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Laura-Dona Capota

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# UNIVERSITÉ D'ORLÉANS

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LABORATOIRE D'ÉCONOMIE D'ORLÉANS

## THÈSE

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**Laura-Dona CAPOTA**

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## Mutual Funds and Financial Stability

### THÈSE dirigée par :

**Mme. Raphaëlle BELLANDO**

Professeure, Université d'Orléans

**M. Sébastien GALANTI**

Maître de Conférences, Université d'Orléans

### RAPPORTEURS :

**M. Bruno SÉJOURNÉ**

Professeur, Université d'Angers

**Mme. Anne-Gaël VAUBOURG**

Professeure, Université de Poitiers

### JURY :

**Mme. Raphaëlle BELLANDO**

Professeure, Université d'Orléans

**M. Sébastien GALANTI**

Maître de Conférences, Université d'Orléans

**M. Bruno SÉJOURNÉ**

Professeur, Université d'Angers

**Mme. Anne-Gaël VAUBOURG**

Professeure, Université de Poitiers, Présidente du Jury

### INVITÉ :

**M. Laurent GRILLET-AUBERT**

Économiste senior, Autorité des Marchés Financiers



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# General Introduction

Financial development fosters growth. This is the conclusion of a rich literature, although issues related to the causality of this relationship (Robinson (1952), Lucas (1988)), the variables used and the employed methodology are still discussed by economists<sup>1</sup>. With financial development comes the emergence and the growth of financial intermediaries. The primary function of these actors is to intermediate between lenders and borrowers and therefore to optimally direct funds from the first to the latter.

Financial intermediaries can be further divided into banks and non-bank financial intermediaries (NBFIs henceforth). The NBFIs sector is composed of several types of financial institutions. Of these, insurance corporations, pension funds and investment funds account for over 60% of the NBFIs sector (Financial Stability Board (FSB henceforth) FSB (2021a)). The NBFIs sector also increased in size: according to the FSB (2021a), in 2020, NBFIs managed almost 50% of global financial assets, compared to 42% in 2008. However, during the last years, investment funds have increased the share of their activities in the total of non-bank activities. According to the FSB (2021a), in the Euro Area, other financial intermediaries (which are mostly composed of investment funds) managed almost 40% of non-bank assets in 2020 compared to 23% in 2008.

Indeed, regulatory and academics devoted a high number of studies on potential vulnerabilities displayed by mutual funds given their increased importance in the financial system and the significant stress experienced by them during different turmoil periods.

In order to enhance the financial system's resilience, it is therefore important to better understand how mutual funds work, what drove their strong development in recent years and what role they play during stress periods. In addition, an important topic related to the last one is the identification and the understanding of the potential sources of risk stemming from the activities of these different actors.

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<sup>1</sup>See Levine (2005) for a discussion of the empirical literature related to the relationship between finance and growth.

## The activity of mutual funds

Investment funds are financial intermediaries that invest in different types of securities with the resources collected by issuing shares to investors. Thus, they offer investors a direct access to financial markets. In order to calculate the price of the shares, the portfolio is valued in most cases on a daily basis (although some funds value it at a weekly or lower frequency). If one investor wishes to redeem (or to invest in a fund), then he or she will receive (pay) the liquidation value of the share. In the case of open-end funds, those shares are priced at their end-of-day Net Asset Value (NAV), which is calculated by dividing the difference between the total assets and liabilities by the total number of shares<sup>2</sup>. A mutual fund typically issues different types of shares, which target different types of investors. For example, shares can differ with respect to their distribution of the gains (either capitalized or distributed to investors) and management fees, the amount of the minimum investment requirements etc. The purpose of issuing shares with different characteristics is to attract different types of investors. For instance, retail investors will prefer shares with a low minimum investment but with larger fees, while institutional investors will direct themselves towards shares with low fees but high minimum investments.

There exist a multitude of types of mutual funds in the financial system. First, we can differentiate funds according to their structure: open-end funds, closed-end funds etc<sup>3</sup>. In the remainder of the introduction we will only describe open-end funds, as the different studies presented in this doctoral thesis include only funds with this structure.

Open-end funds generally compute their NAV at the end of each day and they accept daily redemptions (the funds buys back the shares of redeeming investors at their NAV). They also create new shares if new investors enter the fund or if an existing investor wishes to expand its participation. These funds are the most represented in the investment funds space and their growth has been substantial both in the US and in the European space: according to the Investment Company Institute (2021), assets managed by global open-end funds grew from \$28.4 trillion at end 2011 to \$63.1 trillion end 2020. Most of the funds are domiciled either in the US or in Europe (according to Investment Company Institute (2021), in December 2020, European and American funds manage 82% of the

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<sup>2</sup>In some cases the value of the share upon investment or redemption will vary from the NAV in order to account for entry or exit fees.

<sup>3</sup>For a short description of the other types of funds see Appendix 1.

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assets of this category).

Second, in addition to a differentiation according to their structure, funds can also be differentiated based on the securities in which they invest:

- Money market funds (MMFs) typically invest in money-market instruments. As those funds generally aim to preserve the value of the investments while generating a small return, they will invest in short-term instruments with a high credit quality. The regulation of these funds is more binding, compared to the regulation other types of funds need to comply with. Most notably, in contrast to other funds, MMFs need to comply with specific rules regarding the securities in which they can invest, and they also face liquidity and maturity requirements which depend on their regulatory type. Also, there are specific rules regarding the pricing of their shares (some funds are allowed to keep a constant NAV, while other MMFs will display a variable NAV).
- Stock funds which invest in common stocks. These funds can further be differentiated with respect to the country of origin of the stocks, the sectors of stocks' issuance, income or growth stocks etc.
- Bond funds mostly invest in debt securities. Similar to stock funds, bond funds can be further differentiated based on the country of bonds' issuance, bonds' credit quality, maturity etc.
- Hybrid funds are allowed to invest in both bond and stock securities.
- Other funds such as hedge funds, real estate funds etc.



## **Benefits of mutual funds**

Investment funds began to develop strongly in the '80s-'90s due to numerous advantages they offer investors. First, they offer the possibility to benefit, even for small savers, from a diversified portfolio and to reduce transaction costs. In this respect they offer the possibility to all investors to directly access financial markets. Second, it allows investors to benefit from liquidity services. A fund investor can therefore redeem from the fund generally at the end of each day, without needing to sell his portfolio if he were to invest in a basket of securities himself. Third, investors will benefit from the experience of a professional fund manager who is supposed to be able to maximise future returns while minimising risks. However, information is not perfect between investors and fund managers. Indeed, fund managers may not act in the best interest of investors and may hide information from them. Hence, an agency contract (which we will see more in detail in the second section of the introduction) exists between investors and fund managers, with the purpose of incentivising fund managers to act in investors' interests. In practice, fund managers' remuneration is contingent upon the level of assets under management. Bonuses can be rewarded in case of extra-performance of the fund.

