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Insurance companies as shock absorbers in the mutual fund sector: contrarian investment behavior and market stabiliser

by Falko Fecht, Stelios Kotronis, and Huiting Xu

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SUMMARY

Focus

How do insurance companies influence the stability of mutual funds when these face severe net outflows? Insurance companies are significant investors in mutual funds and are widely perceived as liquidity providers and contrarian traders. Mutual funds, especially those invested in illiquid underlying assets (e.g., corporate bonds) are often seen as fragile and prone to liquidity crises. This paper investigates the investment behavior of European insurance companies in mutual funds, particularly during periods when funds face significant net outflows, and examines their role in stabilizing the market.

Methodology

The study utilizes Solvency II data from the European Insurance and Occupational Pensions Authority (EIOPA), detailing insurers' portfolio holdings on a security-by-security basis. This data is matched with fund-level information from Lipper/Eikon, including net inflows, returns, and total net assets. The analysis employs panel regressions with time-varying insurer and fund fixed effects to assess whether insurers purchase fund shares when the funds experience elevated net outflows and to evaluate how insurers' financial health influences these investment decisions.

Key Findings

Contrarian Trading Behavior: Insurance companies tend to purchase fund shares when other investors are divesting, especially during periods of severe net outflows. This contrarian behavior is more significant for fixed income funds that face large net outflows, with insurers purchasing a substantial portion of them.

Affiliation Impact: Insurers act as contrarian traders particularly to funds affiliated with them, purchasing significantly more shares of these funds compared to unaffiliated ones.

Solvency II Requirements: The contrarian trading of insurers varies as a function of their solvency ratios. Insurers with lower solvency ratios purchase fewer shares of funds that experience elevated net outflows, indicating that their financial health affects their ability to act as contrarian traders.

Fund Resilience: Funds with insurer investments exhibit lower flow-to-performance sensitivity and reduced volatility of flows, suggesting that insurers' support enhances mutual funds' resilience.

Conclusion

The investment patterns uncovered in the research paper provide interesting insights for the stability of the financial system. Firstly, by acting as contrarian traders, particularly to affiliated funds, insurers help mitigate the impact of potential investor runs and enhance market resilience. Secondly, they suggest that the contrarian trading of insurers may prove more modest in times of severe systemic stress when insurers' own financial health comes under pressure. The loss of this stabilising force could leave mutual funds more vulnerable to panic-induced withdrawals and exacerbate financial turbulences.

Insurance companies as shock absorbers in the mutual fund sector: contrarian investment behavior and market stabilizer

Falko Fecht* Stelios Kotronis† Huiting XU‡

Abstract

This paper studies specific ties between different types of non-bank financial intermediaries by looking into the portfolio investments of European insurance companies in mutual investment fund shares. Using Solvency II data on insurer portfolio holdings, we document that insurers purchase fund shares when other investors divest. We find that insurers act as contrarian traders towards funds that are experiencing large outflows, especially if they are affiliated. Depending on the fund's underlying assets, this contrarian trading could effectively result in providing liquidity support. However, this investment behavior varies with the issuer's fulfillment of Solvency II capital requirements, suggesting that it depends on the insurer's own financial health. We also show that funds in which insurers hold a stake benefit from a lower flow-to-performance sensitivity and a lower volatility of flows compared to their peers supporting the view that insurers' contrarian behavior improves the resilience of investment funds.

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*Frankfurt School of Finance & Management, Deutsche Bundesbank
†European Insurance and Occupational Pensions Authority
‡Frankfurt School of Finance & Management

1 Introduction

Insurance companies are key investors in investment funds sector.[1] While insurance companies are widely perceived as liquidity providers and contrarian traders stabilizing financial markets (Chodorow-Reich, Ghent, & Haddad, 2021; Timmer, 2018), some open-ended mutual funds are seen as inherently fragile and susceptible to liquidity crises forcing funds into fire sales (Chen, Goldstein, & Jiang, 2010; Falato, Hortacsu, Li, & Shin, 2021). The open-ended structure guarantees investors redemption at net asset value and, for funds invested in illiquid underlying e.g., corporate bonds, gives early redeeming investors a first-mover advantage when expecting large-scale withdrawals, giving rise to panic-induced liquidity crises. Recent prominent cases of investor runs on investment funds such as H2O Asset Management and Woodford Investment Management's funds in summer 2019, as well as at Swiss asset manager GAM in 2018, among the others, have been given ample coverage by financial media worldwide and have put the question of liquidity in the spotlight (Thompson (2019)). Banks with their large liquidity pools and access to central bank facilities serve as a liquidity backstop to affiliated mutual funds facing significant outflows (Bagattini, Fecht, & Weber, 2019; Fecht, Genc, & Karabulut, 2020). However, insurance companies, as other deep-pocket investors and given their long-term liabilities, might also act as contrarian traders and effectively provide liquidity support in some cases.

In this paper, we analyze insurance companies' portfolio investments in mutual investment funds. Specifically, we aim to identify how insurers react to investors' runs on funds in which they own a stake. We use a unique regulatory data set from the European Insurance and Occupational Pensions Authority (EIOPA) covering, for each insurance company[2] domiciled in the European Economic Area, the holdings of mutual fund shares on a security-by-security basis. We match these data to fund-level information obtained from Lipper/Eikon on net inflows and fund characteristics such as returns and the fund's total net assets. Based on these data, we study whether insurance companies tend to purchase fund shares of funds that experience elevated net outflows (defined as "distressed" funds throughout the paper). Our results show that insurance companies are contrarian traders and, indeed, could serve as liquidity providers to distressed funds invested in illiquid underlying, e.g., bond funds, which are often seen as fragile and prone to liquidity crises. Using panel regressions saturated with fund and time-varying insurer fixed effects, we find that

[1] For example, as of 2019, the stock of EEA insurers' exposure to Euro-area investment funds compares to almost 10% of the outstanding funds shares domiciled in Euro-area. This high level estimation is based on data sourced by EIOPA Statistics, solo quarterly asset exposures statistics which can be retrieved from: `https://www.eiopa.europa.eu/tools-and-data/insurance-statistics_en` and a publication of Deutsche Bundesbank Monthly Report October 2019, which is retrieved from `https://www.bundesbank.de/resource/blob/811964/5596189fab34ee46da28dcb380f4a129/mL/2019-10-investmentfonds-data.pdf`.

[2] By referring to insurers, insurance sector, insurance companies etc. we refer to all types of insurers i.e., life, non-life, composites, and reinsurers.

an insurance company tends to purchase fund shares of a fund that experiences a particularly severe outflow from other investors. These findings are particularly pronounced for distressed fixed income funds: the average insurer purchases 10 bps, which corresponds in total to a purchase of 4% of the outflows by the insurance sector. However, this contrarian behavior is largely confined to distressed funds of asset management companies affiliated to the insurer: for fixed income funds, we find that insurance companies purchase 6 times more fund shares of affiliated distressed funds than of unaffiliated distressed funds.

In order to test whether this investment behavior varies with insurers' ability to engage in contrarian trades, we use the heterogeneity across different insurers, in particular in the fulfillment of Solvency II requirements. Solvency II was introduced in 2016 and requires insurance companies to meet capital requirements to ensure sufficient loss-bearing capacity, similar to Basel II capital requirements. Equivalent to the Basel III counter-cyclical capital buffers for banks, Solvency II capital requirements for insurance companies include some counter-cyclical adjustments. For example, regarding the symmetric adjustment for equity risk, it is expected to be positive (i.e., the capital requirement is higher than the average) when markets have risen recently and negative (i.e., the capital requirement is lower than the average) when equity markets have dropped in the previous months. Interestingly, we find that insurance companies that are relatively poorly capitalized (have a solvency ratio of less than 150% of their Solvency II requirements, which ranks between the bottom 10% and 25% of the distribution) purchase on average 50% fewer fund shares of a distressed bond fund than a better capitalized insurer.

In the next step, we provide some evidence supporting the view that, indeed, the contrarian behavior of insurance companies towards mutual funds or the anticipation of it by other market participants, increases mutual funds' resilience. In order to do so, we compare in panel regressions the net flow volatility and the sensitivity of flows to past performance of funds affiliated to an insurer to those not affiliated. The volatility of net flows is a simple and rough proxy for the variation in a fund's net liquidity flows from new issuance and redemption of fund shares, where extreme outflows might be driven by panic-induced investor runs. An elevated sensitivity of fund flows to past performance, especially negative past performance, is perceived in the literature as an indication of investors' panic-induced withdrawals, identifying particularly fragile funds (Chen et al., 2010). Controlling for fund and time fixed effects as well as time-varying fund controls, we find that funds in which at least one insurer is currently invested have both a significantly lower flow volatility and a significantly muted flow-performance sensitivity. Interestingly, though, this effect is not driven by affiliated funds: neither for funds issued by an affiliated asset management company nor for funds issued by an affiliated asset manager *and* currently held by the insurer we find a significantly lower flow volatility and a lower flow-performance sensitivity.

These results support the view that insurers' contrarian trading behavior in mutual fund shares could provide essential liquidity support to mutual funds, and thereby increase their resilience. Actual investments or past trades by insurers appear to be more important to contain panic-induced withdrawals than the pure affiliation of the issuing asset manager with the insurer.

Our findings have important implications. They show that investment ties between different non-bank financial intermediaries, specifically insurance companies and mutual investment funds, can help to increase resilience of the more fragile entities. However, our results also show that the ability or willingness to provide support depends on insurance companies' own financial health. Thus, in times of severe systemic stress, insurers might not serve as a liquidity backstop to mutual funds, increasing their fragility and aggravating financial turbulence.

The remainder of the paper is organised as follows. In section 2, we discuss the related literature and the institutional background. In section 3, we present the data and its trimming, as well as some key descriptive statistics. In section 4 we investigate the investment behavior of insurers and the role of the affiliation and capital solidity. Section 5 focuses on whether affiliation plays a role in the stability of a fund, trying to identify the most prominent aspects of the affiliation nexus. The paper concludes with Section 6.

2 Related literature and Institutional Background

2.1 Related literature

The paper directly contributes to the literature on insurers' trading behavior. The evidence of insurers' trading strategies is mixed. For example, Bijlsma and Vermeulen (2016) studied the market in the Netherlands and found that insurers trade pro-cyclically during the sovereign crisis period, while Timmer (2018), focusing on the German market, suggested that insurers trade counter-cyclically during the sovereign crisis period. Fache Rousová and Giuzio (2019) explain this mixed evidence by a simple theoretical model. They also show empirically that insurers trade counter-cyclically if government bonds move due to the risk-free interest rate and pro-cyclically if the move is due to a variation in the risk premium. These results, however, are only valid for insurers' holdings of foreign government bonds, while insurers' holdings of domestic bonds appear to receive preferential treatment. In particular, they find that insurers tend to respond counter-cyclically (rather than pro-cyclically) to changes in the risk premia of their own sovereign.

Our paper is unique in terms of the data used. It is the first to utilize granular fund holding data since the start of the Solvency II, while the above papers do not explicitly take into account this regulatory regime. This is important since Solvency II introduced a marked-to-market valuation approach, which was a regime shift compared to the previous period, and this could have affected the investment behavior of insurers.

Moreover, our paper relates to the role of a financial conglomerate as a market stabilizing mechanism, with a particular focus on insurers. Bagattini, Fecht, and Weber (2019) and Fecht et al. (2020) documented that parent banks provide liquidity support to their affiliated mutual funds. Golez and Marin (2015) finds that the affiliated mutual funds will also support their parent bank around the seasoned equity issues. Regarding the insurance sector, our paper is the first to document the sector's role in stabilizing the investment fund market.

Last but not least, this paper relates to studies of the fund return-flow relationship. In fact, we study this relationship to investigate whether the affiliation of a fund to insurers weakens or strengthens it, aiming at understanding the stabilization role of insurers for the mutual funds sector. Ippolito (1992) found a positive relationship between past performance and future fund growth rate, both theoretically and empirically. More recently, Ivković and Weisbenner (2009) studied the impact of past performance on near-future fund flows, suggesting an asymmetric mechanism between positive and negative past returns. The inflows are sensitive to relative past performance, while the outflows are sensitive only to absolute past performance. Carhart (1997) found that funds with strong past performance tend to perform well in the following year. In contrast, those with weak past performance continue to underperform. Such findings may also explain the positive relationship between past returns and current flows. Chen et al. (2010) empirically tests the fund investors' strategic complementarity. They find that the strategic complementarity is more significant for funds with less liquid assets and less significant for funds with a larger proportion being held by institutional investors.

2.2 Institutional Background

In January 2016, the Solvency II regulatory framework entered into force (EIOPA, n.d.). It was introduced to protect policyholders by ensuring that insurance companies have adequate capital and risk management systems to meet their obligations to policyholders, even in adverse market conditions. It also aims to promote financial stability in the insurance sector by reducing the likelihood of insolvencies and contagion risks to prevent potential systemic risks to the wider financial system.

Under Solvency II, insurance companies are required to maintain a level of capital to ensure that they can absorb potential losses and remain solvent over a one-year time horizon with a 99.5% confidence level. The capital requirement is calculated based on the insurance company's risk profile, assets, and liabilities.

From a balance sheet perspective, Solvency II prescribes a market-consistent valuation. Assets and liabilities are valued based on a mark-to-market approach wherever possible, prescribing a hierarchy of alternative valuation methods for assets otherwise. A key aspect of such a market-consistent approach is that liabilities of insurance companies are priced using a discount curve that is based on the swap curve.

