ij} - outflows_{ij}}{NAV_{i-1,j}}.$$

The monthly performance of a fund j with NAV (Net Asset Value) at month i is computed as follows:

$$performance_{ij} = 1 - \left(\frac{NAV_{i,j} - net\ redemptions_{ij}}{NAV_{i-1,j} - net\ redemptions_{i-1,j}}\right)$$

Furthermore, we calculate the standardized performance indicator '$perfind$' over the respective observation period $n = 1, \ldots, n$ recursively to assess the past performance with the beginning of our observation period:

$$\begin{aligned}
&perfind_0 = 100 \\
&perfind_1 = perfind_0 + (performance_{1j} * perfind_0) \\
&\quad \vdots \qquad\qquad\qquad\qquad \vdots \\
&perfind_{n-1} = perfind_{n-2} + (performance_{n-1,j} * perfind_{0,n-2}) \\
&perfind_n = perfind_{n-1} + (performance_{nj} * perfind_0).
\end{aligned}$$

The standardized net redemption indicator '$nmaind$' over the respective observation period $n = 1, \ldots, n$ is also assessed recursively to identify the past net redemptions:

$$\begin{aligned}
&nmaind_0 = 100 \\
&namind_1 = nmaind_0 + (netredemptions_{1j} * nmaind_0) \\
&\quad \vdots \qquad\qquad\qquad\qquad \vdots \\
&namind_{n-1} = nmaind_{n-2} + (netredemptions_{n-1,j} * nmaind_{n-2}) \\
&namind_n = nmaind_{n-1} + (netredemptions_{nj} * nmaind_{n-1}).
\end{aligned}$$

Several statistic assessments are conducted in order to describe the structure and dynamics of fund flows from 2008 to 2010 with a primary focus on net redemptions during the financial crisis in 2007/2008. Moreover, a number of ordinary least square regressions are applied in order to find some evidence on the relationship between a number of independent variables that are listed in Table 3 and net redemption of fund shares.

4. Results

During the financial market turmoil in 2008, the German fund industry was faced with the most dramatic outflows from retail funds in more than three decades (for details see BVI Jahrbücher [1999–2010]). Not surprisingly, our sample (which includes 6 different categories of retail funds) shows tremendous redemptions of fund shares from September 2008 to November 2008. With the default of Lehman Brothers in September 2008 and a peak net outflow from funds of 3.77% in October 2008, the preliminary height of the crisis was reached. In contrast, flows of new money into funds were recorded by the fund industry during 2009. In addition to the average monthly fund flows, Table 1 reports the monthly percentage of funds characterized by two month net outflows that means that outflows are higher than inflows over a two month period. Although we assess a surprisingly high percentage of funds reporting two month net outflows over the entire observation period, a peak of this ratio occurs in September 2008 which can be assigned to the height of the financial crisis reached as a result of the turmoil faced by several major banks around the globe. In contrast, the percentage of funds reporting two month net outflows fall below 40% level from May 2009 to September 2009. However, the relatively high percentage of funds reporting two month net outflows over the entire observation period might be explained by cross-sectional fund flows.

[Insert Table 1 about here]

A more detailed view on the various fund categories covered by our sample suggests that under crisis circumstances investors might react in a different manner depending on the related fund category. Table 2 demonstrates that with respect to their median of outflows ‘money market funds’, ‘fixed income funds’ and funds invested in convertible bonds are faced with the highest net redemption of fund shares by investors over our observation period from 2008 to 2010. Furthermore, the highest percentage of funds reporting two month net outflows are also observed in the event of ‘money market funds’, ‘fixed income funds’ and ‘convertible funds’[22].

Approximated 99th percentiles of two month net redemptions calculated on the basis of estimated extreme value distributions show only slight differences between ‘equity

[22] Convertible funds are highly invested in convertible bonds.

funds', 'mortgage and convertible funds' and 'fixed income funds'.[23] Apparently, the most tremendous redemption risk over the period from 2008 to 2010 is observed for 'money market funds'. In contrast, so-called 'balanced funds' that have to be invested in equities and fixed income securities as required by investment directives show, unsurprisingly, much more moderate evidence of redemption risk than the other aforementioned categories of funds. This may be explained by diversification strategies that are signaled to investors by reporting lower losses during financial market crisis episodes.