Apart the above mentioned advantages they offer investors, mutual funds' activity also offers advantages to the financial system. First, financial markets (in which mutual funds play an important role) offer an additional source of financing for the real economy, which complements the one provided by banks. Mutual funds may therefore act as a "spare tire" when banks are under stress (Fischer (2015), IMF (2015)). Indeed, firms can finance themselves by issuing shares or bonds that are bought by funds (instead of obtaining a loan from a bank). However, it is important to note that not all firms have the ability to issue shares or bonds (in general small or medium companies finance themselves to a large extent via bank loans). Second, the presence and importance of mutual funds also encourage financial actors to issue securities. In the case of bonds, Zhu (2021) for example shows that fund flows encourage the issuance of new bonds for firms in which bond funds hold a large part of issued bonds. In addition, these firms also benefit from lower yields on their bonds. Third, by their trades, they also contribute to the underlying liquidity, especially during normal market conditions (according to the Investment Company Institute (2021), the average turnover rate of US equity funds between 1985 and 2020 is of 54% ).<sup>4</sup>

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<sup>4</sup>However, under stressed market conditions, it is important to note that not all funds provide liquidity

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## Mutual funds during stress periods

While financial intermediation encourages investment and ultimately economic growth, its actors can suffer significant outflows under stressed market conditions, and they can, by their parts, contribute to the transmission of shocks across the financial system's players. For example, mutual funds faced significant stress during both the 2008 crisis (GFC henceforth) and the COVID-19 turmoil more recently. For example, during the 2008 crisis, in the money-market fund (MMF) segment, prime MMFs (allowed to invest in riskier securities, such as commercial papers and certificates of deposit) suffered high outflows, as investors fled to quality. A number of MMFs had to close or suspend redemptions, while others benefited from sponsor support (Bengtsson (2013), Baba et al. (2009)). High outflows from prime MMFs meant lower available liquidity for banks, as well as for other firms issuing corporate papers (IMF (2008)). Other mutual funds, such as hedge funds exposed to mortgage asset-backed securities, as well as equity funds investing primarily in financials were also exposed to significant outflows (IMF (2008)). The selling strategies of these funds played an important role during the crisis<sup>5</sup>, as fire-selling illiquid assets could further decrease their prices and impact other participants through common exposures for example.

Following the GFC, it became clear that a better understanding of the risks related to the activities of mutual funds is needed. Also, the 2008 crisis revealed the necessity of better evaluating and addressing the interplay of fragilities between banks and mutual funds. In response to the gravity of the 2008 crisis, regulators took parts in order to build a framework for global regulation. For example, in the non-banking space, regulators adopted reforms regarding money market funds (MMFs) as well as other entities than MMFs among other reforms (US Securities and Exchange Commission SEC (2010), or the MMF regulation (EU) 2017/1131 in Europe). However, as the FSB (2021c) Annual Report indicates, "the implementation of NBFIs reforms continues, but it is at an earlier stage than other reforms" (FSB (2021c), p.2).

The growing importance of investment funds in the financial sector and their contribu-

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to the market. Indeed, as Wang et al. (2020) demonstrate, funds with less cash, less liquid corporate bonds and higher flow-performance sensitivities (which is synonymous of higher liquidity needs) buy to a lesser extent fire sale bonds sold by insurance companies.

<sup>5</sup>Indeed, as Manconi et al. (2012) demonstrates, mutual funds exposed to securitized bonds sold corporate bonds. This behaviour contributed to a transmission of stress from the securitized segment of the bond market towards the corporate segment.

tion to the amplification of imbalances especially during stress periods are in the spotlight since the GFC and the COVID-19 crisis and calls for the introduction of a macroprudential policy targeted to non-bank intermediaries have been multiplying (ESRB (2016), Schnabel (2021), de Guindos (2021)). More recently, during the COVID-19 turmoil, mutual funds came again under stress, with riskier, corporate bond funds and prime MMFs experiencing high outflows. This in turn contributed to price declines and limited liquidity for commercial papers or corporate bonds for example (FSB (2020a)). Better understanding of their functioning and the risks inherent to their activity, as well as the mechanisms by which those risks can be transmitted to the overall system is hence crucial for better regulating the sector.

In the remainder of the introduction we will concentrate more particularly on vulnerabilities exhibited by open-end funds and their potential consequences for the financial system's stability. In the first section we argue that due to the agency conflict that exists between managers and investors, the latter will incentivise the former by evaluating funds based on their performances. A convex flow-performance relationship emerges for equity funds, where good performers are rewarded with inflows, while bad performers are not punished with outflows. The convex shape of this relationship will in turn create dangerous incentives for fund managers, who will take more risk and herd. In the second section we explain that in a context of low levels of interest rates after the 2008 and the debt crises, the focus switched from equity to bond funds. Bond funds are less liquid than equity funds, which contributes to the emergence of first-mover advantages and run risks ultimately. The flow-performance relationship is no longer convex, but investors also withdraw following poor performances. The accommodative monetary policy also contributed to managers investing a higher degree of their portfolio in riskier securities, which contributes to increasing first-mover advantages. In the event of stressed market conditions, the turmoil experienced by mutual funds could also expand to other financial actors.

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# 1 Mutual funds and sub-optimal investment decisions

As described previously, the investment decisions can either be made by the investor himself or be delegated to a portfolio manager. The early literature on mutual funds concentrated on the analysis of the delegated portfolio management efficiency and the consequences of the intermediated portfolio management on prices. Namely, are the investor savings optimally allocated and in their best interest? There are two underlying topics related to this research question, which both treat of the agency conflict that exist between investors and managers. In the first subsection we will analyse the agency conflict (i.e. before the choice of the fund has been made by the investor). We will examine how investors incentivise managers to respect their interests. Here we will also discuss what fund characteristics investors take into account when selecting the funds. In the second subsection, we show that the incentives given by investors may have detrimental effects from a financial stability point of view.

## 1.1 The agency contract between investors and managers

The relationship between investors and fund managers is characterised by an information asymmetry. More particularly, investors cannot evaluate the managers' abilities. They also cannot know at each point of time the portfolio composition. This agency conflict needs to be mitigated, otherwise an investor will choose a fund that is inappropriate for him in terms of his risk profile. Thus, a principal-agent contract needs to be established in order for the manager (or the agent) to act according to the investor's (the principal) interests. Managers will hence be incentivised by investors to act in the interest of the latter.

Thus, according to Rajan (2006) and Ma et al. (2019), investors will provide performance-based incentives to fund managers by linking the manager's compensation to the fund's performance. Investors can also provide incentives to managers by directing their money to the best performers (IMF (2015)). As IMF (2015) argues, these two ways of providing incentives are similar if "compensation increases with assets under management" (IMF (2015), p.100). In contrast, when a fund performs poorly, investors redeem "with sub-

stantial inertia" (Rajan (2006), p.316). The fund performance is thus a key element that investors can use to evaluate funds. Indeed, several papers demonstrate that investors interpret past returns as an indicator of a manager's performance, which is the reason why they direct themselves towards past good performers and out of past bad performers (Ippolito (1992), Berk and Green (2004)).<sup>6 7</sup>

There is a large number of studies that examines the relationship between flows and past returns. In the case of equity funds, several papers demonstrated that this relationship is convex, meaning that a fund will record inflows if it had a good past performance, but outflows are explained to a lesser extent by a low past return (Sirri and Tufano (1998), Chevalier and Ellison (1997), Del Guercio and Tkak (2002), Chen et al. (2010), Bellando and Tran-Dieu (2011), Del Guercio and Reuter (2014), Goldstein et al. (2017) among others)<sup>8 9</sup>. Numerous papers tried to provide different explanations for the shape of this relationship.

### **Explanations for the convexity of the flow-performance relationship**

First, chasing past good performance is not an indicator of rational decisions. Bailey et al. (2011) for example demonstrate that biased investors base to a higher degree their decisions on past performances. However, Lynch and Musto (2003) argue that past

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<sup>6</sup>This finding extends to the more general question on whether past performances are an indicator of future performances, i.e. whether a mutual fund's performance exhibits persistence. While Grinblatt and Titman (1992), Hendricks et al. (1993), Brown and Goetzmann (1995) find evidence of performance persistence, Carhart (1997) shows that "common factors in stock returns and investment expenses almost completely explain persistence in equity mutual funds' mean and risk-adjusted returns"(Carhart (1997), p. 57) and Wermers (1997) prove that the performance persistence is driven by the momentum strategies.