Fund investments have a relevant share in the asset allocation of insurance companies. The holdings of funds account for almost 20% of insurers' investments, which suggests their importance in the context of their asset and liability management and their asset allocation strategy. From this point of view, it is reasonable to expect that, to some extent, the delegation of investment can take the form of investing in in-house (e.g., from within the group asset manager) funds, which can also be tailor-made to reflect characteristics of the liability portfolio.

The level playing field ensured by the regulation provides a natural set-up on which we can test our hypotheses. Interestingly, the introduction of Solvency II coincided with the low interest rates period, which spans through our sample period, and attracted a lot of attention both in the research literature as well as from a supervisory perspective. Low interest rates can influence the investment behavior of investors and of insurance companies. The returns on traditional fixed-income investments, typical asset class held by insurers, reduced or even became negative. This can also incentivize investors to seek alternative investments that offer higher returns, but by accepting higher risks.

From this point of view, the sample period we are using in the analysis might have been fundamentally tight for insurers' economic model, which means that the evidence of contrarian behavior in our sample might actually be even more pronounced during periods with higher interest rates.

3 Sample and variables

3.1 Data source

Our analysis is based on two samples. The first sample is used to assess the trading behavior of insurance companies in mutual fund shares. It comprises the investment fund records of insurance companies domiciled in the EEA reporting for Solvency II and captures the direct fund holdings for insurers. This data allows us to derive insurers' quarterly investment decisions in mutual investment fund shares. We match these implied fund share transactions by each insurer with fund-level net inflows, returns, and other fund share characteristics obtained from Lipper Eikon's Global Fund Flow function. We also included a number of fund characteristics, such as geographical and investment focus, domicile, currency, launch and liquidation date, the fund's management company, and whether it is dedicated to institutional clients or open to retail investors, provided by Eikon's Fund Screener function.

Since our interest lies in studying the role of insurers as absorbers of instability in the mutual funds sector, we exclude funds that only manage insurers' assets. Finally, to identify insurers' affiliated funds, in parallel to the reported data on insurers' group structure, we also use a hand-collected matching list to match insurers and asset management companies that belong to the same insurance group.

The second sample is used to compare the stability of funds which are affiliated to insurers against the stability of their peers. For this data set, we consider all open-ended mutual funds domiciled in Europe that are reported in the Eikon Lipper Dataset, as well as their fund characteristics and the asset management firms (AMFs). It varies at the fund-quarter dimension but has a wider fund coverage than the first sample. We are then able to identify funds that are 1) issued by an asset management firm that belongs to an insurance group, 2) funds whose shares are held by an insurance company, or 3) funds that fit both features. We use these different criteria to study the effect of affiliation under various definitions.

3.2 Key variables construction

We are interested in identifying fund flows net of the trade of a specific insurer, or – depending on the specification – net of the trades of all insurers in the sample. In order to derive this measure, we first calculate the change in a fund's total net assets (TNA) while netting out the change in the market value of the portfolio and normalize by the fund's TNA as follows:

$$\text{Fund\_flows}_{jt} = \frac{\text{TNA}_{jt} - \text{TNA}_{jt-1} \times R_{jt}}{\text{TNA}_{jt-1}}. \tag{1}$$

Similarly, we define fund flows generated by a single investor (in our case, an insurer) starting from its holding of fund share j in market value terms in the following way[3]:

$$\text{Insurer\_flows}_{ijt} = \frac{\text{Holding}_{ijt} - \text{Holding}_{ijt-1} \times R_{jt}}{\text{TNA}_{jt-1}}. \tag{3}$$

In this way, we express the insurer's trade in the same unit of measure as Fund flows$_{jt}$. We also aggregate the $Insurer\_flows_{ijt}$ along the i dimension, i.e., aggregate all insurers holding changes over fund j in quarter t. We denote it as $Insurer\_flows_{jt}$.

[3]An alternative definition that we essentially only use, e.g., to check the robustness of the results, is the following:

$$\Delta\text{Holding}_{ijt} = \frac{\text{Holding}_{ijt} - \text{Holding}_{ijt-1} \times R_{jt}}{\text{Holding}_{jt-1}}, \tag{2}$$

where i denotes the insurance company, j denotes the fund share, t denotes the quarter, and R_{jt} is the gross return of the fund's portfolio in period t.

Next, we can construct the percent fund flows from investors net of insurance company i's trade:

$$\text{Net\_flows}_{ijt} = \text{Fund\_flows}_{jt} - \text{Insurer\_flows}_{ijt}. \tag{4}$$

Finally, to compare the reaction of the insurance sector against the other investors, we need a measure of fund flows that is exogenous to the insurance sector. Therefore, we construct the percent fund flows originating from outside our sample of insurers[4]:

$$\text{Net\_flows}_{jt} = \text{Fund\_flows}_{jt} - \sum_{i=1}^{I} \text{Insurer\_flows}_{ijt}, \tag{5}$$

As the last variable of interest, we define the fraction of a fund j that is owned by insurance companies:

$$\text{Insurer\_stake}_{jt} = \frac{\sum_{i=1}^{I} \text{Holding}_{ijt}}{\text{TNA}_{jt}}. \tag{6}$$

In addition to the above-mentioned variables, we also apply various moderators and controls throughout the analysis. We introduce these variables in the relevant sections of the paper.

3.3 Descriptive statistics

We restrict the first sample to the following types of funds: bond, equity, mixed assets, and money market. This results in more than 423,702 observations at an insurer-fund-quarter level. The time of the sample ranges from 2016Q4 to 2020Q4, in a total of 17 quarters. There are slightly more than 12 thousand different investment funds, among which almost 1500 funds have the affiliation status, i.e., issued and held by the same insurance group. Within the data 73,927 monthly fund flows are negative, and 66,531 monthly fund flows are non-negative.

When we break down the insurer-fund-quarter level sample by fund's asset type (Table 1), there are around 28% observations on bond funds, 48% on equity funds, 18% mixed assets, and around 6% money market funds. If we look at the distinct number of portfolios, we will see that we have 3265 bond funds, 5770 equity funds, 2915 mixed assets funds, and 479 money market funds.[5] We further break down the sample by insurer types: 55% of observations are from life insurers, 22% from non-life insurers, and 22% from composite insurers, and less than 1% observations are from reinsurers.

The pie charts from Figure 1 take 2018Q2 as a reference date and reveal the value composition of the second sample. The left panel is based on all asset types for all aggregated

[4]In the rest of the paper, we will refer to the summation of insurers' flows as $Insurer\_flows_{jt}$.

[5]Some funds are changing type across time, hence the "by type" of fund counting cannot be directly reconciled with the overall counting provided before.

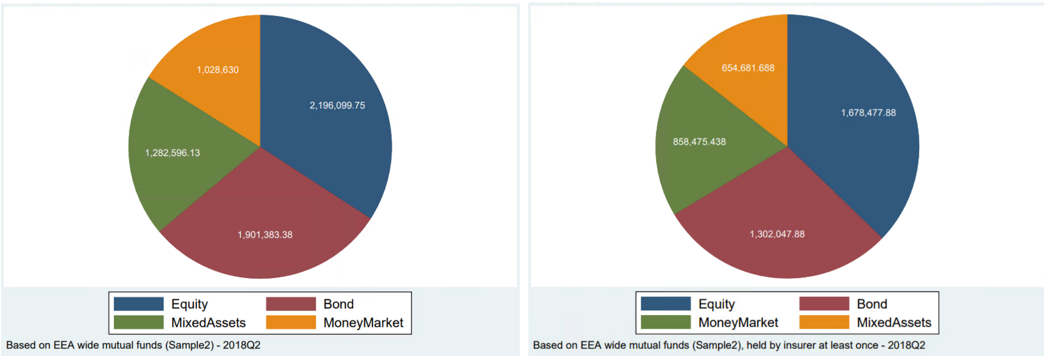
Table 1: Frequency count for sub-samples

Sample split by fund asset type	Freq.	Percent	Cum.
Bond	119,998	28.32	28.32
Equity	203,016	47.91	76.24
Mixed Assets	75,690	17.86	94.10
Money Market	24,998	5.99	100.00

Sample split by insurer(investor) type	Freq.	Percent	Cum.
Life	232,843	54.95	54.95
Non-life	93,123	21.98	76.93
Composite	93,966	22.18	99.11
Reinsurer	3,770	0.89	100.00

EEA-wide mutual funds, and the right panel is based on EEA-wide mutual funds but held at least once by insurance companies during the sample period.

Figure 1: Aggregated fund value (mil. euro) over different asset types



Both pie charts show a similar split. The values of bond funds and equity funds held by insurance companies at least once are not equal, but still close to each other. However, based on Table 1, the number of transactions for bond and equity funds executed by insurance companies are not close to each other e.g., indicating that insurance companies trade bond funds with a larger value per transaction, or with lower frequency relative to equity funds, or a combination of both.

An overview of the descriptive statistics for some of the variables used in the paper is shown in Table 2. The upper part of the Table 2 describes variables at the fund-quarter level, and the lower part of this table introduces variables at insurer-fund-quarter dimensions.[6]

The distress dummies are based on the Net flows (each in the corresponding dimension), taking a threshold of -5%. Table 2 shows that there are around 21%-22% observations falling within the definitions of distress.

$Affiliation_{ijt}$ is a binary variable equal to 1 if, in quarter t, the following two conditions hold: a) the fund is held by an insurance company, and b) it is issued by an asset management company that belongs to the same insurance group as the fund holder insurer. Otherwise, it equals 0. In the sample, about 5.6% of the observations indicate an affiliation status.

[6]The variables are created before winsorization, but the statistics are reported after winsorization. Also, the entire sample is split on the basis of the aggregate flows at ij, hence e.g., in the ijt dimension there might still be negative flows in column (2).

Table 2: Descriptive statistics for variables at insurer-fund-quarter dimension.

	(1) entire sample			(2) non-negative fund flow			(3) negative fund flow		
	count	mean	sd	count	mean	sd	count	mean	sd
Fund_flows$_{jt}$	130,618	0.3992	12.4914	56,691	8.9814	12.5702	73,927	-6.1820	7.3977
Insurer_flows$_{jt}$	140,458	-0.0110	2.2212	66,531	0.3406	2.3765	73,927	-0.3275	2.0198
Net_flows$_{jt}$	130,618	0.3826	11.5452	56,691	8.1980	11.6352	73,927	-5.6107	6.9953
Distress$_{jt}$	140,458	0.2021	0.4016	66,531	0.0000	0.0000	73,927	0.3840	0.4864
N	140,458			66,531			73,927		
Insurer_flows$_{ijt}$	404,896	-0.0024	0.7548	177,592	0.0866	0.8342	227,304	-0.0720	0.6782
Net_flows$_{ijt}$	400,702	0.2690	11.5303	173,398	8.4536	11.4373	227,304	-5.9747	6.6703
Distress$_{ijt}$	423,702	0.2193	0.4138	195,733	0.0020	0.0449	227,969	0.4059	0.4911
Affiliation$_{ijt}$	423,702	0.0568	0.2314	195,733	0.0677	0.2512	227,969	0.0474	0.2126
N	423,702			195,733			227,969		

The middle and right panels are subsample statistics split by fund flows. The mean and standard deviation columns are rounded to 4 digits after decimal points.

The proportion of affiliated funds is slightly larger in the non-negative portfolio subsample. Need to notice that the *Affiliation* variable is a fund-insurer-quarter specific variable. As the second sample varies at the fund-quarter dimension, the respective variable to capture affiliation essentially collapses to the fund-quarter level.

Table 3: Descriptive statistics for the whole sample with funds domiciled in the European Economic Area.

	(1) entire sample			(2) non-insurer-held			(3) insurer-held		
	count	mean	sd	count	mean	sd	count	mean	sd
Fund_flows$_{jt}$	374,314	1.2601	18.3993	220,131	1.2641	19.4092	154,183	1.2543	16.8530
Funds' total net asset value (mil. euro)	393,410	279.78	930.98	234,018	143.01	431.00	159,392	480.58	1341.17
Insurer stake (in %)	125,553	9.7242	22.1094	0	-	-	125,553	9.7242	22.1094
Institutional stake	392,391	0.2023	0.3582	233,494	0.1957	0.3687	158,897	0.2121	0.3420
Fund return	374,029	1.2792	6.6971	220,207	1.1455	6.4132	153,822	1.4706	7.0792
Fund alpha	373,601	0.0167	0.1755	219,875	0.0165	0.1777	153,726	0.0170	0.1722
Affiliation$_{jt}$	393,556	0.0113	0.2023	234,128	0.0000	0.0000	159,428	0.0279	0.1646
N	393,556			234,128			159,428		

The sample varies at the fund-quarter dimension. The Middle and Right panels are subsample statistics split by fund returns. The mean and standard deviation columns are rounded to 4 digits after decimal points.

Table 3 describes the statistics for our second sample, which constitutes all open-ended mutual funds available from the Refinitiv Lipper database and domicile in the European Economic Area[7].

To be consistent with the first sample, we also restricted the second sample to funds with asset types of bond, equity, mixed asset, and money market only. In the end, we have 393,556 observations in the second sample. There are 30,379 distinct portfolios, which is

[7]In total 30 countries are included: AUS, BEL, BGR, HRV, CZE, DNK, EST, FIN, FRA, DEU, GRC, HUN, ISL, IRL, ITA, LVA, LIE, LTU, LUX, MLT, NLD, NOR, POL, PRT, CYP, ROU, SVK, SVN, ESP, SWE.

around 2.5 times the distinct portfolio counts of the first sample (12,128). In the sample, there are 10,884 funds being held at least once by insurance companies.