As stated previously, a great majority of funds recorded massive losses during the financial markets crisis of 2008 as a result of the subsequent global tumbling asset markets. Estimated 99th percentiles of funds` losses reported in Table 2 are significantly higher at 'equity funds' than that at 'fixed income funds' which might be due to more volatile equity markets. These market characteristics could also explain the diversification effects of 'balanced funds' since this category of funds has to be invested in equities as well as in fixed income securities as given by investment directives. Finally, Table 2 shows that the computed sensitivities of 'outperforming funds' are clearly higher than the sensitivities of 'underperforming funds' in general.[24] Furthermore, the highest values of this sensitivity measure for our three examined subsamples are provided in the event of 'money market funds' and 'fixed income funds'. In contrast, the sensitivity measures suggest the lowest sensitivity of shareholders in 'equity funds' and 'balanced funds'. Therefore it seems likely that investors in 'money market funds' and 'fixed income funds' react more dramatically than investors in 'equity funds' or 'balanced funds'. This might be related to the fact that in the past, 'fixed income funds' and 'money market funds' were promoted to be the more appropriate investments for risk-adverse investors by the fund industry. In summary, our results provide some evidence that based upon fund flows, 'balanced funds' can be declared 'winners' over the observation period. This evidence reflects a relative low risk-bearing inherent to this fund category. In contrast, 'money market

[23] Approaches emanating from Extreme-Value-Theory allow the reliable prediction of the likelihood of rare but also plausible events since they model the 'fat tails' of empirical distributions with sufficient accuracy. In such a way they can also assess the daily net redemptions of funds and the fund performance from empirical data even in times of a crisis (Reiss R.–D. and Thomas M. [2000], Longin [2000], Embrechts, Klüppelberg, Mikosch [1997]). For the estimation of parameters we rely on a genetic algorithm, which deliver reliable and valid results for our purposes.
[24] Sensitivity equals the ratio between 99% percentiles of losses and 99% of two month net redemptions

funds' are faced with surprisingly tremendous redemptions during a period of increasing yields of money market instruments.

[Insert Table 2 about here]

Next, we examine various regression models to test our hypothesis that poor performing funds are punished by tremendous redemption of fund shares with a shrinking confidence in the fund industry as a result of a financial crisis and that significant outflows subsequently lead to further outflows. Moreover, with these regressions we search for further support of our hypothesis that investors show a different redemption behavior over our observation period from 2008 to 2010 depending upon the type of fund category. In general, we test various performance indicators, measures of prior redemption of fund shares and a couple of macroeconomic and financial market indicators as control variables as they relate to independent variable *'evtnma2m'*. This variable reflects the percentiles of two month net redemptions of fund shares that are estimated by appropriate extreme value distributions. As figured out before, significant differences relating to the redemption of fund shares among different categories of funds has been observed from March 2008 to April 2010. Therefore, we introduce the given fund classification as a factored predictor variable to our panel regression with randomized effects at this stage.[25] With an r-squared value of 46.16 % for the within regression and an r-squared value of 81.62 % for the between regression, our model shows a strong overall relationship between the independent and dependent variables. Table 3 reports positive and statistically significant coefficients for the performance variables *'evtperf2m'*, *'evtperf'* and *'log10perf'* that reflect the corresponding percentiles of the performance over the prior two months, percentiles of the prior monthly performance and our standardized prior performance indicator, respectively. In contrast, our logarithmized indicator on prior redemption of fund shares *'log10nma'* enters the regression with a negative and statistically significant coefficient. Among the control variables, our indicators on the performance in global stock markets *('msci')*, stock market uncertainty *('vola')* and our variable reflecting *'gold'* prices generates positive and statistically significant coefficients. In contrast, a negative and statistically significant relationship between the dependent variable and the indicator on global bond

[25] Therefore our regression model equals $evtnma2m = \alpha_1 P + \alpha_2 NMA + \alpha_3 C + \alpha_4 F + eY + \epsilon$ with P as a vector of our performance variables, NMA as a vector of our net redemption variables, C as a vector of control variables and F as factorized predictor variable of fund categories; eY and ϵ are the respective error terms.

market prices *'gbi'*, the *'libor'* rate as well as the global creditworthiness of banks *'cds'* is reported in Table 3.

[Insert Table 3 about here]

So far, it can be shown that both performance variables and flow variables display a significant relationship for the two month net redemption of fund shares. It is clear that there is some evidence that the performance indicators have a negative influence on the two month net redemption since the obtained coefficients exhibit a positive influence on the percentiles of respective two month net redemptions of fund shares.[26] In contrast, our flow indicator *'log10nma'* exhibits a negative influence on the two month net redemption. In addition, it is noteworthy that apart from 'convertible funds', the fund classification variable has a significant negative relationship with the dependent variable for all fund categories but to a different extent, whereas the classifier for 'equity funds' has been set as the base of our factor variable. Taking into account that related fund categories show significant performance differences over the observation period, these findings suggest that the prior performance of a fund is one of the driving forces for the redemption of fund shares by investors.

Following our basic concept to distinguish between 'outperforming funds' and 'underperforming funds', we examine the relationship between the chosen independent variables and the percentiles of the respective two month net redemptions by panel regressions with random effects on these two subsamples during the next stage of our research. Apart from the categories of 'money market funds', 'convertible and mortgage funds', all other related fund categories yield negative and statistically significant coefficients in the event of 'outperforming funds', whereas this factor variable enters the regression with negative coefficients in the case of 'underperforming funds'. By comparing the results of regressions with random effects reported in Table 4, it can be said that there is little variation between the two models. Only creditworthiness of banks *('cds')* shows a statistically significant but weak effect in the event of 'underperforming funds' but not in the case of 'outperforming funds'. In addition, the *'gold'* price is the sole statistically significant factor for 'outperforming funds'.