<sup>7</sup>More generally, various studies analysed whether investors are "smart" enough to detect future performers, based on the past return exhibited by a fund. If this is demonstrated, the existence of a "smart-money effect" is proved, which would allow funds recording high inflows to display high future performances. Some early paper demonstrate that this is indeed the case (Gruber (1996), Zheng (1999), Keswani and Stolin (2008)). However, more recent literature argues that their findings are explained by a "persistent flow" hypothesis, and that once one controls for this explanation, past good performers will not certainly be the future performers (Wermers (2003), Lou (2012), Jiang and Yuksel (2017)).

<sup>8</sup>There is no consensus in the literature regarding which is the most appropriate performance measure. First, academics wonder whether investors base their decisions on raw or risk-adjusted returns (such as the Sharpe ratio or alphas estimated according to different factor models in order to control for investors' sophistication). Second, papers vary with respect to the use of an absolute measure of performance or a relative one. Indeed, one may consider that investors classify funds amongst themselves, which would explain why a relative measure of performance should be used. Third, the investment horizon that investors use is also uncertain (do they respond to past monthly or longer-term returns?). Irrespective of the performance measure used, the literature agrees on the shape of flow-performance for equity funds.

<sup>9</sup>Most of the aforementioned papers analyse the US market. Ferreira et al. (2012) examine the convexity of the flow-performance relationship in a panel of countries displaying different levels of development. They find that the flow-performance relationship displays a lower degree of convexity the more developed the country is.

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bad performances do not convey any signal about future returns as funds abandon the strategies that led them to underperformance. This could explain the convex shape of the flow-performance relationship as investors will not redeem following bad performance given that the fund will change its strategy.

Second, several papers (Sirri and Tufano (1998), Huang et al. (2007), Fu et al. (2012)) explain the role of costs (fund fees, transaction costs related to withdrawals and entry costs, participation costs) on funds' flow-performance relationship. Indeed, it is costly to exit a fund and to search which fund is better (Huang et al. (2007) refer to "participation costs"). As Huang et al. (2007) explain, "given fund-level participation barriers, more new investors are able to overcome their participation costs to invest in a fund only as its performance improves" (Huang et al. (2007), p. 1305). Sirri and Tufano (1998) also show that funds displaying lower research costs (due to more marketing for example) will display a more pronounced flow-performance relationship.

Finally, behavioural economics also attempted to provide an explanation for why investors do not redeem from underperforming funds. Goetzmann and Peles (1997) explain this finding by the presence of cognitive dissonance, i.e. that investors in poor performing funds tend to overestimate their performance.

In this subsection we argued that investors take into account fund returns when evaluating funds. This finding leads to the following research question: what is the relationship between flows and past returns? In the case of equity funds, it has been demonstrated that the flow-performance relationship is convex. However, the next subsection will argue that this form of the flow-performance relationship may lead to a sub-optimal choice of securities made by the manager.

## **1.2 The flow-performance relationship and incentives**

An ex-post agency conflict exists between fund managers and investors. More particularly, once the investor selected the fund based on its past performance, he cannot control the portfolio choice of the manager. In this section we will argue that rewarding performers with inflows (while not punishing losers with outflows) will provide dangerous incentives to managers, which can have detrimental effects in terms of securities pricing and financial stability.

The positive relationship between flows and performances may lead to **risk-taking incentives** (Morris and Shin (2014)). Indeed, managers might be incentivised to invest in riskier portfolios in an attempt to increase their future performances and maximise their compensation. The literature on tournaments is rich and provides useful insights on the presence of risk-taking incentives. Brown et al. (1996) find that in an attempt to increase their relative performance, mid-year losers will display a higher volatility portfolio compared to mid-year winners. Basak et al. (2007) also demonstrate that a fund with a higher or identical performance compared to an index will tend to mimic the index in order to secure its gains, while a fund with an underperformance compared to an index will increase its portfolio's riskiness under certain conditions. Goriaev et al. (2001) and Palomino (2005) consider the case of two funds with relative ranking objectives. They find that a mid-year loser will take more risks in the second part of the year.

However, certain papers' findings are not in line with the ones previously mentioned. Busse (2001) finds that the results reported in Brown et al. (1996) hold when using monthly data, but that they completely disappear when using daily data. They argue that this result "arises from biases in the monthly standard deviation estimates" (Busse (2001), p.54). Carhart et al. (2002) show that winning funds are performing a "portfolio pumping" strategy, which allows them to show strong performance at quarter-ends. More specifically, they manipulate stock prices at quarter-end by buying existing positions which drives up their prices, with a subsequent reversal the first day of the next quarter. Taylor (2003) shows that a mid-year winner fund will have the incentive to take on more risk as it anticipates that the loser fund will do the same. This incentive will even be stronger when the stocks expected returns are high in the second part of the year. Jans and Otten (2002) demonstrate empirically that the existence of a tournament behaviour depends on the period of study: between 1989 and 1996 a tournament behaviour exists, but between 1997 and 2003 winning managers will be more likely to increase risks, as in the theoretical model of Taylor (2003).

This topic is also treated in more recent literature. Ferreira et al. (2012) for example show that managers are incentivised to take more risk the more convex the flow-performance relationship is. Basak and Makarov (2012) find that mid-year winner funds will aim for a higher-volatility portfolio compared to mid-year losers and they argue that their results are in fact "consistent with a rational tournament model" (Basak and Makarov

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(2012), p.379).

As investors reward funds with high performances, managers may be incentivised to invest in the same assets, i.e. to herd. A vast array of studies concentrate on **herding models**. For a comprehensive review of literature see Cai et al. (2019) who distinguish between models in which agents ignore their private informations and models in which investors' decisions are driven by fundamentals. In the US mutual funds space, Wermers (1999) finds that investment funds herd in small stocks, while Brown et al. (2014) show that mutual funds herd according to analysts recommendations. Mutual funds' herding has also been studied in the French case. Indeed, Arouri et al. (2013) demonstrate that French equity funds herd, and that they tend to herd to a higher degree in small-capitalisation firms.

To sum up, before the crisis different studies were interested in examining whether the delegated portfolio management represented an optimal choice for investors. The question of which contract between investors and asset managers was optimal was also analysed. In practice, as Rajan (2006), Ma et al. (2019) demonstrate, investors incentivise managers to act in their interest by linking the manager's compensation to fund returns. Funds that perform well will receive inflows, with investors being relatively inert to poor performers (Rajan (2006)). This convex flow-performance relationship leads to risk-taking incentives and herding among fund managers, as previously described by different studies.

If academics and regulators were aware of these different vulnerabilities prior to the 2008 crisis, they did not anticipate the run risks mutual funds are subject to and the contagion risks that were revealed by the GFC.



## 2 Mutual funds and the run risk

The 2008 crisis changed the way regulators and academics perceive the risks exhibited by mutual funds. If the GFC did not originate from mutual funds, the crisis revealed that these actors are subject to first-mover advantages and are capable of transmitting shocks to other players in the financial system. In this section we will provide a new interpretation of the flow-performance relationship, we will also describe the role played by the accommodative monetary policies on the risks taken by fund managers and we will finish by analysing the contagion risks that exist between funds and other financial actors.