Table 3 is split into three columns. The first column reports the statistics from the entire sample. The third and second columns report the statistics from two subsamples of funds which are at least once held by an insurance company versus those never held by an insurance company, respectively.

Looking at the statistics in more detail, the Fund_flows_{jt} variable has a mean value of 1.26%, larger than the statistic from Table 2. The average for the funds that insurers never held is very similar to the one for funds that insurers at least held once. The standard deviation for Fund_flows_{jt} from the insurer-held subsample is slightly lower than that from the non-insurer-held subsample. In addition, the mean value for the funds' total net asset value is different in the two subsamples. The total fund value for insurance company-affiliated funds is significantly larger than the rest, even though the rest of the funds can be affiliated with, e.g., a bank holding group.

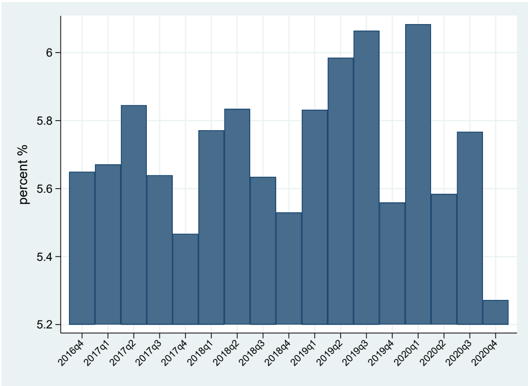
The insurer stake (in %) measures the proportion of a mutual fund held by insurance companies in percentage points. Conditional on being held by insurance companies, 9.7% of a fund's total assets is under the holding of insurance companies on average. Moreover, the variable institutional stake is how much of the fund is retained by institutional investors, which is about 20% for both samples.

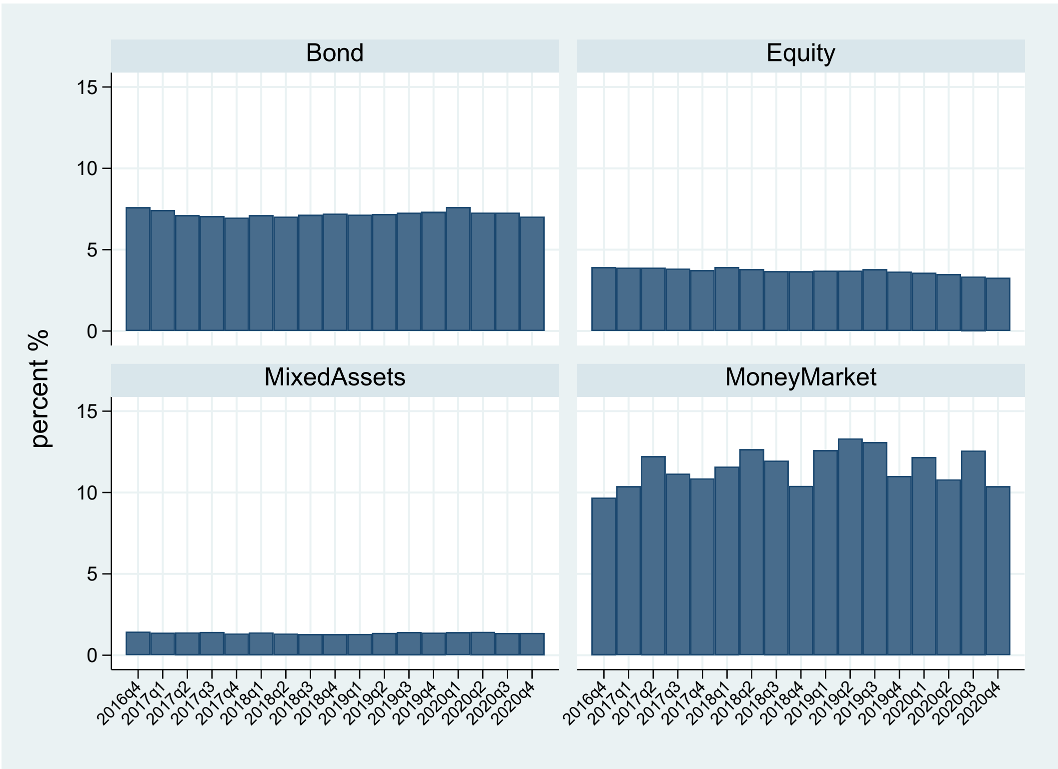
The second part of the table displays the descriptive statistics for more general fund characteristics variables. The affiliation variable is essentially the collapsed (at fund-quarter level) version of the one in Table 2. Intuitively, the variable $\text{Affiliated}_{j,t} = 1$ if in quarter t both conditions below hold: a) the fund is held by an insurance company and b) it is issued by the asset management company that belongs to the same insurance group of the fund holder insurer. Otherwise, the variable = 0.

Figure 2 displays the insurer's share of the fund value from 2016Q4 to 2020Q4. The calculation is based on funds that were at least held by insurance companies once. The plot on the upper side of the figure displays the overall sample development over time. The insurer holding proportion ranges between 5.2% to 6.1%. The data shows a seasonal trend, with the fourth quarter always having the lowest insurer-holding-penetration rate of the year. The bottom four plots show the same data by type of fund. The seasonality is not obvious except for the money market funds. Generally, the proportion of insurers' holdings is highest in money market funds. The figure is almost always larger than 10% and reaches the highest 13% in 2019Q2. The insurer holding penetration rate for money-market funds is more volatile than that of other asset-type funds.

Insurance companies also hold a notable share of the bond funds market; the insurer holding penetration rate is around 6%-7.5% with equity fund holding relatively lower in

Figure 2: Time series plots for the insurer holding proportion over total fund value

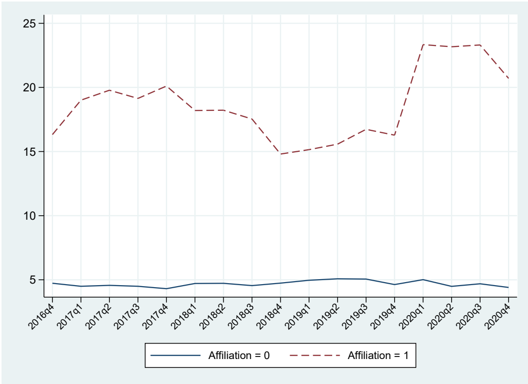


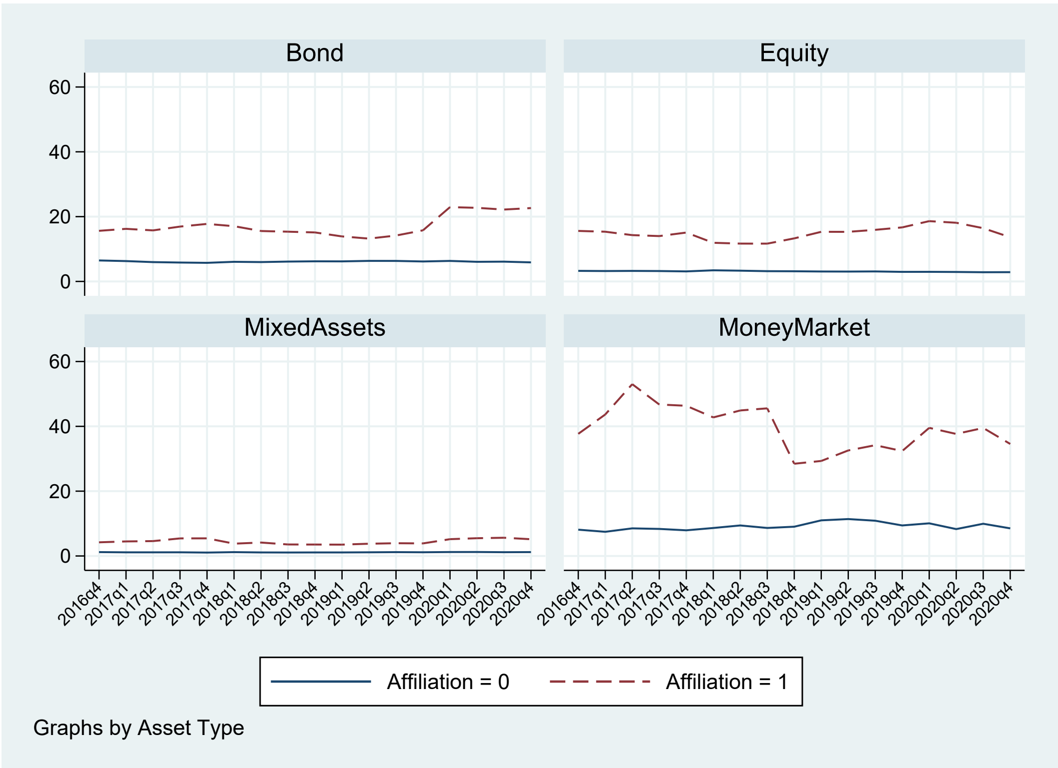


The horizontal axis is year-quarter; the vertical axis is the insurer holding penetration rate, which equals the quarterly aggregate insurance companies' total fund holdings divided by the quarterly aggregate total fund values. The calculation is based on funds that were at least held by insurance companies once during 2016q1-2020q4.

relative terms with the percentage holdings less than 5%. The holding over mixed assets is the lowest, only around 2%.

Figure 3: Time series plots for the insurer holding value over total fund value, separating funds by affiliated versus non-affiliated feature.





The horizontal axis is year-quarter; the vertical axis is the aggregated insurer holding percent, which equals all insurance companies' holding amount of a fund divided by the fund's total value. The red dashed line represents funds that are affiliated (held and issued by the same insurance group), and the blue line represents the funds not being affiliated. The calculation is based on the insurers and funds that appeared in the first sample.

Figure 3 plots the same type of graph as in Figure 2, but it incorporates more information. In fact, it also includes the dimension of Affiliation_{jt} by showing how holdings vary depending on that status. In more detail, the horizontal axis of the plots gives the time dimension of year-quarter. The vertical axis is the insurer holding penetration rate, following the same structure as the previous graph. The bottom line is that insurers hold a higher proportion of their affiliated funds compared to non-affiliated fund investments.

4 Insurers investing in the mutual fund market

In this section, we focus on the question of whether insurers act as contrarian traders or not by investigating how their investment decisions depend on fund flows, especially in the case of extreme outflows and a run on the fund. Subsequently, we investigate whether affiliation could explain the relationship in the cross-section, whereas the last part of the section focuses on the role that capital solidity has on the capacity of insurers to act as a contrarian traders.

4.1 Insurers' investment behavior with respect to mutual funds

Firstly, we investigate how the investment decisions of insurers depend on fund flows, with particular interest in the cases of extreme outflows. In other words, we want to study how insurance companies' direction of trade is compared to other types of investors.

The risk of running on mutual funds arises because when asset managers have to sell illiquid assets at a discount to meet large redemptions, investors are incentivized to exit faster than the others, in case the liquidation value of fund shares declines the longer investors wait to exit. However, investors might incur losses by withdrawing their funds during a liquidity crisis instead of waiting for a share price reversal.[8] As insurance companies are long-term investors, we conjecture that they tend to hold on to their assets in such instances.

We address this question by estimating the following fixed-effects panel specifications. We focus mainly on Eq.(8), of which Eq.(7) is the main building block.

$$\begin{aligned}\text{Insurer\_flows}_{ijt} =& \beta_1 \cdot \text{Net\_flows}_{ijt} + \beta_2 \cdot \text{Net\_flows}_{ijt} \times \text{Distress}_{ijt} \\ &+ \beta_3 \cdot \text{Distress}_{ijt} + \alpha_j + \gamma_{it} + \epsilon_{ijt}\end{aligned} \tag{7}$$

$$\begin{aligned}\text{Insurer\_flows}_{jt} =& \beta_1 \cdot \text{Net\_flows}_{jt} + \beta_2 \cdot \text{Net\_flows}_{jt} \times \text{Distress}_{jt} \\ &+ \beta_3 \cdot \text{Distress}_{jt} + \alpha_j + \gamma_t + \epsilon_{jt}\end{aligned} \tag{8}$$

We start from Eq.(7), where $Insurer\_flows_{ijt}$ is the relative change of insurer i's position in fund j during quarter t, scaled by fund total assets at $t-1$. *Net flows*$_{ijt}$ represents fund j's percent flows net of those generated by insurer i's investment, and *Distress*$_{ijt}$ is a dummy that takes the value of 1 if *Net flows*$_{ijt} < -5\%$, a threshold that is in the left tail of the distribution, but still sufficient to include almost 20% of (the first) sample. The α_j is fund fixed effects, trying to capture the fund-specific characteristics. The γ_{it} are insurer-quarter fixed effects that capture the average trade of an insurance company in order to account for the changing size of the mutual fund portfolio independent of specific fund characteristics.

[8]This is especially true if funds apply forms of penalization for investors redeeming shares in a crisis, such as swing pricing, which adjusts funds' net asset values to pass on funds' trading costs to transacting shareholders.

The Eq.(8) aggregates the $Insurer\_flows_{ijt}$ along the i dimension, i.e., aggregates all insurers holding changes over fund j in quarter t. Similar aggregation is followed for the $Net\,flows_{jt}$. The $Distress_{jt} = 1$ if $Net\,flows_{jt} < -5\%$. Because Eq.(8) varies at the fund-quarter level, we cannot identify the specific insurer i, so in the fixed effects, we replace the insurer-quarter fixed effects with quarter fixed effects.