[Insert Table 4 about here]

[26] For better orientation it should be emphasized at this point that the higher the percentile of the respective two month net redemptions the more fund shares are expected to be redeemed by investors.

Although these two regression models provide only weak support for our assumptions, we can ascertain that the persistence of prior performance of funds as well as the categories of funds influence the two month net redemptions. This observation corresponds with prior research (for example see Ippolito [1992], Sirri and Tufano [1998] or Berk and Xu [2004]). This weakly supporting data for our hypothesis might be a result of our relatively rough distinction between 'outperforming' and 'underperforming funds' at this stage in our research.

Therefore, in the next step we further test three ordinary least square regressions (OLS) in order to gain a better understanding of the relative importance of the obtained coefficients at subsamples of 'equity funds', 'fixed income funds' and 'money market funds', respectively by analyzing provided standardized beta coefficients.[27] By comparing the results of these linear regressions reported in Table 6 we see that the majority of our independent variables are significantly related with the percentiles of two month net redemptions.

By analyzing standardized beta coefficients in detail we find an overall strong positive and statistically significant influence on net redemptions by the indicators on the prior performance *('evtperf2m' and 'evtperf'),* whereas in the case of 'equity funds', the logarithmic performance indicator *('log10perf')* shows only a weak but statistically significant influence on two month net redemptions. By comparing standardized beta coefficients obtained by the logarithmic net redemption indicator *('log10nma')* we find a strong relationship with the dependent variable for all different fund categories since it enters the regressions with negative and statistically significant coefficients. In the case of fixed income and 'money market funds', the *'msci'* reflecting global stock market performance does not result in a statistically significant coefficient, whereas in the case of 'fixed income funds', global creditworthiness *('cds')* clearly does not have any significant impact on the two month outflows. With respect to 'money market funds', we do not find a significant relationship between the *'libor'* rate and the two month net redemptions. The control variables are generally characterized by relatively low standard beta coefficients. Solely standardized beta coefficients obtained by the global

[27] In detail these regression models correspond to $evtnma2m = \alpha_1 P + \alpha_2 NMA + \alpha_3 C + \alpha_4 F + \epsilon$with P as a vector of our performance variables, NMA as a vector of our net redemption variables, C as a vector of control variables and F as factorized predictor variable of fund categories; ϵ is the respective error term. For these least square linear regressions (OLS) we use the same predictors as applied to the panel regressions described before. In addition, as a kind of robustness test we precautionary compute the variance inflation factors as listed in Table 5, which suggest that there are not any strong collinearities between our depending variables. Other robustness tests confirm the validity of our models as well.

stock market indicator and the performance indicator for the global bond markets enter the regressions with relatively high coefficients in case of 'equity funds' but not for our subsamples of 'fixed income' and 'money market funds'.

In summary, it can be said thus far that our results from the examined linear regressions on 'equity funds', 'fixed income funds' and 'money market funds' are consistent with our hypothesis that the prior performance of funds, as well as persistent prior redemptions of fund shares by investors are strongly related with two month net redemptions. This provides some evidence that poor performing funds are punished with high redemption rates of fund shares. Regardless of whether these net redemptions are caused by sales activities of the asset management companies or solely based on the investors´ information about prior performance of funds in general, it seems likely that investors are not so 'ignorant' staying with poor performing funds. Quite the opposite, investors seem to gather information about the funds´ performance and decide on a relative short term whether to redeem their fund shares or not. Within this context, it might be relevant that the information cost to consumers has clearly been lowered over the recent years due to increased access to electronic media (see for example Bogan [2008]). Our observation of reactions by investors in such a short term is in considerable contrast to the argument presented by Sirri and Tufano (1992), who pointed out that consumers abstain from redeeming fund shares when faced with poor performing funds due to high information costs.

Furthermore, the examined regressions also suggest that redemption of fund shares by investors over prior periods generally have an impact on the flows of funds. Since our indicators on the persistence of prior net redemptions result in negative and statistically significant coefficients the applied regressions provide strong support for our hypothesis that a significant number of fund investors redeem their shares based upon fund outflows as a result of other investors redeeming their shares. As consumers typically do not receive any information on investment flows for funds in detail, it seems more likely that flows into funds and out of funds are caused by sales activities of the asset management companies and/or the result of bad news concerning the fund industry as a whole in general.

[Insert Table 6 about here]

In order to confirm the observed relationship between prior performance of funds and the net redemptions of fund shares, we examine further ordinary least square (OLS) regressions on each quintile of the two month fund performance. Furthermore, using these regressions we also attempt to prove the influence of the related fund category on two month net redemptions. At this stage, one should keep in mind that the highest quintiles of this performance measurement represent well performing funds. The results reported in Table 7 show the corresponding standardized beta coefficients in order to assess the relative strength of coefficients received by relevant independent variables.