### 2.1 The flow-performance relationship: a new interpretation

As described in the previous section, the early literature analysed the flow-performance relationship in the context of a tournament between funds that compete to attract inflows. Its convexity incentivise managers to invest in riskier securities and to herd as fund investors will not punish poor performers with large redemptions. However, during the 2008 financial crisis, some mutual funds were subject to high redemptions as investors flew to safety. Therefore, regulators and academics turned their attention towards the existence of a run risk in mutual funds and the conditions under which this run risk may be magnified. There is a consensus in the literature regarding the fact that in riskier funds, the fund's operating method will create strategic complementarities<sup>10</sup> which will lead poor performing funds to experience redemptions. Hence, in riskier funds, the financial stability question related to the flow-performance will be the presence of a run risk and the conditions under which this risk will be amplified.

#### **The run risk: the mechanism**

The origins of the run risk can be found in the fund's operating method and the share's pricing rules. An investor wishing to redeem will notify the fund about his decision and will receive the share's price (or the NAV) calculated at the end of that respective day. In order to reimburse redeeming investors, the fund will need to proceed to a portfolio

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<sup>10</sup>By strategic complementarities we mean that redeeming investors impose a cost on the remaining investors, thus incentivising the latter to also redeem.

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change, an activity which is accompanied by transaction costs and which could potentially be made at a discount or have a price impact on the rest of the fund's portfolio especially under stressed market conditions. The following day, the portfolio will be reevaluated on a marked-to-market basis and potential losses on securities' valuations will be recorded, which could lead to a lower NAV for the investors remaining in the fund. Hence, an investor will have the incentive to redeem before others do in order to avoid suffering losses on his investment. This strategic complementarity will bear more severe consequences in case of significant outflows (in response to which the funds will need to sell more assets, possibly at a discount) and in case of a more illiquid portfolio (selling illiquid assets will be more difficult without accepting a potential loss especially during turmoil periods).

### **The returns' effect on flows: empirical proofs**

As described above, the more illiquid the fund is, the more important the strategic complementarities will be. Indeed, it is more costly to sell illiquid assets (especially during crisis periods), which will lead to a higher cost of liquidity imposed on remaining investors. Therefore, from a financial stability point of view, we worry about a run risk if investors redeem following poor performances in more illiquid, riskier funds. As bonds are generally more illiquid than shares, the run risk has been extensively studied in the case of bond funds.

In contrast to equity funds, several papers proved that investors will react in response to past poor performance, i.e. that the relationship between flows and past returns is not convex (Goldstein et al. (2017), Chen and Qin (2017), IMF (2015), Wang (2015) among other papers). However, the degree to which investors respond to past low performances is contingent upon the different characteristics of funds and financial conditions.

First, as first-mover advantages are greater in more illiquid bond funds, the flows will display a higher sensitivity to past returns in funds with less cash or in funds that hold a larger proportion of their portfolio invested in illiquid assets (Goldstein et al. (2017), Wang (2015)). Falato et al. (2021a), Ma et al. (2020) also show that the degree of portfolio illiquidity plays a role in explaining outflows of bond funds, with more illiquid funds suffering more outflows compared to their liquid peers during the COVID-19 turmoil. In addition, Falato et al. (2021a) show that higher outflows are experienced by more vulnerable funds, i.e. those with more common holdings with the other funds and with

holdings more probably impacted in their prices. In the money market space, Li et al. (2021), Cipriani and La Spada (2020), ECB (2020) inter alia show that MMFs able to invest in riskier money-market instruments (both in Europe and in the US) also suffered high outflows, with investors turning to a great extent towards public debt MMFs (a flight to safety behaviour taking place).

Second, financial conditions play a role in the decision of bond fund investors to withdraw following poor performances. For example, Falato et al. (2021a) shows that the COVID-19 episode was an extraordinary one for corporate bond funds with outflows reaching higher levels than during the Taper Tantrum episode of 2013<sup>11</sup>. Indeed, the liquidity costs imposed by redeeming investors on passive investors will be higher during illiquid periods of time, as illiquid assets would be sold at a greater discount. In the same vein, Goldstein et al. (2017) prove that investors react more strongly to past poor performance during illiquid periods.

Third, the flow-performance relationship is also contingent upon the type of funds' investors. Goldstein et al. (2017) demonstrate that institutional investors are more sensitive to performance and they explain this finding by a greater sophistication of these investors, which dispose of higher capacities to monitor fund managers. However, institutional investors are less sensitive to poor performance in more illiquid funds compared to their retail counterparts. The authors explain this interesting result by the fact that institutional investors are more sophisticated and more aware of the consequences of their decisions if they were to redeem from illiquid funds: "hence, they serve to reduce coordination problems that lead to runs on funds"(Goldstein et al. (2017), p. 608). Nevertheless, it is worth noting that there is no consensus in the literature related to these findings, as Wang (2015) finds the opposite results.

There is a consensus in the literature that bond fund investors will react more strongly to past poor performances (compared to investors in equity funds) given the more important strategic complementarities that investors face in bond funds. However, it is important to note that the existence of a first-mover advantage also relies on whether current flows influence future fund and securities returns.

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<sup>11</sup>The Taper Tantrum episode refers to a sharp rise in bond yields following the announcement of a future tapering of asset purchases made by the Federal Reserve Chair Ben Bernanke in May 2013.

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## The flows' effect on returns: empirical proofs

The effect of flows on securities' returns has been demonstrated by several papers<sup>12</sup>. Feroli et al. (2014) demonstrate the existence of a feedback loop between flows and asset prices especially in the bond funds. Coval and Stafford (2007) argue that a temporary price pressure will be exerted in response to outflows. Ben-Rephael et al. (2011) also find that flows lead to a temporary price pressure. In the French corporate bond case, Coudert and Salakhova (2020) show that fund flows influence corporate bond yields and that bond yields are affected to a higher degree by outflows compared to inflows. Also during the COVID-19 turmoil, the extreme outflows suffered by mutual funds put pressure on securities prices and ultimately on the good functioning of the economy. Jiang et al. (2022) construct a measure of bond fragility, based on the average illiquidity of bond funds' portfolio and the relative size a fund has in a given bond, relative to other funds. The more recent findings of Jiang et al. (2022) also echoes the previous findings, i.e. they find that for more fragile bonds, a price decline followed by a subsequent reversal is happening in response to outflows. Also, these bonds seem to display a higher volatility of their returns especially under stressed market conditions. The authors argue that these findings can be explained by the selling pressures of underlying investors, namely a bond with higher fragility will suffer from a higher selling pressure. Haddad et al. (2021) also demonstrate that bonds more subject to liquidation pressure of bond funds experienced a higher decline of their prices.

A feedback loop between flows and securities returns may be reinforced the more holdings mutual funds have in common. Indeed, Falato et al. (2021b) demonstrate that fire sales might have detrimental effects on bond funds that hold the same assets and that they contribute to reduced returns and high outflows of peer funds, which in turn encourage additional sales. The findings of Falato et al. (2021b) relate to two underlying research questions which are interconnected, namely do mutual funds sell assets that performed badly (procyclical behaviour) and do mutual funds invest in the same securities

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<sup>12</sup>Several papers find the opposite result, namely that flows do not drive securities' prices below their fundamental values. Choi et al. (2020) for example find little evidence of fire sale price pressure following bond fund redemptions. They argue that a potential explanation is related to liquidity cushions that funds maintain and use in order to reimburse redeeming investors. Hoseinzade (2016) finds this result for corporate bond funds and he argues that the result is driven by fund managers who do not massively sell illiquid bonds and thus act in a precautionary way. Czech et al. (2021) also find that mutual fund flows also lead over the next one to two months to positive UK gilt returns. Also, a different result compared to prior research is that the effect on returns is not temporary.