We formulate the following hypothesis:

Hypothesis 1: *In equation (8), $\beta_2 < 0$: when a fund in an insurer's portfolio is experiencing extreme outflows, insurers are contrarian traders relative to when funds are experiencing normal flows and (possibly) relative to other investors in that fund.*

In order to study insurers' contrarian behavior with respect to investor flows in normal times, we evaluate the sign and statistical significance of the coefficient β_1: we interpret a negative and significant β_1 as evidence that insurers always act contrary to the rest of the funds' investors. In case we find a positive β_1, instead, we evaluate the sign of $\beta_1 + \beta_2$ and β_2, to study insurers' relative trading direction with respect to times of extreme outflows.

Table 4: Regression at fund-quarter dimension, Eq(8)

	Dependent var: Insurer flows$_{jt}$				
	All funds	split by asset type			
		Bond	Equity	Mixed	Money market
	(1)	(2)	(3)	(4)	(5)
Net flows$_{jt}$	0.0026*	0.0053*	0.0030*	-0.0071***	0.0165*
	(1.78)	(1.68)	(1.78)	(-3.53)	(1.69)
Distress	-0.1318***	-0.2889***	-0.0213	-0.0961**	0.0171
	(-3.54)	(-3.63)	(-0.54)	(-1.99)	(0.06)
Distress × Net flows$_{jt}$	-0.0294***	-0.0476***	-0.0183***	-0.0108**	-0.0555**
	(-8.54)	(-6.54)	(-5.10)	(-2.16)	(-2.57)
constant	-0.0646***	-0.0683***	-0.0790***	-0.0271***	-0.1413*
	(-10.69)	(-4.29)	(-11.54)	(-4.51)	(-1.72)
Security fixed effects	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	130,109	34,851	59,610	30,374	5,274
R-squared	0.12	0.14	0.13	0.15	0.07

* p<0.1, ** p<0.05, *** p<0.01

This table reports coefficient estimates for regression 8. The model regresses all insurance companies' holding changes on a fund over a quarter against all non-insurance companies holding changes. The sample ranges from 2016Q4 to 2020Q4. The dependent variable is Insurer flows$_{jt}$, aggregating all insurers that trade on the fund j during quarter t. The independent variables also vary along the fund-quarter dimension only. Net flows$_{jt}$ is the fund quarter flows excluding the part driven by insurance companies; $Distress = 1$ if Net flows$_{jt} < -5\%$. We apply security fixed effects and quarter-fixed effects for all five models. All standard errors are adjusted for heteroscedasticity. Column (1) reports coefficient estimates from the entire sample. Columns (2) to (5) report coefficient estimates from the four asset type funds subsamples. The t-statistics reported in parentheses use standard errors clustered at the fund level.

Table 4 reports the coefficient estimates from regression Eq(8). Column (1) refers to the entire sample. Overall, the insurance companies' fund trading has the same direction as the non-insurance company investors and $\beta_1 + \beta_2 < 0$. For example, when the net outflows increase by one standard deviation (i.e., 6.995% from column (3) of Table 2), then insurers flows increase by almost 0.187% [9].

In order to further illustrate the results, panel (a) of Figure 4 plots Insurer_flows$_{jt}$ against Net_flows$_{jt}$ and follows the quadratic model:

$$\text{Insurer\_flows}_{jt} = \beta_1 \cdot \text{Net\_flows}_{jt} + \beta_2 \cdot \text{Net\_flows}_{jt} \times \text{Net\_flows}_{jt} + \alpha_j + \gamma_t + \epsilon_{jt} \tag{9}$$

When compared to Eq.(8), the quadratic model removes the *Distress* dummy and its interaction term. Instead, it includes the term $Net\_flows_{jt} \times Net\_flows_{jt}$. Essentially, it removes the kink at a certain negative fund flow point (the 5% threshold), and the quadratic model allows for a smooth version of the curve.

Figure 4 Panel (a) shows that when non-insurers' net flows (Net_flows_{jt}, shown in horizontal axis) are negative, the curve is downward sloping, and insurance companies are contrarian traders ($Insurer\_flows_{jt}$, shown in vertical axis). In fact, insurance companies start to buy into the fund overall when all non-insurers push the fund to have more than approximately 7.5% (horizontal axis) outflows.[10]

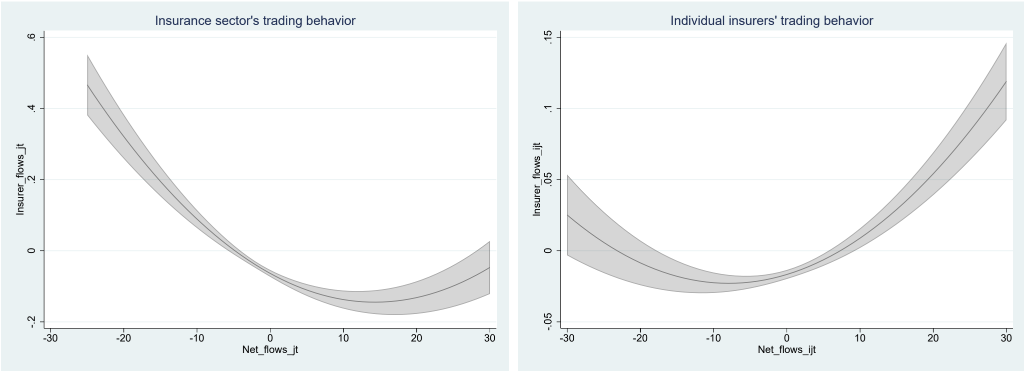
Columns (2) to (5) of Table 4 split the sample by the fund type. The results remain essentially the same, looking at corresponding β_1 and β_2. Considering all four types of funds have one standard deviation extra outflow of 6.995%, this extra outflow will drive insurers' flows to increase by almost 0.29% of the bond fund, 0.11% of the equity fund, 0.13% of the mixed asset fund, and 0.27% of the money market fund. However, for mixed funds, insurers' trade is always in the opposite direction to that of other non-insurer investors.

We now turn to Eq.(7). The model compares the trading of an insurer (instead of all insurers) against all other investors in the fund (including the non-insurers as before, but also all insurers excluding the one whose trading behavior is under investigation), hence the sample varies at insurer-fund-quarter dimensions. Table 5 reports the results and follows a similar, but not identical, format as before. Column (1) shows the results for the whole sample and then for bond (column (2)) and equity funds (column (3)), but also by life (column (4)) and non-life (column (5)) type of insurer. We also build the underlying model for Panel (b) of Figure 4.

[9] 0.187% = 0.0026 * (-6.995) + (-0.0294) * (-6.995).

[10] There would be a concern that the quadratic model can differ from the linear model results we displayed in Table 4. To address the concern, we plot the graph following exactly the underlying model used for column (1) of Table 4. The linear-kink model plot is available in Appendix Figure 7, with which we find that the trend of the curve derived from the linear-kink model is very similar to the curve derived from the quadratic model here. Later in the paper, we will only include the quadratic model plots. The linear kink plots are available on request.

Figure 4: Overall insurance companies' reaction to the non-insurance investors



(a) Overall insurers' reaction to all non-insurers (b) Individual insurer's reaction to all others

The figure illustrates the trading of insurers against the non-insurer investors in a fund. Panel (a) on the left is the quadratic regression results for fund-quarter variate data; Panel (b) is the quadratic regression results for insurer-fund-quarter variate data. Their underlying quadratic models are Eq.(9) and Eq.(10) respectively. Notice that the scales of the two-panel plots are different.

Table 5: Regression at insurer-fund-quarter level, Eq.(7)

	Dependent var: Insurer flows$_{ijt}$				
	All funds	split by asset type		split by insurer type	
		Bond	Equity	Life	Non-life
	(1)	(2)	(3)	(4)	(5)
Net_flows$_{ijt}$	0.0048***	0.0071***	0.0035***	0.0029***	0.0071***
	(8.93)	(5.83)	(7.30)	(5.79)	(9.06)
distress	-0.0030	0.0033	0.0047	0.0014	-0.0027
	(-0.32)	(0.19)	(0.66)	(0.17)	(-0.14)
distress × Net_flows$_{ijt}$	-0.0047***	-0.0081***	-0.0026***	-0.0021**	-0.0050***
	(-5.09)	(-4.22)	(-3.31)	(-2.49)	(-2.78)
constant	-0.0167***	-0.0229***	-0.0168***	-0.0129***	-0.0086**
	(-8.72)	(-4.25)	(-10.78)	(-8.83)	(-2.21)
Security fixed effects	Yes	Yes	Yes	Yes	Yes
Insurer-Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	397,090	110,088	188,865	219,687	85,614
R-squared	0.20	0.29	0.29	0.20	0.29

* $p<0.1$, ** $p<0.05$, *** $p<0.01$

The table reports the coefficient estimates for equation 7. The model regresses individual insurance companies' holding changes on a fund over a quarter against all other investors' holding changes. The sample ranges from 2016Q4 to 2020Q4. Column (1) displays coefficient estimates from the entire sample. Columns (2) and (3) report coefficient estimates from the bond-fund and equity-fund subsamples. Columns (4) and (5) are from the life-insurance and non-life insurance subsamples. The dependent variable is *Insurer flows*$_{ijt}$, the proportion of fund j that is traded by insurer i during quarter t. *Net_flows*$_{ijt}$ is the fund j's flows in quarter t excluding the flows driven by the insurance company i; *Distress* $= 1$ if *Net_flows*$_{ijt} < -5$. We apply security fixed effects and quarter fixed effects for all five models. All standard errors are adjusted for heteroscedasticity. The t-statistics reported in parentheses use standard errors clustered at the fund level.

For the whole sample, the coefficient of the net flows is positive and significant, which is also the case across the splits of the sample. The interaction terms between the distress and the net flows are also negative and significant in all subsamples. However, for all except the bond funds, the absolute value of the coefficient for the interaction term is slightly less than the coefficient of the net flows (in other words, $\beta_1 + \beta_2 > 0$). All these evidences indicate that when a fund in an insurer's portfolio is experiencing extreme outflows, insurers are contrarian traders relative to when funds are experiencing normal flows. In fact, for bond funds, this effect is stronger, and insurers act as contrarians relative to other investors in the fund (in other words, $\beta_1 + \beta_2 < 0$).

Regarding bond funds, a potential explanation is that insurance companies might use them for asset and liability management. When interest rates move, bond funds' value changes, but also the liability value changes in the same direction (because they are discounted with interest rates). Therefore, insurance companies' bond fund value and liability value co-move, giving them the capacity to withstand losses that other investors potentially face.

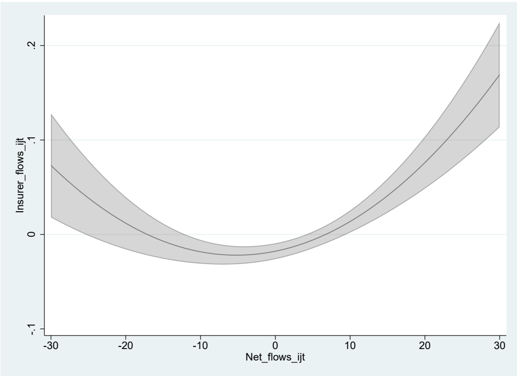
Illustrating the results in a more intuitive way, Figure 4, panel (b) displays the result of the corresponding quadratic model, which is given in Eq.(10). The difference in the shape of the curve of Panel (b) compared to Panel (a) is indicative of the difference in the behavior between individual insurers (Panel (b)) and the insurance sector as a whole (Panel (a)). The curve in Panel (b) never surpasses the zero line in a significant way, although it shows that, in extreme fund flows, insurers are reducing their reaction. Figure 5 illustrates the results by separating bond versus equity funds, and life versus non-life insurers. It is interesting to note the different shape of the curve corresponding to bond funds against all the others.[11]

$$\text{Insurer\_flows}_{ijt} = \beta_1 \cdot \text{Net\_flows}_{ijt} + \beta_2 \cdot \text{Net\_flows}_{ijt} \times \text{Net\_flows}_{ijt} + \alpha_j + \gamma_{it} + \epsilon_{ijt} \quad (10)$$

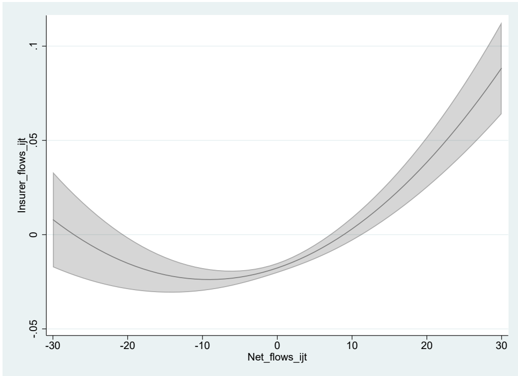
We now turn to the discussion of the robustness of the results. In Table 4 and Table 5, the dependent and independent variables are adding up to the fund flows. Hence, by construction, it could be a concern for structural negative correlations between the two variables. In order to eliminate this concern, we conduct a robustness test that replaces the dependent variable with a similar one that only captures the percentage change of fund j held by insurer i between quarter $t-1$ and quarter t, e.g., if an insurer is holding fund j of 100 units in the previous quarter, and now the insurer is holding 150 units, then the dependent variable becomes $(150-100)/100 \times 100\% = 50\%$. The results can be found in Table 12 in the Appendix. The main variables of interest are the corresponding coefficients for β_2, which remains negative for the whole sample.