Comparing standardized beta coefficients obtained by the logarithmic net redemption indicator (*'log10nma')* also provides strong support for our hypothesis that the persistence of prior net redemptions of fund shares has a substantial impact on subsequent further net redemptions because the provided coefficients get a more prominent place among the coefficients with increasing quintiles of the two month performance. In addition, the logarithmic performance indicator (*'log10perf')* appears to show an increasing influence on higher percentiles of the two month performance whereas standardized beta coefficients get the highest values among the provided coefficients. The obtained standardized beta coefficients of *'log10nma'* and *'log10perf'* clearly exhibit opposite patterns. While persistent net inflows seem to reduce subsequent further net inflows, a corresponding persistence of prior positive performance amplifies fund outflows if such funds appear to display a lower performance. This effect is confirmed by our variable *'evtperf'* which enters the regressions with high standardized beta coefficients in the event of poor performing funds as well as in the case of funds that report a positive monthly performance.

In summary, it appears likely that investors tend to flee from poor performing funds to a much greater degree after experiencing consistently high prior performance by such funds. This might be explained by a significant number of well informed investors who prefer ensuring a profit over further risk-taking with such funds when the respective fund performance is shifting from well to poor. Therefore, our results are consistent with the findings by Cashman et al. (2006) such that they observe high outflows both for well and poor performing funds. Cashman et al. find a similar shape of curve of fund inflows but to a relatively greater extent in the case of poor performing funds. Assuming that inflows of new money are generally reduced by consumers under tensioned market conditions in light of a declining fund industry, our results might be more easily explained by the behavior of investors in more panicked conditions. While our findings are fairly surprising, they also appear to be supported by standardized beta coefficients of the examined fund categories that turn from negative at low percentiles to positive at high percentiles based on their two month performance. In addition, the sign of standardized beta coefficients of the indicator on creditworthiness of banks *('cds')* not surprisingly changes from positive to negative with increasing percentiles of the two month performance. Furthermore, it should be noted that the indicator on the performance of global stock markets *('msci')* enters the regressions with relative high positive standard beta coefficients whereas our indicator on the performance of global bond markets *('gbi')* apparently influences two month net redemptions of fund shares in the opposite direction.

[Insert Table 7 about here]

5. Conclusion

During the financial crisis of 2008, 'money market funds', 'fixed income funds' and funds invested in convertible bonds have been faced with the highest net redemptions of fund shares by investors ever witnessed. By summarizing our results, we can point to strong evidence that investors behave in a selective manner when they decide whether or not to redeem their shares from funds.

In general, we find that the prior performance of funds had a negative and statistically significant influence on the net redeeming of fund shares by investors over our observation period from March 2008 to April 2010. However, our results do not confirm some findings in the literature (Ippolito [1992] or Sirri and Tufano [1998]) that consumers are investing disproportionately more in funds that performed very well the prior period while failing to flee from poor performing funds at the same rate. This contradiction might be due to the high frequency of unfortunate events that led to tremendous losses by the banking and fund industry during the financial crisis of 2008. Furthermore, lower information costs for investors resulting from the rapidly growing availability of electronic media might amplify such behavior of investors. In addition, we find some evidence pointing to another specific behavior of consumers over the observation period; they appear to flee from poorly performing funds to a much greater degree after having experienced a high level of performance in prior periods. This observation might be explained by a significant number of active investors who prefer ensuring a profit over further risk-taking when their fund performance is shifting from good to bad. The role that institutional investors play relating to this observation will be the subject of future research.

Although our regression models do not provide strong support for our hypothesis that those investors in different categories of funds show an easily distinguishable reaction our measures of redeeming sensitivity which are based on estimates of extreme value, distributions suggest that consumers indeed appear to redeem fund shares to varying degrees depending on the related fund category.

Furthermore, our regression models provide some empirical evidence that redemption of fund shares by investors in prior periods generally have an impact on more recent flows of funds. Therefore, our findings provide strong support for our assumption that investors redeem fund shares to a great extent subsequent to redemptions of fund shares by other consumers.

As a result, patient investors have to accept further losses due to 'fire sales' which might have had a substantial impact on the overall fund performance and lead to further redemptions of fund shares over the course of the financial crisis (some basic studies on this issue are done by Edelen [1999] and Massa and Phallippou [2005]). Such amplifying effects might be quite similar to the effects of self-accelerating spirals of liquidity risk within the global banking system under crisis circumstances described by Brunnermeier (2009).

In conclusion of our study, we emphasize that the fund industry is well-advised to establish a strong self-regulatory framework that ensures that fund managers have a fairly clear idea of the different dimensions of liquidity risk such as redemption risk and market liquidity risk. It is worth noting that generating liquidity under tensioned market conditions in order to cover increasing redemptions of fund shares causes certain negative externalities for patient consumers that remain invested in such tumbling funds since they have to accept further losses by additional unexpected liquidity costs (For details, our theoretical model explains such externalities in section 2 of this paper). This may allude to possible discussions within the industry to introduce a redemption fee that takes into account performance losses caused by the necessity of fund managers to cover liquidity needs in the event of high redemption ratios or to introduce a prolongation of notice periods. In order to contribute some enlightening arguments to such a discussion, we will examine the degree of such externalities in the next phase of our research work.