(herding behaviour). These research questions are interconnected as fire sales of funds that have a price impact will impact funds that hold the same assets. In turn, peer funds will also have the incentive to sell poorly performing assets as they hold the same underperforming assets.

Related to the first research question, Timmer (2018) indeed demonstrate that mutual funds display a procyclical behaviour. Also, the author displays evidence of the procyclical behaviour increasing with the fund's outflows. In the same vein, Raddatz and Schmukler (2012) demonstrate that both fund managers and fund investors redeem from countries that are under stressed market conditions. Czech et al. (2021) also show that during the 2013 taper tantrum, funds were selling corporate bonds following an increase in their yields. This procyclical behaviour feeds upon a herding behaviour, which may contribute to driving prices beyond their fundamental values. Cai et al. (2019) demonstrate that a herding behaviour is present in mutual funds and that the selling herding behaviour is stronger than buying herding. Also, the authors show that sell herding behaviour is particularly present in illiquid, small bonds after a price decline. Also, this herding behaviour contribute to price distortions: Wermers (2003) finds that stocks that are persistently bought overperform stocks that are persistently sold and that there is no price reversal. On the contrary, Dasgupta et al. (2011), Brown et al. (2014), Cai et al. (2019) shows that there is a price reversal on the long-term.

As previously detailed, several studies provide evidence that fund flows have an effect on future securities returns. However, it is also important to analyse whether fund flows will also influence fund future returns, thus contributing to the emergence of strategic complementarities. A number of studies focused on the pre-requisite conditions that could magnify the first-mover advantage<sup>1314</sup> Indeed, the future share price may decrease

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<sup>13</sup>Regulators and academics worked on identifying stabilising mechanisms which could allow a reduction in the fund's first-mover advantage. A swing pricing rule for calculating the NAV has been proposed as a potential solution. According to this pricing rule, investors willing to sell their shares will bear the liquidity costs associated to their redemptions. Several papers studied the efficiency of such a measure: Jin et al. (2022) empirically proves that the adoption of swing pricing reduces outflows under stressed market conditions and eliminates first-mover advantages. In a theoretical framework, Capponi et al. (2020) shows that a swing pricing rule allow the costs to be transferred effectively from remaining investors towards redeeming investors, hence allowing a reduction in the first-mover advantages. Lewrick and Schanz (2017) also finds that swing pricing makes outflows are less sensitive to past performance, but that this effect is limited under stressed market conditions.

<sup>14</sup>Other papers analyse the implications of pricing rules of certain funds that trade at stale prices. Greene and Hodges (2002), Chalmers et al. (2001), Goetzmann et al. (2001) find that redeeming investors that exploit the existence of stale prices will benefit from a higher return and will impose a cost on passive investors that choose to stay in the fund.

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to a larger extent if fund managers respond to current outflows by selling more illiquid assets, or if the fund has less cash or liquid assets, which would incentivise the fund to use his illiquid assets first. In an empirical setup, Goldstein et al. (2017) and Wang (2015) for bond funds and Chen et al. (2010) for equity funds provide evidence that outflows decrease fund's returns and that this effect is larger in funds with more illiquid assets. In addition, Goldstein et al. (2017) also highlights the importance of financial conditions as they find that in bond funds, outflows will impact the future NAV to a higher extent during more illiquid time periods. Zeng (2017) theoretically shows that selling illiquid assets in order to replenish the cash buffers will hurt the fund's future NAV.

The selling strategies of fund managers therefore play an important role in the existence of a relationship between current flows and future returns.

### **The impact of selling strategies on the first-mover advantages**

In response to outflows, a fund manager must make a trade-off between conserving the liquidity of its portfolio (at a cost of a lower future return and at the risk of selling illiquid assets at a discount) and offering a higher return to his investors (at a cost of a lower future portfolio liquidity). Indeed, if it is demonstrated that funds proceed by selling more illiquid assets first especially under stressed conditions, then their behaviour might influence to a higher degree assets' prices and ultimately funds' future returns, hence contributing to the emergence of first-mover advantages. What assets mutual funds sell first has been the research subject of several papers. Notably, funds can respond to outflows in an horizontal (by using cash first or by selling the more liquid assets first) or in a vertical way (by selling all types of assets, independently of their liquidity, on a pro-rata basis). Chernenko and Sunderam (2016) find that equity and corporate bond funds use their cash to accommodate redemptions. Also, they use cash even more during periods of low market liquidity and they hold larger cash buffers if the fund performs more liquidity transformation. However, these findings are challenged by more recent papers. Morris et al. (2017) show that bond funds sell more assets and tend to accumulate cash in response to redemptions. Jiang et al. (2021) find that corporate bond funds respond to outflows by using cash or by selling first liquid assets (such as government bonds), which is synonymous of an "horizontal cut" of their portfolios, but they switch to a "vertical cut" in times of elevated uncertainty. Huang (2020), Girardi et al. (2017) find that bond

fund managers increase cash holdings and decrease portfolio illiquidity through trades (inferred from quarterly holdings) during periods when expected volatility increases. Ben-Rephael (2017) also finds that during crisis periods, mutual funds reduced their aggregate shareholdings of illiquid stocks. In addition, the selling pressure can be particularly large as Shek et al. (2018) demonstrate that in the case of Emerging Market Economies (or EME) bond funds, discretionary sales reinforce the bond sales due to investor redemptions. This dynamic portfolio management can have detrimental consequences. Indeed, Zeng (2017) shows that first-mover advantages arise when funds sell illiquid assets in order to replenish their cash buffers.

However, in the more recent setup of the COVID-19 turmoil, Ma et al. (2020) show that bond funds responded to outflows by selling first more liquid corporate bonds and Treasuries, which contributed to a decrease of their returns. O'Hara and Zhou (2021) also find that "when market liquidity started to evaporate trading shifts to bonds that were more liquid during normal times" (O'Hara and Zhou (2021), p.47).

To sum up, there is mixed evidence on whether mutual funds managers sell first liquid or illiquid securities in response to outflows. As demonstrated by a number of papers, if managers choose to sell illiquid assets first, this could increase the strategic complementarities investors are subject to and ultimately the fund's run risk. However, it is worth noting that in the past years a growing number of funds invested a higher share of their portfolio in riskier assets. As portfolios get riskier, managers will have no choice but to sell illiquid assets. It is therefore crucial from a financial stability point of view to understand why managers accumulate illiquid holdings.

As explained above, one of the reasons that explains the manager's choice to invest in illiquid securities is the tournament model: as the manager's compensation is based on the amount of assets under management, the funds compete with each other in order to attract the highest inflows. They are therefore incentivised to take more risk as investors will prefer the good performers. However, the risk-taking incentives do not originate only from the tournament model funds are subject to, but also from the monetary policy stance in force until the 2008 crisis and thereafter.

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## 2.2 The impact of the monetary policy on fund holdings

More recently, regulators and academics worry about a general pursuit of a search for yield behaviour, in a context of low for long interest rates and Unconventional Monetary Policy (UMP henceforth) applied by Central Banks.