[11] For completeness, we also analyze subsamples of mixed asset funds and money market funds. Test results are displayed in Appendix Table 13 columns (1) and (2). The coefficients for the two-way interaction term $distress \times net\_flows$ are insignificant in both columns.

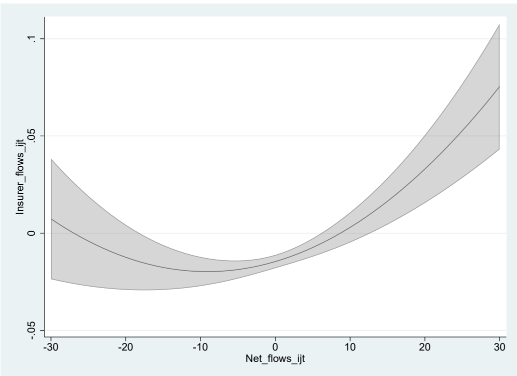
Figure 5: Individual insurance companies reaction to all other investors - split the sample into subsamples



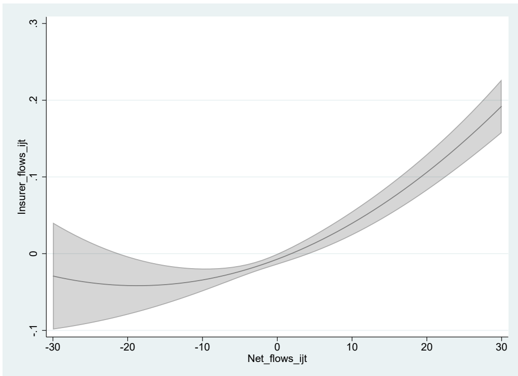
(a) Bond fund



(b) Equity fund



(c) Life-insurer



(d) Non-life insurer

This figure plots how individual insurers trade against other investors. The four panels are from four different subsamples. The panels (a) and (b) on the upper half are results from the subsamples of bond funds and equity funds. Panels (c) and (d) on the bottom half are results from the subsamples of life and non-life insurers. All four curves' underlying model follows Eq.(10).

Summing up, the analysis above provides evidence that insurance companies act as contrarian traders relative to when funds experience normal flows and, in some cases, relative to other investors in that fund. It is therefore interesting to understand additional cross-sectional characteristics that can provide further insights into what drives the aggregate contrarian behavior of the sector. In the following two subsections, we explore the effect of fund-insurer affiliation and the insurer's capital strength, respectively.

4.2 Affiliated funds

Asset management companies in Europe are sometimes part of a conglomerate, and this arrangement can have different implications for the trading behavior of entities within the group. For banks, for example, Bagattini, Fecht, and Maddaloni (2019) provides evidence that distressed mutual funds receive liquidity support in the form of direct share purchases from the parent bank, in particular if they had outperformed their peers before the distress started.

It is important that an emergency intervention can prevent the fund from depleting its cash buffers, decreasing the quality of its asset portfolio, and incurring liquidation costs, thereby contributing to attenuating strategic complementarities among investors.

Similarly, insurers can step in to provide support to intragroup distressed funds. For example, in order to avoid the reputational cost in cases in which the fund is issued by an asset manager within an insurance group (but not necessarily held by the insurer). Another reason for stepping in can be to avoid internalizing the cost of a run of the fund in case the fund is directly held by an insurer (and not necessarily issued by an asset manager belonging to the insurance group). In fact, when both these conditions are met, the fund is defined to be affiliated with the insurer.

To reflect these considerations, we define the variable $\mathit{Affiliated}_{ijt}$ as a dummy that equals 1 if fund j 's holder i and fund's asset management firm belong to the same insurance group in quarter t; and zero otherwise.

There are two ways for insurers to provide support to affiliated funds that are experiencing excessive outflows: by buying illiquid securities that the fund manager intends to sell off, or by directly purchasing the fund's shares. In this paper, we test the latter. We do this via the following specifications:

$$
\begin{aligned}
\text{Insurer\_flows}_{ijt} = &\beta_1 \cdot \text{Net\_flows}_{ijt} \times \text{Distress}_{ijt} \\
&\beta_2 \cdot \text{Net\_flows}_{ijt} \times \text{Distress}_{ijt} \times \text{Affiliation}_{ijt} \\
&+ \sum_n \beta_n \cdot \text{Lower-dimensional interaction terms \& main effects} \\
&+ \alpha_j + \gamma_{it} + \epsilon_{ijt}
\end{aligned} \tag{11}
$$

where the dependent variable $Insurer\_flows_{ijt}$ is again the relative change of insurer i's position in fund j during quarter t, scaled by fund total assets. It represents the percent fund flows originated by the trading activity of a single investor, insurer i. Same as Eq.(7), we add α_j and γ_{it} as well.

If a fund is always affiliated with an insurer because of a certain feature, the fund-fixed effect will absorb this feature. With the insurer-quarter fixed effects, we are then comparing the different funds held by the same insurer in one quarter, i.e., we can find out how an individual insurer treats the affiliated versus non-affiliated funds differently.

Hypothesis 2: *In model* (11), $\beta_2 < 0$*: when an affiliated fund in an insurer's portfolio is experiencing extreme outflows, insurers are contrarian traders relative to when funds are experiencing normal flows and (possibly) relative to other investors in that fund.*

Table 6: Insurers' behavior towards affiliated funds

	Dependent var: Insurer flows$_{ijt}$				
		split by asset type		split by insurer type	
	All funds	Bond	Equity	Life	Non-life
	(1)	(2)	(3)	(4)	(5)
Net_flows$_{ijt}$	0.0035***	0.0053***	0.0025***	0.0017***	0.0060***
	(8.13)	(5.98)	(6.81)	(4.41)	(8.01)
Distress	-0.0066	0.0013	0.0033	0.0006	-0.0110
	(-0.75)	(0.08)	(0.51)	(0.09)	(-0.56)
Distress × Net_flows$_{ijt}$	-0.0040***	-0.0062***	-0.0019***	-0.0013*	-0.0047***
	(-4.62)	(-3.60)	(-2.63)	(-1.78)	(-2.62)
Affiliation$_{ijt}$	0.0333	0.0506	0.0182	0.0557**	-0.0393
	(1.59)	(0.98)	(0.89)	(2.05)	(-0.95)
Affiliation$_{ijt}$× Net_flows$_{ijt}$	0.0176***	0.0265***	0.0158***	0.0175***	0.0146***
	(5.99)	(3.37)	(4.86)	(5.24)	(3.63)
Distress × Affiliation$_{ijt}$	-0.0154	-0.0185	-0.0275	-0.0792	0.0668
	(-0.24)	(-0.18)	(-0.30)	(-0.83)	(0.69)
Distress × Affiliation$_{ijt}$× Net_flows$_{ijt}$	-0.0108*	-0.0299***	-0.0113	-0.0122	-0.0055
	(-1.88)	(-2.64)	(-1.64)	(-1.63)	(-0.84)
constant	-0.0182***	-0.0248***	-0.0174***	-0.0152***	-0.0057
	(-10.47)	(-5.23)	(-11.21)	(-9.96)	(-1.41)
Security fixed effects	Yes	Yes	Yes	Yes	Yes
Insurer-Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	397,090	110,088	188,865	219,687	85,614
R-squared	0.20	0.29	0.29	0.20	0.29

* p<0.1, ** p<0.05, *** p<0.01

The table displays regression results for H2. The model regresses individual insurer flows against the fund flow driven by all other investors. Sample ranges from 2016Q4 to 2020Q4. The dependent variable is Insurer flows$_{ijt}$, the proportion of fund j that traded by insurer i during quarter t. Net_flows$_{ijt}$ is the fund j's flows in quarter t exclude the flows driven by the insurance company i; $Distress = 1$ if Net_flows$_{ijt} < -5$. Affiliation$_{ijt}$ is a dummy variable, it = 1 if the fund issuer (asset management company) and the holder (insurance company) belong to the same insurance. We apply security fixed effects and quarter fixed effects for all five models. All standard errors are adjusted for heteroscedasticity. Columns (2) and (3) are results from the bond-fund and equity-fund subsamples. Columns (4) and (5) are from the life-insurance and non-life insurance subsamples.

Results are displayed in Table 6. Similar to Table 5, column (1) displays results with the entire sample, and columns (2) and (3) for bond and equity funds, while columns (4) and (5) for life and non-life insurers. Here we focus more on the effect of affiliation.

All coefficients for Net_flows_{ijt} main effect are positive, which means for non-distress and not affiliated funds, individual insurers are trading in the same direction as the other investors of the fund. When the fund is in distress (and not an affiliated fund), insurance companies will do contrarian trading. The $Affiliation \times Net\_flows_{ijt}$ are significantly positive in all columns. Combined with the significant positive coefficients for Net_flows_{ijt} main effects, it shows that insurers increase their flows in their affiliated funds to a larger extent than for non-affiliated funds.

Next, we discuss the case when funds are in distress and affiliated. The main variable of interest is the triple interaction term $Distress \times Affiliation_{ijt} \times Net\_flows_{ijt}$. The coefficients for this term are significantly negative in columns (1) and (2) and are negative but insignificant in columns (3), (4), and (5) (although close to the 10% significance level). The negative and significant coefficients reveal that regarding affiliated funds, insurers will do contrarian trading relative to when funds are experiencing normal flows. It is interesting to note that for bond funds, insurance companies purchase 6 times more fund shares of affiliated distressed funds than of unaffiliated distressed funds.

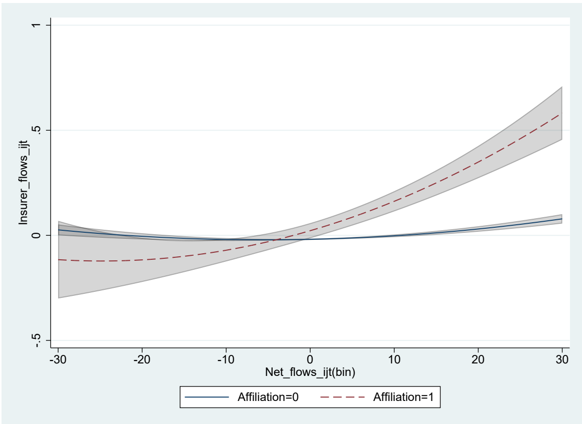
Figure 6 shows the parabola plots for individual insurers' reaction to other investors, separated between the affiliated funds and the non-affiliated funds. Panel (a) is derived from the entire sample. Overall, insurers are trading the affiliated funds to a larger extent than the non-affiliated funds, particularly when the fund is performing well.

When affiliated funds experience outflows, if the insurers were not contrarian traders and would hold more sticky trading elasticity, then they would approximately trade roughly along the tangent of the red dashed curve at the point of zero net flows in Panel (a). However, the analysis suggests that, insurers are trading along the red dashed curve (which lies above the tangent at 0). This means that insurers are selling less than they could have done (though they are not buying in the fund shares either). Considering the insurers' trading behavior towards the non-affiliated funds, represented by the blue curve, they generally do not have much elasticity and trade smoothly around zero.[12]

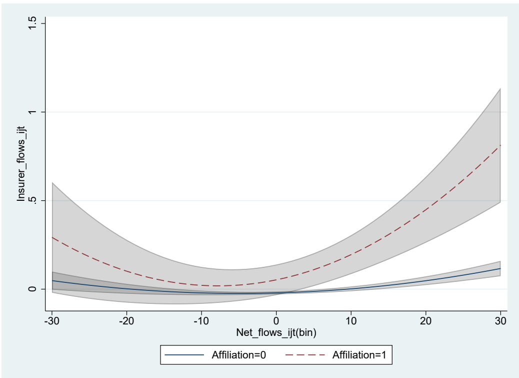
Panels (b) and (c) of Figure 6 are derived from the bond fund and equity fund, respectively. The dark-red curve in Panel (b) is in a U-shape, meaning insurers are buying in their affiliated distressed bond funds. This shape is not observed in the Panel (c) for the equity funds subsample. Furthermore, insurers are not trading extensively for non-affiliated funds. The blue curves in both panels are all around the zero line.

[12]For completeness, we also conduct the analysis for subsamples of mixed asset funds and money market funds. Test results are displayed in Appendix Table 13 columns (3) and (4). We find that the three-way interaction term coefficient for mixed asset funds is significantly negative at a 5% confidence level, but the coefficient is insignificant for money market funds.

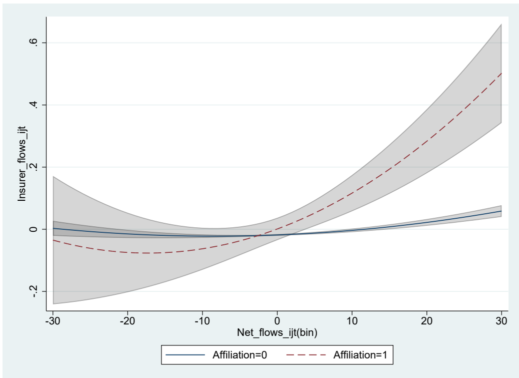
Figure 6: How individual insurers react to the other investors differently in terms of affiliated and non-affiliated funds.