However, under the assumption that poor performances of fund managers are punished by significant redemptions of fund shares by consumers that appear to be confirmed by our findings, fund managers should be obliged to hold a sufficient part of liquid assets at any time to cover such redemptions of fund shares. In order to avoid negative externalities for patient consumers to a great extent, such liquidity risks should be better regulated and proved by regulatory authorities especially with regard to funds that report poorer performance than a respective peer group.

Appendix

Table 1: Two month net redemptions grouped by month of observation period
Our sample contains 35.895 monthly observations from 1.672 funds from March 2008 to April 2010. Among the 1.672 funds are 695 'equity funds', 367 'fixed income funds', 540 'balanced funds', 58 'money market funds', 11 'mortgage funds' and 17 'convertible funds'. Funds are classified as 'balanced funds' when they are invested in equities and fixed income securities. Per definition 'convertible funds' are funds that are invested in convertible bonds. The monthly net redemptions are calculated as the difference of inflows into funds and outflows from funds. The two month net redemptions equal the sum of net redemption in two consecutive months. The percentage of funds with outflows is calculated as the ratio of the number of funds with negative two month net redemptions (outflows) to the total number of funds.

month	averaged two month net redemptions in %	percentage of funds with outflows	month	averaged two month net redemptions in %	percentage of funds with outflows
01.04.2008	2.78%	45.17%	01.04.2009	0.56%	43.32%
01.05.2008	2.53%	46.65%	01.05.2009	1.53%	38.19%
01.06.2008	2.14%	50.08%	01.06.2009	1.81%	35.99%
01.07.2008	1.38%	48.13%	01.07.2009	1.89%	37.25%
01.08.2008	0.43%	54.45%	01.08.2009	2.11%	35.17%
01.09.2008	-0.91%	63.85%	01.09.2009	2.79%	35.29%
01.10.2008	-3.77%	59.97%	01.10.2009	2.09%	38.95%
01.11.2008	-2.47%	45.39%	01.11.2009	2.10%	39.79%
01.12.2008	3.49%	42.34%	01.12.2009	0.97%	42.05%
01.01.2009	3.85%	46.61%	01.01.2010	0.72%	43.79%
01.02.2009	0.12%	45.49%	01.02.2010	1.76%	41.28%
01.03.2009	0.23%	46.66%	01.03.2010	1.33%	43.12%

Table 2: Two month net redemptions grouped by categories of funds
The percentage of funds with outflows is calculated as the ratio of the number of funds with negative two month net redemptions (outflows) to the total number of observations. (n = number of observations, average and median are calculated over the entire observation period from 2008 to 2010). Sensitivity equals the ratio between 99th percentiles of losses and 99th percentiles of two month net redemptions. 99th percentiles are calculated on the basis of approximated extreme value distributions (GEV or GPD).[28]

	Equity Funds	Money Market Funds	Mortgage Funds
n	14,768 / 7,677	1,427 / 983	284 / 103
% observations with outflows	51.98%	68.89%	36.27%
average / median of outflows	-0.11% / 0.90%	-5.82% / -4.27%	-1.49% / 0.11%
99th percentile net redemptions	34.98%	31.04%	31.81%
99th percentile losses	53.02%	29.79%	43.22%
sensitivity (entire sample)	0.66	0.90	0.74
sensitivity ('outperforming funds')	1.16	1.49	1.65
sensitivity ('underperforming funds')	0.64	0.86	0.74
	Balanced Funds	Fixed Income Funds	Convertible Funds
N	10,536 / 4,318	7,990 / 4,719	394 / 251
% observations with outflows	40.98%	59.06%	63.71%
average / median of outflows	3.62% / 0.00%	0.45% / -0.93%	-2.24% / -2.12%
99th percentile net redemptions	18.55%	31.04%	31.81%
99th percentile losses	29.79%	34.16%	43.22%
sensitivity (entire sample)	0.62	0.91	0.74
sensitivity ('outperforming funds')	0.78	1.17	1.65
sensitivity ('underperforming funds')	0.62	0.85	0.74

[28] GEV (Generalized Extreme Value Distribution), GPD (Generalized Pareto Distribution)