As policy rates and long-term yields for a variety of assets decline, investors may be pushed to search alternative investments that present a higher yield. Rajan (2006) and Borio and Zhu (2012) among others argue that in a low interest-rate environment, investors may be incentivised to reach for yield. This phenomenon is known as the risk-taking channel of the monetary policy. The search for yield behaviour displayed by mutual funds has drawn the attention of regulators. ECB (2019) states that "profitability challenges have encouraged non-banks to increase their exposure to riskier and less liquid securities" (ECB (2019), p.84). This behaviour also continued after the 2020 COVID-19 turmoil. According to the ECB (2021c), 22% of bond funds portfolios is invested in high-yield assets (an increase of 3% since the end 2019). In addition, mutual funds took on more duration risk, i.e. they invested in longer-term debt securities, which rendered their portfolios more sensitive to a potential rise of interest rates. As this may be beneficial from an economic point of view (because the UMP aim to push investors towards other types of assets, therefore relaxing the financing conditions and providing liquidity), this behaviour may be at the origin of a greater liquidity risk taken by fund managers. Indeed, if financial conditions were to tighten and more investors would like to withdraw, it may be more difficult to sell less liquid assets without a loss. Both end investors and fund managers may be at the origin of this risk-taking behaviour.

### **The reach for yield from an investor perspective**

Several papers analysed the behaviour of funds' investors in response to changes to the monetary policy. Banegas et al. (2016) for example find that in response to decreasing market rates, investors increasingly take more risk and direct themselves towards riskier funds (such as high-yield bond funds). Fratzscher et al. (2018) show that the unconventional monetary policies adopted by the Federal Reserve System (Fed henceforth) after 2010 contributed to a decrease of global bond fund assets and an increase in fund flows towards EMEs. Kroencke et al. (2015) find that in response to Fed's monetary policy easing,



US investors direct their savings towards international assets. Furthermore, they show that institutional investors switch their portfolio towards high-yield or riskier bonds, a result that is in line with a search for yield behaviour displayed by these investors. Giuzio et al. (2021) prove that inflows increase in riskier Euro Area funds (high yield, corporate bond funds for example) following an expansionary monetary policy shock. Daniel et al. (2021) argue that based on a "reaching for income" behaviour investors will shift their portfolio towards higher income assets following a decrease of interest rates. Furthermore, Hau and Lai (2016) finds evidence of a rebalancing of investor's portfolios from money market funds towards equity funds following a decrease of the real interest rates.

### **The reach for yield from a manager perspective**

Other papers analysed the fund manager's portfolio allocations decisions in a low-interest environment. Choi and Kronlund (2018) show that corporate bond funds will reach for yield in a context of low level and slope of the yield curve. Kaufmann (2020) finds evidence that after an easing of the US monetary policy, fund managers increasingly shift their holdings towards corporate of high-yield bonds. Czech and Roberts-Sklar (2019) also find evidence of a search for yield behaviour by showing that asset managers will buy higher yielding bonds. Di Maggio and Kacperczyk (2017) study money market funds and show that managers of these funds will invest in riskier securities in response to low levels of interest rates. Although linked to the previously mentioned papers, another strand of the literature concentrated on analysing the risk-taking behaviour of fund managers in response to unconventional monetary policy announcements and operations. Cenedese and Elard (2021) for example find that both equity and bond funds shift their portfolios from the developed country that conducts its purchases towards other developed countries. However, a potential rebalancing towards EMEs is not clearly found.

The analysis of the consequences of a risk-taking behaviour is important from a financial stability point of view. Indeed, if this search for yield behaviour is replaced by a flight to safety behaviour under stressed market conditions, then selling illiquid assets will prove to be highly detrimental for their prices and can potentially affect other financial institutions due to their common holdings. Contagion risks from mutual funds to other financial actors will be the topic of the next section.

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## 2.3 Contagion risks to other financial institutions

The vulnerabilities displayed by mutual funds can also impact other actors in the financial system. Indeed, regulators are closely monitoring the different links and a potential risk transmission between NBFIs actors and banks (Sydow et al. (2021), Aikman et al. (2019), Mirza et al. (2020), the Haut Conseil de Stabilité Financière HCSF (2020) among others). These links can relate either to the balance sheets of these institutions (for example through the presence of common securities, holdings of funds' shares, loans made by banks to funds etc.) which can be easily quantified. Integrating the investment fund sector in a conventional stress test scenario complements existing bank-based stress tests results and better inform the regulator on the possible interparts between these sectors. In an ECB Working paper, Sydow et al. (2021) which make use of granular datasets, prove that mutual funds in the Euro Area contribute and add to the overall stress by proceeding to fire sales in response to investor redemptions. In addition, the authors argue that the presence of funds "increases average bank capital depletion by one percentage point" (Sydow et al. (2021), p.2). Calimani et al. (2019) prove that mutual funds can amplify fire sales even if only banks were hit by shocks. Aikman et al. (2019) also construct a stress-test scenario that comprise banks, investment funds, hedge funds, insurance companies and pension funds and find that under this scenario if shocks are large enough, a feedback loop between asset prices and binding solvency or liquidity constraints appears. Mirza et al. (2020) examine the common holdings channel in a two-actor financial system (composed of banks and investment funds) and also find evidence of increasing systemic importance of Euro Area investment funds. In the more specific case of France, HCSF (2020) modelled a financial system composed of banks, investment funds and insurance companies. The study underlines the importance of the stress transmission through the common holdings channel and the channel of price losses on institutions' securities which are detained by other financial system actors.

As described in the previous paragraph a growing literature analyses the contagion risk in a system comprising investment funds. In the aforementioned papers, the transmission risk is modelled by considering the balance sheet structure as well as other channels (interbank lending, repo markets etc.) and some papers make use of granular data in order to estimate the impact of the transmission of an initial shock. However, another contagion

channel, harder to be quantified exists. As the Bank of England (BoE henceforth) shows, banks could indeed be incentivised to intervene in order to protect their reputation if direct links exist between them and their non-bank activities (BoE (2019)). Indeed, as the ECB (2020) argue, banks and insurance companies often control asset management companies, which allows the first to benefit from additional revenues and risk diversification (Ferreira et al. (2018) notes that as of December 2010 "about 40% of mutual funds are run by asset management divisions of groups whose primary activity is commercial banking" (Ferreira et al. (2018), p.1)). This step-in risk is very important especially during a crisis period as it could lead to a contagion risk.<sup>15</sup> Indeed, it has been proven especially during the GFC that a number of banks granted credit lines, bought troubled assets or issued guarantees to distressed MMFs in order for them to avoid registering losses (Bengtsson (2013), McCabe (2010)). More recently, anecdotal evidence suggests that a number of European banks bought back commercial papers from distressed MMFs in order to provide them a source of financing (ECB (2020)).

To sum up, we have described how the principal-agent model that exists between fund managers and investors lead to investors chasing performance. Thus, a flow-performance relationship appears with potential financial stability consequences. If the early literature pointed to risk-taking incentives related to the convexity of this relationship, the more recent literature also stressed the run risks funds face due to a high sensitivity of investors to poor performances and to the presence of first-mover advantages. Also, in a context of accommodative monetary policies adopted after the 2008 crisis run risks are potentially greater as funds invest to a greater extent in riskier securities. It is therefore important to analyse the different fragilities (or the strengths) exhibited by funds and their drivers. In addition, from a regulatory perspective, it is crucial to understand whether the current regulation reduces or contributes to the build-up of vulnerabilities.

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<sup>15</sup>the Directive 2002/87/EC and the amending Directive 2011/89/EU "FICOD1" of the European Parliament and of the Council aim to mitigate spillover risks in a financial conglomerate.