(a) over all sample



(b) bond fund



(c) equity fund

Individual insurers' reaction to other investors, separate between the affiliated funds and the non-affiliated funds. Panel (a) is derived from the entire sample. The dashed-black line is the tangent line for the dark-red curve around 8.45, where the mean value Net_flows$_{ijt}$ for the non-negative fund flow subsample is located. Panels (b) and (c) are derived from the bond funds and equity funds, respectively.

In summary, this subsection shows that the funds affiliated with insurance companies are indeed one factor that motivates insurers to be contrarian traders. This feature is especially significant when insurers are trading bond funds.

4.3 The role of solvency capital requirement

It is reasonable to expect that not all insurers can effectively implement a contrarian behavior or a supporting mechanism to prevent liquidity shocks at their affiliated mutual funds. For example, capital-constrained insurers might not be able to purchase fund shares in response to unexpected severe outflows. Therefore, the appetite for insurers to intervene in the mutual fund market might depend on their available capital, or even on how close they are to their target capital ratios. This reasoning leads us to test the following specifications:

$$\begin{aligned}\text{Insurer\_flows}_{ijt} = &\beta_1 \cdot \text{Net\_flows}_{ijt} \times \text{Distress}_{ijt}\\ &\beta_2 \cdot \text{Net\_flows}_{ijt} \times \text{Distress}_{ijt} \times \text{Variable that captures the solvency position}\\ &+ \sum_n \beta_n \cdot \text{Lower-dimensional interaction terms \& main effects}\\ &+ \alpha_j + \gamma_{it} + \epsilon_{ijt}\end{aligned} \tag{12}$$

We are using two different approaches to capture the effect due to the solvency positions. Firstly, we are using the dummy variable $\mathit{SCR\ coverage\ ratio\_low}_{it-1}$, which $= 1$ if the insurance company i's SCR coverage ratio in the past quarter *t-1* is smaller than 150%, and 0 otherwise (the 150% ranks between the bottom 10% and 25% of the distribution). This dummy variable allows us to separate the insurance companies without solid capital from those with solid capital. In fact, the theoretical reason to consider a specific threshold is the following: when an insurance company increases its SCR coverage ratio from, e.g., 500% to 650%, the effect can be different to an insurance company that increases its SCR coverage ratio from 100% to 250%, i.e., the incremental of SCR coverage ratio does not has a linear impact on the ability to be a contrarian trader and makes β_2 less significant.

Nevertheless, as a robustness check, given that the 150% threshold is not set or implied by the regulation, we explore a specification with a continuous variable for the solvency ratio. To that aim, we are also using the $\mathit{SCR\_coverage\_ratio}_{it-1}$. This is the solvency ratio of the insurer (with 100% being the regulatory threshold). In fact, we take the one-quarter lag value to remove some endogeneity effects (given that the quarter t solvency ratio is influenced by the trading behavior of the insurance company), and it better reflects the starting capital solidity of quarter t.

Essentially, except for dropping the variable on affiliation and replacing it with the solvency ratio related one, the rest variables and fixed effects of the model Eq.(12) here are very similar to Eq.(11) from subsection 4.2.

We state below the two hypotheses:

Hypothesis 3a: *If we use dummy SCR coverage ratio* low_{it-1} *in model* (12), $\beta_2 > 0$*: if an insurer's capital position is low, the insurer will do less contrarian trading relative to when funds are experiencing normal flows and (possibly) relative to other investors in that fund.*

Hypothesis 3b: *With the continuous variable,* $\beta_2 < 0$*: the more solid an insurer's capital position is when the fund is experiencing extreme outflows, the higher the contrarian trading relative to when funds are experiencing normal flows and (possibly) relative to other investors in that fund.*

The regression results are shown in Table 7, with Panel (a) referring to the $SCR\_coverage\_ratio\_low_{it-1}$ and Panel (b) to the $SCR\_coverage\_ratio_{it-1}$.

We start from Panel (a), and with the coefficients for Net flows which are positive and significant in all columns, whereas, for the interaction with the distress dummy, they are negative and significant. Next, we focus on the interaction terms containing $SCR\_coverage\_ratio\_low$. We look at the two-way interaction term $SCR\_coverage\_ratio\_low \times net\_flows$. The signs of the coefficients for this term are all negative (and significant except for column (5)). A negative coefficient of the $SCR\_coverage\_ratio\_low \times net\_flows$ indicates that if an insurer's past quarter SCR coverage ratio is below 150%, and if the fund is performing well, then they are not trading as extensively as the insurers with a higher SCR coverage ratio.

Focusing on the triple interaction term, it has a positive and significant effect in columns (1) to (4), which fits Hypothesis 3a that when a fund is in distress, a low SCR ratio results in insurers reducing their flow, hence weakening contrarian trading. The finding is valid in the subsamples of bond funds, equity funds, and life insurers but not for non-life insurers. [13]

Next, looking at Panel (b) and focusing on the interaction term that contains the solvency ratio, we can see that the interaction term between net flows and the solvency variable is significant and positive, but the triple interaction terms with the distress are not (although the coefficient is negative). Whereas the former carries on for all samples, the latter is not: bond funds have a significantly negative coefficient. We can also observe that

[13] For completeness, we also conduct the analysis for subsamples of mixed asset funds and money market funds. Test results are displayed in Appendix Table 14. We find that the coefficients for three-way interaction terms for mixed asset funds are significantly negative in column (1) and significantly positive in column (3), in the same pattern as those for bond funds. The coefficients for three-way interaction terms for money market funds are both insignificant.

Table 7: The role of capital solidity

Panel (a): $SCR\_coverage\_ratio\_low_{it-1}$

	All funds	split by asset type		split by insurer type	
		Bond	Equity	Life	Non-life
	(1)	(2)	(3)	(4)	(5)
Net_flows_{ijt}	0.0054***	0.0077***	0.0040***	0.0034***	0.0074***
	(9.26)	(5.84)	(7.49)	(6.36)	(8.58)
Distress	-0.0069	-0.0007	0.0042	0.0006	-0.0003
	(-0.67)	(-0.04)	(0.53)	(0.06)	(-0.02)
Distress × Net_flows_{ijt}	-0.0055***	-0.0090***	-0.0031***	-0.0026***	-0.0047**
	(-5.31)	(-4.26)	(-3.61)	(-2.74)	(-2.39)
Net_flows_{ijt} × $SCR\_coverage\_ratio\_low_{it-1}$	-0.0035***	-0.0039**	-0.0027***	-0.0025***	-0.0022
	(-5.78)	(-2.55)	(-4.52)	(-3.69)	(-1.57)
Distress × $SCR\_coverage\_ratio\_low_{it-1}$	0.0232	0.0218	0.0031	0.0036	-0.0184
	(1.57)	(0.69)	(0.26)	(0.24)	(-0.47)
Distress × Net_flows_{ijt} × SCR_coverage_ratio_low	0.0047***	0.0056*	0.0033***	0.0029*	-0.0018
	(3.35)	(1.94)	(2.86)	(1.95)	(-0.55)
constant	-0.0167***	-0.0229***	-0.0169***	-0.0129***	-0.0086**
	(-8.75)	(-4.26)	(-10.84)	(-8.84)	(-2.22)
Security fixed effects	Yes	Yes	Yes	Yes	Yes
Insurer-Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	397,090	110,088	188,865	219,687	85,614
Degrees of freedom	6	6	6	6	6
R-squared	0.20	0.29	0.29	0.20	0.29

Panel (b): $SCR\_coverage\_ratio_{it-1}$

	All funds	split by asset type		split by insurer type	
		Bond	Equity	Life	Non-life
	(1)	(2)	(3)	(4)	(5)
Net_flows_{ijt}	0.0035***	0.0045***	0.0027***	0.0015**	0.0048***
	(5.34)	(2.80)	(3.87)	(2.04)	(3.48)
Distress	-0.0069	0.0438	-0.0054	-0.0148	0.0334
	(-0.48)	(1.30)	(-0.47)	(-1.11)	(0.92)
Distress × Net_flows_{ijt}	-0.0029*	-0.0021	-0.0014	-0.0016	0.0030
	(-1.92)	(-0.63)	(-1.11)	(-1.06)	(0.93)
Net_flows_{ijt} × $SCR\_coverage\_ratio_{it-1}$	0.0006**	0.0011*	0.0004	0.0006*	0.0010*
	(2.16)	(1.70)	(1.63)	(1.96)	(1.75)
Distress × $SCR\_coverage\_ratio_{it-1}$	0.0035	-0.0152	0.0046	0.0079	-0.0131
	(0.65)	(-1.26)	(1.08)	(1.44)	(-0.99)
Distress × Net_flows_{ijt} × $SCR\_coverage\_ratio_{it-1}$	-0.0004	-0.0021*	-0.0004	0.0000	-0.0028**
	(-0.74)	(-1.73)	(-0.87)	(0.05)	(-2.35)
constant	-0.0206***	-0.0277***	-0.0199***	-0.0149***	-0.0152***
	(-10.75)	(-5.20)	(-12.70)	(-10.18)	(-3.92)
Security fixed effects	Yes	Yes	Yes	Yes	Yes
Insurer-Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	392,680	108,910	186,717	216,913	84,595
Degrees of freedom	6	6	6	6	6
R-squared	0.19	0.28	0.28	0.19	0.28

* p<0.1, ** p<0.05, *** p<0.01

The table displays regression results for H3a and H3b. The models regress individual insurer flows against the fund flow driven by all other investors. The sample ranges from 2016Q4 to 2020Q4. The dependent variable is $Insurer\_flows_{ijt}$, the proportion of fund j that traded by insurer i during quarter t. Net_flows_{ijt} is the fund j's flows in quarter t exclude the flows driven by the focal insurance company i; $Distress = 1$ if $Net\_flows_{ijt} < -5$. In both panels, we apply security fixed effects and quarter fixed effects for all five models. All standard errors are adjusted for heteroscedasticity. Columns (2) and (3) are results from the bond-fund and equity-fund subsamples. Columns (4) and (5) are from the life-insurance and non-life insurance subsamples.

the role of capital solidity in contrarian trading capacity is more pronounced among non-life insurers than life insurers.

To sum up, we can conclude that insurers that are relatively poorer capitalized purchase fewer fund shares from a fund in distress, when compared to better capitalized insurers. This suggests that the contrarian trading of insurers may prove more modest in times of severe systemic stress when insurers' own financial health comes under pressure, highlighting the important role of a robust insurance sector from a broader financial stability perspective.

5 The impact of insurers on mutual funds' stability

In this section, we analyze whether insurer-affiliated funds are more resilient to underperformance as a result of the intragroup support.[14] The existing literature suggests that such links can be expected. For example, Franzoni and Giannetti (2019) show that financial conglomerate-affiliated hedge funds perform better than independent hedge funds in times of distress and experience fewer outflows when they underperform. Bagattini, Fecht, and Maddaloni (2019) find that mutual funds belonging to banking conglomerates where the bank is well-capitalized and liquid are more resilient to shocks in the financial markets. The ownership structure of funds might also affect their investment behavior: Kacperczyk and Schnabl (2013) show that money market funds within financial conglomerates were less inclined to take risks during the global financial crisis, presumably because of reputational reasons.

To that aim, subsection 5.1 investigates the impact of insurers on the stability of affiliated funds. We then break the affiliation nexus into its two components, namely a) the holding effect in 5.2 and b) the labeling effect in 5.3. Overall, it should be noted that the weaker significance in the results across the following subsections might be driven by purely statistical and not economic reasons. For example, due to the lower (relative) sample size to identify affiliated funds, depending on which definition is followed.

5.1 The role of affiliation on fund stability

We start by looking into insurance companies' impact on affiliated mutual funds' stability. Firstly, we use the past-return to current-flow relationship as a fund stability measure. An elevated sensitivity of fund flows to past performance, especially negative past performance, is perceived in the literature as an indication of investors' panic-induced withdrawals, identifying particularly fragile funds. Secondly, we look at the effect of insurer affiliation on the volatility of fund flows. The volatility of net flows is a simple and rough proxy for the variation in a fund's net liquidity flows from new issuance and redemption of fund shares, where extreme outflows might be driven by panic-induced investor runs.

We are using a definition of affiliation similar to the one in the previous section, but only at the fund-quarter level. Concretely, we define the variable $\text{Affiliated}_{j,t} = 1$ if in quarter t both conditions below hold: a) the fund is held by an insurance company and b) it is issued by the asset management company that belongs to the same insurance group of the fund holder insurer. Otherwise, the variable = 0.

The dependent variable is fund net flow, which is the flow driven by all investors,

[14] The subsequent analysis expands the sample to include funds from the entire European Economic Area rather than focusing only on insurers' holdings.

regardless of whether the investor is an insurer or not. The second dependent variable is the standard deviation of the *Fund flows* from time $t+1$ to time $t+8$, when it includes at least 4 data points; otherwise, we record it as a missing value. $Return_{j,t-1}$ is fund j's return over quarter $t-1$. Our baseline measure for this $\text{Return}_{j,t-1}$ variable is the 10-year monthly rolling return retrieved from the Refinitiv Lipper database.

We control including various variables, namely the stake of institutional investors in the funds, the one-quarter lag of fund flows, the number of quarters of the fund since its establishment, and total expense ratio.