Table 3: Dependent and independent variables

Variable	Definition	Calculation formula
evtnma2m (dependent variable)	percentiles of two month net redemption of fund shares approximated by fitting extreme value distributions[29]	$nma2m_{ij} = \left(\frac{inflows_{ij} - outflows_{ij} + inflows_{i-1,j} - outflows_{i-1,j}}{NAV_{i-2,j}}\right)$ $evtnma2m = percentile_{GEV,GPD}(nma2m_{ij})$
perf_ind	standardized performance indicator (calculated recursively)	$perfind_0 = 100$ $perfind_1 = perfind_0 + (performance_{1j} * perfind_0)$ $\vdots \quad \vdots \quad \vdots$ $perfind_n = perfind_{n-1} + (performance_{nj} * perfind_0)$
nma_ind	standardized net redemptions indicator (calculated recursively)	$nmaind_0 = 100$ $namind_1 = nmaind_0 + (net\ redemptions_{1j} * nmaind_0)$ $\vdots \quad \vdots \quad \vdots$ $namind_n = nmaind_{n-1} + (net\ redemptions_{nj} * nmaind_{n-1})$
log10perf	logarithm to base 10 of standardized performance indicator	$log10perf = log10(\text{perf\_ind})$
log10nma	logarithm to base 10 of standardized performance indicator	$log10nma = log10(nma\_ind)$
evtperf	percentiles of monthly performance approximated by fitting extreme value distributions	$perf_{ij} = 1 - \left(\frac{NAV_{i,j} - net\ redemptions_{ij}}{NAV_{i-1,j} - net\ redemptions_{i-1,j}}\right)$ $evtperf = percentile_{GEV,GPD}(performance_{ij})$
evtperf2m	percentiles of two month performance attribution	$per2m_{ij} = 1 - \left(\frac{NAV_{i,j} - net\ redemptions_{ij} - net\ redemptions_{i-1,j}}{NAV_{i-2,j} - net\ redemptions_{i-2,j}}\right)$ $evtperf2m = percentile_{GEV,GPD}(per2m_{ij})$
msci	percentage change of MSCI World	extracted from Bloomberg[30]
vola	14days volatility of MSCI World	extracted from Bloomberg
gbi	percentage change of JPM Global Bond Index	extracted from Bloomberg
gold	percentage change of gold price	extracted from Bloomberg
libor	libor rate	extracted from Bloomberg
cds	credit default swap rate of banks	extracted from Bloomberg

[29] Approaches emanating from Extreme-Value-Theory allow the reliable prediction of the likelihood of rare but also plausible events since they model the 'fat tails' of empirical distributions with sufficient accuracy. (Reiss R.–D. and Thomas M. [2000], Embrechts [2001], Embrechts, Klüppelberg, Mikosch [1997]). For the estimation of parameters we relied on a genetic algorithm which delivered reliable and valid results for our purposes.

[30] Bloomberg PLC is one of the leading providers of financial market information

Table 4: Panel regression with random effects

This table shows the results of a panel regression with random effects. The percentiles of two month net redemptions of fund shares are defined as the dependent variable. The independent variables are listed in Table 3. The factor variable for fund categories is related to equity funds as the base level. The sample covers the two month net redemptions of 33.739 observations and 1.648 funds respectively over the period from March 2008 to April 2010. Within-cluster correlation is clustered at the level of funds. The effective number of observations is on the order of number of unique funds.

evtnma2m	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
evtperf2m	0.1987	0.0062	32.29	0.0000	0.1866	0.2107
evtperf	0.4830	0.0061	79.07	0.0000	0.4710	0.4950
log10perf	0.2017	0.0076	26.57	0.0000	0.1868	0.2166
log10nma	-0.3403	0.0084	-40.48	0.0000	-0.3568	-0.3238
msci	0.7988	0.0248	32.18	0.0000	0.7502	0.8475
vola	1.4143	0.0868	16.29	0.0000	1.2441	1.5845
gbi	-1.3773	0.0544	-25.3	0.0000	-1.4841	-1.2706
gold	0.0549	0.0193	2.85	0.0040	0.0172	0.0926
libor	-0.0114	0.0008	-15.21	0.0000	-0.0129	-0.0100
cds	-0.0003	0.0000	-5.32	0.0000	-0.0004	-0.0002
money market funds	-0.0233	0.0080	-2.91	0.0040	-0.0389	-0.0076
mortgage funds	-0.0710	0.0173	-4.1	0.0000	-0.1050	-0.0370
balanced funds	-0.0347	0.0037	-9.37	0.0000	-0.0420	-0.0275
fixed income funds	-0.0266	0.0040	-6.66	0.0000	-0.0345	-0.0188
convertible funds	-0.0070	0.0146	-0.48	0.6350	-0.0356	0.0217
cons	0.5367	0.0103	51.98	0.0000	0.5165	0.5570
	sigma_u .04098684; sigma_e .18753532; rho..0455888 R-sq: within = 0.4616; between = 0.8162; overall = 0.5612 Wald chi2(20) = 38996.29; Prob > chi2 = 0.0000					

Table 5: Variance Inflation Factors (VIF) of independent variables applied to ordinary least square (OLS) regressions

This table reports the Variance Inflation Factors (VIF) to test the dependent variables on collinearities. The Variance Inflation Factors have an intuitive interpretation. Variance Inflation Factors less than 5 indicates that the independent variable shows only weak multicollinearity (for further information on Variance Inflation Factors see Belsley et al. 1980).