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## Thesis contribution

With this doctoral thesis we attempt to study how the investment funds' activities can have an impact on the financial stability. We thus aim to contribute to the identification and monitoring of fragilities of this growing sector. We also contribute to a better understanding of investor behaviour. This thesis consists of three empirical articles presented in a chapter format that complement each other in the analysis of different types of investment funds: the first chapter studies bond funds, the second chapter studies equity and bond ESG and conventional funds, while the last chapter examines money-market funds.

First, we contribute to the literature on the flow-performance relationship of bond funds. The first chapter, which has been published in *Finance*<sup>16</sup>, demonstrates that investors of French bond funds are sensitive to both shorter-term and longer-term measures of performance and that investors withdraw more strongly from funds experiencing very negative returns compared to funds displaying small negative returns. This finding sheds light of a non-linearity in investor's response following past levels of negative performances. It also has financial stability implications since bond funds are sensitive to a rise of interest rates, a topic which is increasingly discussed in a context of high levels of inflation after the COVID-19 turmoil and the Russia-Ukraine war.

Second, we analyse the growing sub-sector of ESG funds and we add to the literature by examining whether this type of funds may originate and propagate stress through the existence of a positive flow-performance relationship. The second chapter<sup>17</sup> analyses the flow-performance relationship of ESG funds and more specifically whether these funds are more resilient from a financial stability point of view. We find that investors in bond and equity ESG funds are less sensitive to past negative returns compared to their traditional counterparts. Moreover, this result is robust after controlling for market conditions, clientele composition and liquidity of the portfolios' assets. This analysis also bears financial stability importance since more resilient investors would reduce the extent of the first-mover advantages which exists in traditional funds. More generally, more resilient ESG funds will prove to be a stable source of finance for the green transition.

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<sup>16</sup>Article co-written with Raphaëlle Bellando and Sébastien Galanti, (Bellando et al. (2021))

<sup>17</sup>Article co-written with Margherita Giuzio, Sujit Kapadia and Dilyara Salakhova

Finally, we study in more detail the stress experienced by money market funds during the COVID-19 turmoil and we contribute to the ongoing discussion of enhancing the stability of this sector by improving its regulation. In the third and last chapter<sup>18</sup> we analyse the outflows experienced by the money market funds during the COVID-19 turmoil and we find that more risky, but also Low Volatility Net Asset Value (LVNAV henceforth) funds suffered higher outflows. In addition, we find that LVNAV funds more at risk of breaching their constant NAV properties also experienced higher outflows. Moreover, funds displaying lower levels of liquid assets are subject to increased withdrawals. These findings confirm the more general flight to safety behaviour which took place during the COVID-19 turmoil. Our paper has financial stability implications since it contributes to analysing to what extent the current regulation played a role in explaining the high levels of outflows experienced by some MMFs during the turmoil.

Each chapter is described more extensively below.

## **Chapter 1: Bond Fund Fragility: Flow Reports to Extremely Negative Return Shocks**

The assets managed by bond funds increased rapidly in the last years in a context of low interest rates. According to the ECB's Statistical Data Warehouse, the assets managed by Euro Area bond funds increased from €1.4 trillion at end 2008 to €4.2 trillion in November 2021 (a 300% growth). Bond funds constitute an important research topic given their importance in the asset management industry, but also due to a more recent context of high inflation. Indeed, a normalising monetary policy may have detrimental effects on the return exhibited by bond funds. These developments have risen concerns given the links that exist between their activity and the financial stability. More particularly, a vast literature studied the run risks at which bond funds may be subject to and the presence of a first-mover advantage. Due to its more illiquid holdings (compared to equity funds), several studies provided evidence of investors in bond funds being highly sensitive to past poor performances, the presence of this sensitivity constituting the first step in demonstrating the existence of a flow-performance loop.

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<sup>18</sup>Article co-written with Michael Grill, Luis Molestina Vivar, Niklas Schmitz and Christian Weistroffer. A preliminary version of this work has been published in the ECB's Macroeprudential Bulletin (Capota et al. (2021)).

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We add to this literature by studying in more detail the flow-performance relationship of French bond funds. In order to study this relationship we employ a monthly dataset of French bond funds, covering the period between January 2005 and December 2017. Past literature proved the presence of a non-linearity in investors' response following past positive and negative performances (Goldstein et al. (2017), Chen and Qin (2017)). Also, the authors consider that investors are sensitive to either short-term or long-term returns.

We complement this literature by demonstrating that both short-term and long-term returns explain investors' decisions. In addition, we show that a non-linear relationship exists also in the segment of negative performances, i.e. that investors withdraw more following very negative performances (defined as being in the first quintile of negative performances over our sample). Our results are robust across several specifications, namely after controlling for stress periods (more outflows occur under stressed market conditions) or after considering a clientele effect (the analysis of retail and institutional shares separately yields similar results). Interestingly, in the institutional shares space, we find that investors are more sensitive to the level of past negative performances as we provide evidence that the non-linearity in the effect of past negative performances is observed over a larger range of poor returns. Hence, compared to retail bond funds, institutional bond funds could be subject to higher outflows in the event of poor performances.

Our results bear financial stability importance by showing that not only investors react differently to positive and negative performances in bond funds, but also that they withdraw more when the fund experiences particularly large, negative returns. A strong, negative performance not only decreases the fund's long-term, relative return, but also constitutes a short-term shock. Therefore, a large, negative performance may lead to higher outflows stemming from both a decrease in the relative long-term return and a low short-term return. The study of the flow-performance relationship especially for bond funds is particularly important in the present context, where more Central Banks signal their will of rising the interest rates in the near future. If this shift of the monetary policy stance arises abruptly, and markets do not anticipate it correctly, the returns of debt securities and of bond funds in fine may be quickly affected.

## Chapter 2: Are ethical and green investment funds more resilient?

Global ESG funds recorded a strong growth during the past six years: their assets under management (AuM) increased rapidly from €0.5 trillion in 2015 to €1.3 trillion in June 2021. Moreover, this increase is likely to continue in the years to come: a 2020 survey by BlackRock (2020) mentions that "respondents plan to double their sustainable assets under management in the next five years" (BlackRock (2020), p.3). ESG funds therefore constitute an essential research topic given their increasing market footprint in the asset management sector.

ESG funds constitute nowadays an important source of green finance and undergoing studies try to analyse whether these new funds bear the same risks as their traditional counterparts. As IMF (2021) and ECB (2021a) explains, traditional fund assets are subject to transition and physical risks which could lead to a sudden repricing of the assets. A sudden repricing can contribute to a run risk, originated by a flow-performance loop. Indeed, various studies found that in the case of both equity and bond funds, investors redeem following negative performance, which is the starting point of a first-mover advantage. However, some papers find evidence of investors being less sensitive to past performance in ESG funds, which implies that first-mover advantages might be mitigated in this type of funds. Indeed, it has been demonstrated that the flow-performance relationship is weaker in ESG funds compared to traditional funds (see Renneboog et al. (2011), El Ghoul and Karoui (2017), Benson and Humphrey (2008), Bollen (2007)). Reasons for this findings can be found in the emerging literature.

First, a number of papers studies advance the fact that ESG investors are less influenced by performance as they care more about sustainability than performance (Dottling and Kim (2020), Hartzmark and Sussman (2019), Pastor et al. (2021), Bauer et al. (2021)). Second, ESG investors are willing to forgo a poor short-term performance, as they display a longer-term horizon (see Riedl and Smeets (2017), Dottling and Kim (2020)), Finally, based on survey results, Krueger et al. (2020) demonstrate that moral or ethical considerations, or legal/fiduciary duties as well as the will to protect their reputation push institutional investors to include climate risks criteria in their investment decisions.