The models tested and the corresponding hypotheses are provided below.

$$\begin{aligned}\text{Fund\_flows}_{jt} = &\ \beta_1 \cdot \text{Return}_{jt-1} + \beta_2 \cdot \text{Return}_{jt-1} \times \text{Affiliation}_{jt} \\ &+ \beta_3 \cdot \text{Affiliation}_{j,t} + Controls_{jt-1} + \alpha_j + \rho_t + \epsilon_{jt}\end{aligned} \tag{13}$$

$$\sigma(\text{Fund flows})_{jt} = \beta_1 \cdot \text{Affiliation}_{jt} + Controls_{jt-1} + \alpha_j + \rho_t + \epsilon_{j,t} \tag{14}$$

Hypothesis 4a: *In regression* (13)*,* $\beta_2 < 0$*: fund flows are less sensitive to performance in insurer-affiliated funds than in non-insurer-affiliated funds.*

Hypothesis 4b: *In regression* (14)*,* $\beta_1 < 0$*: flows of insurer-affiliated funds are less volatile than those of comparable funds not affiliated to an insurer.*

Table 8 reports results. The coefficients for the interaction term from Panel (a) (refer to Eq.(13)) are significantly negative for the whole sample, equity, and money market subsample. A negative coefficient means that if a fund is issued and held by the same insurance holding group (as per the definition provided above), its return-flow sensitivity is significantly reduced.

Panel (b) of Table 8 presents the regression result for Eq.(14). The coefficient for the affiliation in the current table is significantly negative only for bond funds and insignificant for all other columns.

The two tests confirm our hypothesis that funds affiliated (in the sense described above) with an insurance company are more resilient to a distress situation, but not in a strong statistical sense. Importantly, the definition of the affiliation dummy is based on the fulfillment of two conditions simultaneously. This prevents us from drawing a conclusion on which of the two is the driving force of the relationship. This is the focus of the two subsections that follow.

Table 8: The impact on fund flow and fund flow volatility if the fund is affiliated to an insurance company

Panel (a). Dependent var: Fund_flows_{jt}

	All funds	split by asset type			
		Bond	Equity	Mixed	Money market
	(1)	(2)	(3)	(4)	(5)
$\text{Return}_{j,t-1}$	0.1988***	0.0616**	0.2270***	0.1933***	2.4370***
	(21.50)	(2.31)	(19.59)	(10.59)	(2.93)
Affiliation_{jt}	-0.4899	-1.0339	-0.1274	-0.6647	-0.7487
	(-0.90)	(-1.15)	(-0.16)	(-0.46)	(-0.26)
$\text{Return}_{j,t-1} \times \text{Affiliation}_{jt}$	-0.0491*	-0.1572	-0.0531**	0.0326	-15.5054**
	(-1.94)	(-1.22)	(-1.99)	(0.44)	(-2.02)
Lagged Control Variables	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes
Security fixed effects	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects		Yes	Yes	Yes	Yes
Asset type-Quarter fixed effects	Yes				
Observations	333,036	88,360	127,962	107,239	9,475
Degrees of freedom	7	7	7	7	7
R-squared	0.27	0.24	0.26	0.37	0.16

Panel (b). Dependent var: $\sigma(\text{Fund\_flows})_{jt}$

	All funds	split by asset type			
		Bond	Equity	Mixed	Money market
	(1)	(2)	(3)	(4)	(5)
Affiliation_{jt}	-0.0240	-0.9583*	0.7289	-0.3999	1.6300
	(-0.07)	(-1.76)	(1.35)	(-0.58)	(1.34)
Lagged Control Variables	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes
Security fixed effects	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects		Yes	Yes	Yes	Yes
Asset type-Quarter fixed effects	Yes				
Observations	208,617	55,127	81,149	66,421	5,920
Degrees of freedom	5	5	5	5	5
R-squared	0.75	0.74	0.73	0.73	0.82

* $p<0.1$, ** $p<0.05$, *** $p<0.01$

This table displays the relationship between affiliation and fund stability. The regression is based on the second sample and ranges from 2016Q4 to 2020Q4. The dependent variables reflect two different proxies for the stability of the fund. The affiliation dummy = 1 if the fund is held by insurer i, and is issued by an asset management firm that belongs to the same (with the insurer) insurance group in quarter t. We add security fixed effects and quarter fixed effects in all settings. For column (1), we add security fixed effects and asset type $\times$ quarter fixed effects instead. All standard errors are adjusted for heteroscedasticity. The t-statistics reported in parentheses use standard errors clustered at the fund level.

5.2 Holding effect on fund stability

Recent papers have shown that the severity of strategic complementarities in investors' redemption decisions is attenuated for funds that are perceived to be more stable and less prone to liquidity risk. For example, Chen et al. (2010) found that investors exhibit reduced sensitivity to poor past performance when the fund ownership primarily consists of institutional investors because institutional investors are more inclined to internalize the negative externalities stemming from their redemptions. We focus on investigating a similar effect for insurance companies.

The variable of interest is $fund\_held\_by\_insurer_{jt}$, which is a dummy variable $= 1$ if the fund j in the quarter t is actually held by at least one insurer, and it is a time-varying variable. This is a more relaxed definition than the one used in the paper up to this point. Essentially, this is the only change in the analysis compared to the previous sub-section.

$$\begin{aligned} \text{Fund\_flows}_{jt} = {} & \beta_1 \cdot \text{Return}_{jt-1} + \beta_2 \cdot \text{fund\_held\_by\_insurer}_{jt} \\ & + \beta_3 \cdot \text{Return}_{jt-1} \times \text{fund\_held\_by\_insurer}_{jt} \\ & + \text{Controls}_{jt-1} + \alpha_j + \rho_t + \epsilon_{jt} \end{aligned} \tag{15}$$

$$\sigma(\text{Fund flows})_{jt} = \beta_1 \cdot \text{fund\_held\_by insurer}_{jt} + \text{Controls}_{jt-1} + \alpha_j + \rho_t + \epsilon_{jt} \tag{16}$$

Hypothesis 5a: *In regression* (15), $\beta_3 < 0$*: fund flows are less sensitive to performance if the fund is held by at least one insurer.*

Hypothesis 5b: *In regression* (16), $\beta_1 < 0$*: fund flows volatility is smaller if the fund is held by at least one insurer.*

The regression results are shown in Panel (a) and (b) of Table 9 for the model in Eq.(15) and Eq.(16), respectively. Starting from Panel (a) of Table 9, the main variable of interest is the two-way interaction term, which indicates the extent to which a fund's current quarter flow is expected to change when the fund is traded by an insurance company. The negative coefficients observed in columns (1), (2), and (3) indicate that the flow-performance sensitivity diminishes when the fund is held by insurers. The holding status of insurance companies does not affect the flow-performance sensitivity of mixed-asset funds. We now turn to Panel (b) of Table 9 where the main variable of interest is the $fund\_held\_by\_insurer$. The coefficients are significantly negative for the entire sample and all four subsamples.

Therefore, the analysis provides evidence that funds in which insurers hold a stake benefit from a lower flow-to-performance sensitivity and a lower volatility of flows compared to their peers.

Table 9: The impact on fund flow and fund flow volatility if the fund is partly held by an insurance company

Panel (a). Dependent var: Fund flows$_{jt}$

		split by asset type			
	All funds (1)	Bond (2)	Equity (3)	Mixed (4)	Money market (5)
Return$_{j,t-1}$	0.2041***	0.0846***	0.2340***	0.1939***	1.4281
	(20.36)	(2.79)	(18.49)	(10.05)	(1.37)
fund_held_by_insurer	-0.3288*	-0.8906**	0.0498	-0.5797*	0.1714
	(-1.70)	(-2.25)	(0.17)	(-1.69)	(0.14)
Return$_{j,t-1}\times$ fund_held_by_insurer	-0.0152*	-0.0733**	-0.0173*	-0.0010	2.6819*
	(-1.82)	(-1.96)	(-1.78)	(-0.06)	(1.75)
Lagged Control Variables	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes
Security fixed effects	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects		Yes	Yes	Yes	Yes
Asset type-Quarter fixed effects	Yes				
Observations	333036	88360	127962	107239	9475
Degrees of freedom	7.00	7.00	7.00	7.00	7.00
R-squared	0.27	0.24	0.26	0.37	0.16

Panel (b). Dependent var: $\sigma(Fund\_flows)_{jt}$

		split by asset type			
	All funds (1)	Bond (2)	Equity (3)	Mixed (4)	Money market (5)
fund_held_by_insurer	-1.0022***	-1.7621***	-0.7463***	-0.5128**	-2.3236*
	(-6.35)	(-5.19)	(-3.27)	(-2.01)	(-1.78)
Lagged Control Variables	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes
Security fixed effects	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects		Yes	Yes	Yes	Yes
Asset type-Quarter fixed effects	Yes				
Observations	208617	55127	81149	66421	5920
Degrees of freedom	5.00	5.00	5.00	5.00	5.00
R-squared	0.75	0.74	0.73	0.73	0.82

* p<0.1, ** p<0.05, *** p<0.01

This table displays the relationship between 'fund held by insurance company' and 'fund stability'. The regression is based on the second sample and ranges from 2016Q4 to 2020Q4. The dependent variables reflect two different proxies for the stability of the fund. The 'fund_held_by_insurer' dummy = 1 if the fund j is held by at least one insurer in quarter t. We add security fixed effects and quarter fixed effects in all settings. For column (1), we add security fixed effects and asset type $\times$ quarter fixed effects instead. All standard errors are adjusted for heteroscedasticity. The t-statistics reported in parentheses use standard errors clustered at the fund level.

5.3 Labeling effect on fund stability

To identify the labeling effect, we investigate cases where no individual insurance company trades or holds the fund, but the fund's asset management firm is affiliated with an insurer group. We adjust the definition of the affiliation to capture this relationship by defining the dummy variable $\text{fund\_issued\_by\_insurer}_{jt} = 1$ if the fund asset management firm belongs to an insurance group in quarter t; $= 0$ otherwise.

$$\begin{aligned} \text{Fund\_flows}_{jt} = \beta_1 \cdot \text{Return}_{j,t-1} &+ \beta_2 \cdot \text{fund\_issued\_by\_insurer}_{jt} \\ &+ \beta_3 \cdot \text{Return}_{jt-1} \times \text{fund\_issued\_by\_insurer}_{jt} \\ &+ Controls_{jt-1} + \alpha_j + \rho_t + \epsilon_{jt} \end{aligned} \tag{17}$$

$$\sigma(\text{Fund flows})_{jt} = \beta_1 \cdot \text{fund\_issued\_by\_insurer}_{jt} + \text{Controls}_{jt-1} + \alpha_j + \rho_t + \epsilon_{jt} \tag{18}$$

Hypothesis 6a: *In regression* (17), $\beta_3 < 0$*: fund flows are less sensitive to performance if the fund is issued within an insurance group.*

Hypothesis 6b: *In regression* (18), $\beta_1 < 0$*: fund flows volatility is smaller if the fund is issued within an insurance group.*

The results of the first model above are shown in Table 10 Panel (a). The main variable of interest is the interaction term. Among fund types, only money market funds show a significant coefficient. The negative sign indicates that, conditional on never being traded or held by insurance companies, money market funds issued by asset management firms within an insurance group have significantly lower return-flow sensitivity.

Panel (b) of Table 10 shows the result from the complementary test of insurance companies' labeling effect on fund flow standard deviation. The coefficient for $\text{fund\_issued\_by\_insurer}_{jt}$ is significantly negative for both mixed assets funds and money market funds. The effect size is much larger (in absolute value) for money market funds than mixed asset funds.

Overall, based on 5.1, 5.2 and 5.3, we find that funds held by insurers exhibit significantly lower flow volatility and a significantly lower flow-performance sensitivity. However, this effect is not driven by affiliated funds, regardless of whether they are issued by an affiliated asset management company or both issued by an affiliated asset manager and currently held by the insurer.

Table 10: The impact on fund flow and fund flow volatility due to labeling effect

Panel (a). Dependent var: Fund_flows_{jt}

	All funds	split by asset type			
		Bond	Equity	Mixed	Money market
	(1)	(2)	(3)	(4)	(5)
$\text{Return}_{j,t-1}$	0.1695***	0.0476	0.2009***	0.1639***	2.8957**
	(12.96)	(1.30)	(11.43)	(7.38)	(2.05)
$\text{fund\_issued\_by\_insurer}_{jt}$	-0.4395	-0.3698	-1.1145*	0.0347	-0.2733
	(-1.37)	(-0.54)	(-1.90)	(0.08)	(-0.12)
$\text{Return}_{j,t-1} \times \text{fund\_issued\_by\_insurer}_{jt}$	-0.0086	0.0684	-0.0111	-0.0236	-4.9641**
	(-0.60)	(1.10)	(-0.61)	(-0.97)	(-2.20)
Lagged Control Variables	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes
Security fixed effects	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects		Yes	Yes	Yes	Yes
Asset type-Quarter fixed effects	Yes				
Observations	189,187	50,182	61,796	73,263	3,946
Degrees of freedom	7.00	7.00	7.00	7.00	7.00
R-squared	0.29	0.25	0.26	0.38	0.19

Panel (b). Dependent var: $\text{Fund\_flows Stdev.}_{jt}$

	all funds	split by asset type			
		Bond	Equity	Mixed	Money market
	(1)	(2)	(3)	(4)	(5)
$\text{fund\_issued\_by\_insurer}_{jt}$	-0.3702	0.1172	0.0140	-0.7029**	-5.0600**
	(-1.43)	(0.19)	(0.03)	(-2.17)	(-2.35)
Lagged Control Variables	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes
Security fixed effects	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects		Yes	Yes	Yes	Yes
Asset type-Quarter fixed effects	Yes				
Observations	113,499	29,987	37,168	44,081	2,263
Degrees of freedom	5	5	5	5	5
R-squared	0.76	0.76	0.74	0.73	0.86

* $p<0.1$, ** $p<0.05$, *** $p<0.01$

This table studies the extent to which a fund's current quarter flow is expected to change when the fund is issued by an asset management firm that belongs to an insurance holding group. Regression is based on the second sample and ranges from 2016Q4 to 2020Q4, but is restricted to funds never held by insurance companies throughout the sample period. $fund\_issued\_by\_insurer_{jt}$ is the dummy variable = 1 if the fund's issuance asset management firm in quarter t belongs to an insurance group. We add security fixed effects and quarter fixed effects in all settings. For column (1), we add security fixed effects, and asset type × quarter fixed effects instead. All standard errors are adjusted for heteroscedasticity. The t-statistics reported in parentheses use standard errors clustered at the fund level.