Variable	VIF	1/VIF
evtperf2m	3.56	0.2807
evtperf	3.52	0.2839
log10perf	5.69	0.1757
log10nma	5.54	0.1804
msci	2.87	0.3480
vola	2.28	0.4382
gbi	1.70	0.5891
gold	1.26	0.7960
libor	1.61	0.6194
cds	1.68	0.5945
money market funds	1.08	0.9251
mortgage funds	1.02	0.9837
balanced funds	1.36	0.7339
fixed income funds	1.30	0.7720
convertible funds	1.02	0.9803
Mean VIF	2.37	

Table 6: Panel Regression with random effects applied to subsamples of 'outperforming funds' and 'underperforming funds'

This table shows the results of a panel regression with random effects of independent variables listed in Table 3 on percentiles of two month net redemptions of fund shares. The factor variable for fund categories is related to equity funds as the base level. In the event of outperforming funds the sample covers the two month net redemptions for 13.663 observations and 1.047 funds over the period from March 2008 to April 2010. In the case of 'underperforming funds' the sample covers the two month net redemptions for 20.076 observations and 1.110 funds over the period from March 2008 to April 2010. 'Outperforming funds' reported a higher net asset value (NAV) at the end of the observed month due to a positive performance attribution since the beginning of the observation period in March 2008 whereas 'underperforming funds' reported a lower net asset value (NAV) at the end of the observed month due to a negative performance attribution since the beginning of the observation period in 2008. Within-cluster correlation is clustered at the level of funds. The effective number of observations is on the order of number of unique funds.

	Outperforming Funds						Underperforming Funds					
	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]		Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
evtperf2m	0.1909	0.0102	18.75	0.0000	0.1710	0.2109	0.1909	0.0102	18.75	0.0000	0.1460	0.1755
evtperf	0.5551	0.0096	57.67	0.0000	0.5363	0.5740	0.5551	0.0096	57.67	0.0000	0.3994	0.4286
log10perf	0.2820	0.0136	20.72	0.0000	0.2553	0.3086	0.2820	0.0136	20.72	0.0000	0.3051	0.3568
log10nma	-0.3798	0.0139	-27.28	0.0000	-0.4071	-0.3525	-0.3798	0.0139	-27.28	0.0000	-0.4979	-0.4436
msci	0.5077	0.0400	12.70	0.0000	0.4294	0.5861	0.5077	0.0400	12.70	0.0000	0.7974	0.9142
vola	1.0269	0.1478	6.95	0.0000	0.7372	1.3166	1.0269	0.1478	6.95	0.0000	1.5654	1.9610
gbi	-0.9928	0.0904	-10.98	0.0000	-1.1700	-0.8156	-0.9928	0.0904	-10.98	0.0000	-1.5460	-1.2965
gold	0.0841	0.0327	2.57	0.0100	0.0201	0.1481	0.0841	0.0327	2.57	0.0100	-0.0111	0.0754
libor	-0.0204	0.0014	-15.08	0.0000	-0.0231	-0.0178	-0.0204	0.0014	-15.08	0.0000	-0.0043	-0.0005
cds	0.0001	0.0001	1.37	0.1710	0.0000	0.0003	0.0001	0.0001	1.37	0.1710	-0.0005	-0.0003
money market funds	0.0486	0.0170	2.86	0.0040	0.0153	0.0819	0.0486	0.0170	2.86	0.0040	-0.0697	-0.0200
mortgage funds	-0.0551	0.0345	-1.6	0.1110	-0.1228	0.0126	-0.0551	0.0345	-1.6	0.1110	-0.1312	-0.0183
balanced funds	-0.0305	0.0073	-4.19	0.0000	-0.0448	-0.0162	-0.0305	0.0073	-4.19	0.0000	-0.0423	-0.0157
fixed income funds	-0.0303	0.0086	-3.53	0.0000	-0.0471	-0.0135	-0.0303	0.0086	-3.53	0.0000	-0.0442	-0.0182
convertible funds	0.0199	0.0381	0.52	0.6010	-0.0547	0.0945	0.0199	0.0381	0.52	0.6010	-0.0495	0.0341
cons	0.3830	0.0215	17.78	0.0000	0.3408	0.4252	0.3830	0.0215	17.78	0.0000	0.5668	0.6424
	sigma_u .07436788; sigma_e .19598406; rho .12586572 R-sq: within = 0.5300; between = 0.6199;overall = 0.5621 Wald chi2(20) = 17303.28; Prob > chi2 = 0.0000						sigma_u .07053144; sigma_e .17440535; rho .1405599 R-sq: within = 0.4179; between = 0.5575;overall = 0.4472 Wald chi2(20) = 15928.93; Prob > chi2 = 0.0000					

Table 7: Ordinary least square (OLS) regressions for the subsamples of ‘equity funds’, ‘fixed income funds’ and ‘money market funds’

This table shows the results of an ordinary least square (OLS) regression of independent variables listed in Table 3 on percentiles of two month net redemptions of fund shares. In addition to coefficients and standard errors, the standardized beta coefficients are calculated. The sample covers the two month net redemptions for 13.848 observations of equity funds, 7.726 observations of fixed income funds, and 1.373 observations of money market funds over the period from March 2008 to April 2010.

	Equity Funds					Fixed Income Funds					Money Market Funds				
	Coef.	Std. Err.	t	P>|t|	Beta	Coef.	Std. Err.	t	P>|t|	Beta	Coef.	Std. Err.	t	P>|t|	Beta
evtperf2m	0.1966	0.0098	20.12	0.0000	0.2223	0.1888	0.0122	15.43	0.0000	0.1785	0.1434	0.0278	5.15	0.0000	0.1388
evtperf	0.3965	0.0098	40.4	0.0000	0.4510	0.6867	0.0122	56.13	0.0000	0.6358	0.7698	0.0282	27.26	0.0000	0.7264
log10perf	0.0766	0.0096	7.96	0.0000	0.0913	0.2812	0.0160	17.6	0.0000	0.3409	0.1174	0.0254	4.62	0.0000	0.1324
log10nma	-0.2754	0.0113	-24.43	0.0000	-0.2704	-0.3621	0.0166	-21.82	0.0000	-0.4317	-0.1460	0.0249	-5.87	0.0000	-0.1674
msci	1.0029	0.0475	21.11	0.0000	0.2317	0.0459	0.0406	1.13	0.2580	0.0103	-0.1133	0.1035	-1.1	0.2730	-0.0237
vola	1.3619	0.1572	8.66	0.0000	0.0810	0.9129	0.1460	6.25	0.0000	0.0521	0.8191	0.3728	2.2	0.0280	0.0432
gbi	-1.8474	0.1004	-18.4	0.0000	-0.1503	-0.3335	0.0909	-3.67	0.0000	-0.0265	-0.6228	0.2473	-2.52	0.0120	-0.0427
gold	0.1128	0.0349	3.24	0.0010	0.0224	-0.0688	0.0329	-2.09	0.0360	-0.0132	-0.1489	0.0838	-1.78	0.0760	-0.0261
libor	-0.0112	0.0014	-8.06	0.0000	-0.0644	-0.0025	0.0012	-2.04	0.0410	-0.0144	-0.0020	0.0034	-0.6	0.5460	-0.0105
cds	-0.0005	0.0001	-5.54	0.0000	-0.0442	-0.0001	0.0001	-1.59	0.1120	-0.0115	-0.0004	0.0002	-1.77	0.0770	-0.0299
cons	0.7143	0.0168	42.48	0.0000	.	0.2620	0.0152	17.22	0.0000	.	0.1731	0.0335	5.17	0.0000	.
	F(10, 14885) = 1151.61; Prob > F = 0.0000 R-squared = 0.4362; Adj R-squared = 0.4358 Root MSE = .23216					F(10, 8082) = 2353.02; Prob > F = 0.0000 R-squared = 0.7443; Adj R-squared = 0.7440 Root MSE = .15436					F(10, 1420) = 443.01; Prob > F = 0.0000 R-squared = 0.7573; Adj R-squared = 0.7556 Root MSE = .16716				

Table 8: Standardized Beta Coefficients from ordinary least square (OLS) regressions applied to different quintiles of two month performance

This table displays the standardized beta coefficients of ordinary least square (OLS) regressions of independent variables listed in Table 3 on the percentiles of two month net redemptions of fund shares. The sample covers the two month net redemptions of the entire sample over the period from March 2008 to April 2010.

	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile
evtperf2m	0,1777***	0,0203	0,0733***	0,1377***	0,1048***
evtperf	0,4714***	0,2884***	0,2265***	0,2404***	0,4113***
log10perf	0,0283	0,2081***	0,2030***	0,3691***	0,3592***
log10nma	-0,1686***	-0,3978***	-0,3677***	-0,5060***	-0,4871***
msci	0,1913***	0,2545***	0,1436***	0,1543***	0,2115***
vola	0,0300***	0,1640***	0,1194***	0,1072***	0,0746***
gbi	-0,1010***	-0,1452***	-0,1243***	-0,1442***	-0,1125***
gold	0,0568***	0,0283	-0,0348***	-0,0216	0,0281***
libor	-0,0504***	-0,1559***	-0,0914***	-0,0571***	-0,0251
cds	0,0972***	-0,0507**	-0,0638***	-0,0942***	-0,0413***
money market funds	-0,0644***	-0,0424***	-0,0247*	0,0528***	0,0873
mortgage funds	-0,0187***	-0,0688***	-0,0478***	-0,0029	0,0094
balanced funds	-0,1362***	-0,1858***	-0,0594***	0,0435***	0,0818***
fixed income funds	-0,1333***	-0,1991***	-0,0296*	0,1158***	0,1401***
convertible funds	-0,0272***	-0,0430***	0,0087	0,0226*	0,0483***

*** 99% significance level, **98%significance level, *95%significance level

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