6 Conclusion

This is the first paper to provide evidence of how insurers behave when trading investment funds and the first to utilize the unique Solvency II data to assess it.

In general, the results suggest that insurers act as contrarian traders to distressed funds, particularly if they are affiliated. The fulfillment of Solvency II capital requirements is one significant factor enabling insurers to act as contrarians, hence highlighting the importance of insurers' own financial health. This also suggests that insurers are not simply assuming the associated risks of supporting funds in distress (or simply expect to be rewarded by a liquidity premium), but they also manage the risks. Trying to understand how funds benefit from insurer ownership, we examine their flow-to-performance sensitivity and volatility of flows compared to their peers. The results provide evidence that insurers' support improves investment funds' resilience.[15]

An interesting topic for future research would be to investigate the trading behavior of the same asset type for both direct and indirect holdings (funds). For example, the investment behavior associated with direct holdings of bonds may align with or differ from the patterns identified for bond funds. Either way, it would provide a more holistic view of insurers' investment behavior and of its connection to asset and liability management, an aspect that is very important and specific to the insurance sector.

[15]It should be noted that the results of the paper do not depend on the particular insurance business model, e.g., on the one with substantially high exposure to funds. Private equity-backed insurance entities retain their specific risk exposures as discussed in the literature and regulatory community, and do not drive the result.

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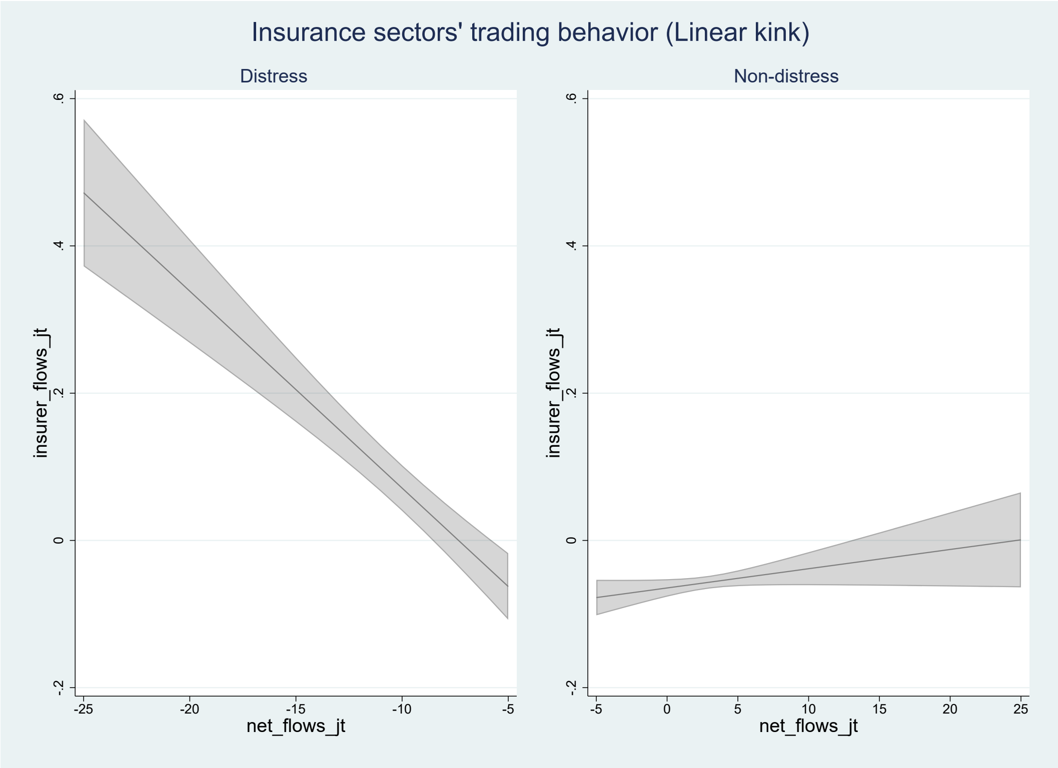
7 Appendix

7.1 Linear Plot

Figure 7: Visualize the column (1) of Table 4



The graph plots the regression Eq.(8). The left half is plotted when the distress dummy = 1, and the right half is plotted when the distress dummy = 0. The left half displays a strict downward sloping curve whereas in the right the curve gets slightly upward sloping. This means when the fund is in distress, insurance companies are trading in an opposite direction to all other investors; they are contrarian traders. The curve has a very similar trend to the Figure 4 left pattern.

The below table tabulates various distinct values based on the first sample:

Table 11: Distinct values by quarter

Quarter	**Count unique number of observations for the variables:**			
	Portfolios	**Affiliated portfolios**	**Insurance companies**	**Insurance company that hold affiliated portfolios**
2016q4	8483	662	1125	210
2017q1	8500	676	1136	218
2017q2	8470	701	1140	226
2017q3	8513	706	1178	227
2017q4	8681	705	1161	238
2018q1	8227	656	1138	213
2018q2	8151	656	1121	216
2018q3	8263	662	1120	220
2018q4	8446	616	1145	221
2019q1	8290	673	1133	216
2019q2	7977	652	1103	223
2019q3	7941	668	1121	224
2019q4	8200	699	1156	228
2020q1	8181	589	1152	184
2020q2	7939	584	1143	193
2020q3	8008	579	1144	192
2020q4	8188	614	1145	200

7.2 Robustness Test Results

Table 12: Robustness test for insurer investment behavior at insurer-fund-quarter level

	Depend. var.: $\Delta \text{Holding}_{ijt}$						
		split by asset type				split by insurer type	
	All funds	Bond	Equity	Mixed	Money market	Life	Non-life
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Net_flows_{ijt}	1.0738***	0.5567***	1.6007***	0.0593	0.9728	1.2483***	0.7270***
	(5.86)	(4.64)	(5.25)	(0.07)	(1.13)	(4.20)	(3.57)
Distress	-21.3763***	-6.7471**	-16.7408**	-86.0891***	-37.2357	-33.1902***	-3.6242
	(-4.08)	(-2.31)	(-2.34)	(-2.72)	(-1.24)	(-3.99)	(-0.78)
Distress × Net_flows_{ijt}	-2.1450***	-0.4882**	-2.2653***	-7.1391**	-1.7851	-3.0654***	-0.6891
	(-5.03)	(-2.16)	(-3.78)	(-2.28)	(-0.79)	(-4.56)	(-1.48)
constant	94.9154***	23.5058***	95.4975***	213.6927***	134.4716***	142.8177***	7.9218***
	(96.58)	(38.03)	(73.52)	(59.28)	(11.76)	(96.81)	(7.06)
Security fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Insurer-Quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	358,504	100,375	170,064	60,715	17,180	195,505	78,801
Degrees of freedom	3	3	3	3	3	3	3
R-squared	0.13	0.21	0.14	0.16	0.31	0.12	0.27

* p<0.1, ** p<0.05, *** p<0.01

The table reports the coefficient estimates for equation 7. The model regresses individual insurance companies' holding changes on a fund over a quarter against all other investors' holding changes. The sample ranges from 2016Q4 to 2020Q4. Column (1) displays coefficient estimates from the entire sample. Columns (2) and (3) report coefficient estimates from the bond-fund and equity-fund subsamples. Columns (4) and (5) are from the life-insurance and non-life insurance subsamples. The dependent variable is $insurer\_trade\_pc$, also known as $\Delta\text{Holding}_{ijt}$, the percentage change of fund j held by insurer i between quarter $t-1$ and quarter t, see equation 1. Net_flows is the fund j's flows in quarter t exclude the flows driven by the focal insurance company i; $Distress = 1$ if $Net\_flows < -5$. We apply security fixed effects and quarter fixed effects for all five models. All standard errors are adjusted for heteroscedasticity. The t-statistics reported in parentheses use standard errors clustered at the fund level.

7.3 Complementary Results

Table 13: Complementary result for Table 5 and Table 6

	Depend var: Insurer flows$_{ijt}$			
	Mixed assets (1)	Money market (2)	Mixed assets (3)	Money market (4)
Net_flows$_{ijt}$	0.0006	0.0031	-0.0004	0.0032
	(0.76)	(1.46)	(-0.72)	(1.60)
Distress	-0.0134	-0.0302	-0.0069	-0.0129
	(-1.18)	(-0.38)	(-0.64)	(-0.16)
Distress × Net_flows$_{ijt}$	-0.0024	-0.0044	-0.0007	-0.0040
	(-1.43)	(-0.90)	(-0.50)	(-0.84)
Affiliation$_{ijt}$			0.0982***	0.4779
			(3.97)	(1.27)
Affiliation$_{ijt}$× Net_flows$_{ijt}$			0.0114**	-0.0051
			(2.52)	(-0.34)
Distress × Affiliation$_{ijt}$			-0.1822	-0.7196
			(-1.50)	(-1.23)
Distress × Affiliation$_{ijt}$× Net_flows$_{ijt}$			-0.0285**	-0.0103
			(-2.27)	(-0.49)
_cons	-0.0103***	0.0005	-0.0170***	-0.0141
	(-5.23)	(0.02)	(-8.39)	(-0.72)
Security fixed effects	Yes	Yes	Yes	Yes
Insurer-Quarter fixed effects	Yes	Yes	Yes	Yes
Observations	68,330	19,369	68,330	19,369
Degrees of freedom	3	3	7	7
R-squared	0.36	0.34	0.36	0.34

* p<0.1, ** p<0.05, *** p<0.01

The table displays regression results of mixed asset funds and money market funds, complementary for Table 5 and 6. The sample ranges from 2016Q4 to 2020Q4. The dependent variable is Insurer flows$_{ijt}$, the proportion of fund j that is traded by insurer i during quarter t. Net_flows$_{ijt}$ is the fund j's flows in quarter t exclude the flows driven by the focal insurance company i; $Distress = 1$ if Net_flows$_{ijt} < -5$. $Affiliation_{ijt}$ is a dummy variable, $= 1$ if the fund issuer (asset management company) and the holder (insurance company) belong to the same financial conglomerate. We apply security fixed effects and quarter fixed effects for all four columns. All standard errors are adjusted for heteroscedasticity.

Table 14: Complementary result for Table 7

	Depend.Var.: Insurer_flows$_{ijt}$			
	SCR_coverage_ratio		SCR_coverage_ratio_low	
	Mixed asset (1)	Money market (2)	Mixed asset (3)	Money market (4)
Net_flows$_{ijt}$	-0.0017*	-0.0007	0.0005	0.0051**
	(-1.66)	(-0.28)	(0.64)	(2.15)
Distress	0.0118	-0.0938	-0.0241**	-0.0595
	(0.48)	(-0.81)	(-2.09)	(-0.69)
Distress × Net_flows$_{ijt}$	0.0040	-0.0087	-0.0038**	-0.0065
	(1.15)	(-1.07)	(-2.42)	(-1.23)
Net_flows$_{ijt}$× SCR_var	0.0009**	0.0016*	0.0004	-0.0097***
	(2.36)	(1.70)	(0.47)	(-3.13)
Distress × SCR_var	-0.0094	0.0280	0.0500**	0.1404
	(-1.00)	(0.87)	(1.97)	(1.12)
Distress × Net_flows$_{ijt}$× SCR_var	-0.0025*	0.0021	0.0068**	0.0090
	(-1.90)	(0.70)	(1.99)	(1.06)
_cons	-0.0130***	-0.0055	-0.0103***	-0.0001
	(-6.60)	(-0.27)	(-5.27)	(-0.01)
Security fixed effects	Yes	Yes	Yes	Yes
Insurer-Quarter fixed effects	Yes	Yes	Yes	Yes
Observations	67,653	19,127	68,330	19,369
Degrees of freedom	6	6	6	6
R-squared	0.35	0.34	0.36	0.34

* p<0.1, ** p<0.05, *** p<0.01

The table displays the complementary result for Table 7. The sample ranges from 2016Q4 to 2020Q4. The dependent variable is Insurer flows$_{ijt}$, the proportion of fund j traded by insurer i during quarter t. Net_flows$_{ijt}$ is the fund j's flows in quarter t exclude the flows driven by the focal insurance company i; $Distress = 1$ if $Net\,flows_{ijt} < -5$. The moderator in columns (1) and (2) is $SCR\_coverage\_ratio$, past quarter $t-1$ SCR coverage ratio of the insurance company i. The moderator in columns (3) and (4) is $SCR\_coverage\_ratio\_low$ is a dummy variable = 1 if the insurers' past quarter SCR ratio is below 150%. In both panels, we apply security fixed effects and quarter fixed effects for all four columns. All standard errors are adjusted for heteroscedasticity.