This paper examines whether the flow-performance relationship of ESG and Environ-

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mental (E)-focused bond and equity investment funds is different from the one exhibited by traditional funds. More particularly, we are interested in analysing whether investors in ESG/E-focused funds are less sensitive to poor past performance.

We complement the existing literature on ESG funds by analysing ESG investors' behaviour over a long time period, covering the COVID-19 market turmoil, and considering both bond and equity funds, and retail vs institutional fund shares. We employ a unique data set covering monthly share observations of both bond and equity funds from January 2016 until December 2020. We identify ESG/E-focused funds by searching certain words in funds' names (e.g. "ESG", "Sustainable", "Green" etc.). We argue that investors may not check the funds' prospectuses, therefore the use of certain words represents a first signal that a fund employs ESG/E-focused criteria in its investment decisions.

Our results have several policy implications. First, a different flow-performance relationship might have financial stability implications for bond funds: investors insensitive to past poor performance would mitigate the higher first-mover advantage existing in more illiquid funds, thus lowering the probability of fund managers fire-selling their assets in order to accommodate redemptions. Second, a higher resilience of investment decisions to low returns might be beneficial for the green transition, as it would prove that ESG/E-focused funds provide a stable source of finance.

We find that in both bond and equity funds, investors in ESG/E-focused funds are less sensitive to past negative returns. This result is robust when considering separately retail and institutional shares and it also remains unchanged during normal and crisis periods. In addition, for the bond funds sample, we demonstrate that ESG/E-focused investors do not withdraw following bad performances even in less liquid funds. Also, one may argue that our results are driven by the choice of our sample, which consists of funds domiciled in the Euro Area. Indeed, one may think that European investors exhibit stronger environmental concerns, which would lead to them being insensitive to poor performances. In contrast, non-European investors would still redeem following poor performances in ESG funds. However, we observe that our results remain robust when we split the sample between funds detained by European investors and the funds detained by other investors.



## Chapter 3: Is the EU Money Market Fund Regulation fit for purpose? Lessons from the COVID-19 turmoil

The 2007-2008 global financial crisis demonstrated that money market funds are also subject to run risks despite their holdings of short-term and generally safe instruments. Indeed, the sector experienced a flight to safety move when investors redeemed massively from prime MMFs towards public debt MMFs. This run originated with the Reserve Primary Fund losing its constant NAV properties<sup>19</sup> due to its Lehman Brothers holdings and quickly spread to other prime funds, forcing their sponsors to intervene (McCabe (2010), Bengtsson (2013)). Following the GFC experience, EU legislators have introduced new rules on money market funds (MMFs), in particular through the adoption of the EU MMF Regulation in 2017. The COVID-19 market turmoil in March 2020 tested the resilience of the MMF sector as private debt MMFs faced large investor outflows. We focus on the events in March 2020 to assess the effectiveness of the EU MMF Regulation from a financial stability perspective.

Our paper contributes to the literature on run risks in MMFs and how regulation can impact incentives among MMF investors and managers. By using a granular, daily data covering Euro Area MMFs, we assess key aspects of the EU MMF Regulation, with a particular focus on LVNAV funds and daily and weekly liquidity requirements. By investigating the behavior of investors and fund managers during the COVID-19 market turmoil in March 2020, we provide new evidence for fragility in the EU MMF sector and call for a strengthened regulatory framework, in particular for private debt MMFs. This directly addresses issues discussed in the ongoing policy debate about regulatory reform to enhance the stability of the MMF sector.

Our results identify three key vulnerabilities in the EU MMF sector. First, investment in private debt assets exposes MMFs to liquidity risk. We find that investors in MMFs investing in less liquid assets redeem more strongly than other investors during crisis periods. Second, LVNAV funds are particularly vulnerable to liquidity shocks as they

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<sup>19</sup>Certain money market funds do not vary the price of their shares, i.e. they have a constant NAV. The constant NAV is obtained by pricing their assets at an amortising cost (instead of a market-based price) and by using rounding techniques. A fund is allowed to display a constant NAV as long as the gap between the constant NAV and the marked-to-market NAV is not bigger than 50 basis points. The fund "breaks the buck" when this gap is no longer respected, forcing the constant NAV to convert to a marked-to-market NAV.

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invest in non-public debt assets while offering a stable NAV. The prospect of breaching the regulatory NAV limit may have incentivised outflows among some LVNAV investors during the March 2020 turmoil. Third, although some LVNAV funds experienced large outflows, fund managers did not draw down on their weekly liquid assets to the same extent, suggesting low levels of buffer usability. According to the MMF Regulation, falling below liquidity requirements can cause LVNAV and CNAV MMFs to consider applying extraordinary liquidity measures, which may encourage investors to redeem early. We find that investors redeem more strongly from MMFs with low liquidity buffers than from funds with large buffers. At the same time, we find that funds with lower levels of liquidity buffers use their buffers less than funds with higher buffers, suggesting a preference for those funds to sell illiquid assets, possibly to avoid getting too close or falling below the regulatory threshold.

## Appendix 1

Description of different main types of mutual fund structures

- Closed-end funds only issue shares at their creation and investors wishing to sell their shares must find a buyer (therefore the number of shares is fixed). Hence, the price redeeming investors get for their shares can differ substantially from the NAV. In the US, according to the Investment Company Institute (2021), the assets managed by closed-end funds varied only marginally, from \$239 billion managed end 2010 to \$279 billion managed at year-end 2020. In the Euro Area however, assets managed by these funds increased from €123 billion end 2010 to €747 billion at year-end 2020 (according to the European Central Bank's Statistical Data Warehouse (ECB SDW henceforth)).
- Exchange-traded funds, the vast majority of which are index funds, attempt to replicate the performance of a certain market index. Therefore, this type of funds will generally hold the same securities in the same proportion as the replicated market index. In contrast to open-end funds, ETF investors can sell or buy shares on stock exchanges at any time. A specific arbitrage mechanism is employed in order to make sure that the trading price does not significantly deviate from the NAV of the share, although deviations occurred especially during turmoil periods (Ref). The importance of this type of funds has been growing during the last years. According to the Investment Company Institute (2021), in the US, at end 2020, index funds manage 19% of the assets managed by the total fund sector compared 10% at year-end 2010. According to the ECB's SDW, in the Euro Area, assets managed by ETFs grew from €390 billion end 2014 to €1.03 trillion end 2020.

# Chapter 1

## Bond Fund Fragility: Flow Reactions to Extremely Negative Return Shocks

### 1.1 Introduction

The recent growth of shadow banking and, in particular, of mutual funds has raised concerns for regulatory institutions. According to the EFAMA (2019), European investment funds increased their Assets under Management (AuM) from 7.1 trillion euros in 2007 to 12.9 trillion euros at the end of 2017. The growth in bond funds is particularly salient. In France, AuM grew from 184 billion euros in 2011 to 297 billion euros in 2017 (AMF (2017), AMF (2018)). One explanation for this growth is the more accommodative monetary policy stance in recent years. The decline in interest rates has had a positive effect on bond prices and has contributed to making bond mutual funds more attractive than their equity counterparts.

This surge has prompted regulatory institutions (OFR (2013), FSB (2017), IMF (2015) IMF (2019)) to focus particularly on the fragility of mutual funds (see also Roncalli and Weisang (2015)). “Fragility” relates to the fact that some actors of the financial intermediation chain could fail and thereby jeopardize the whole chain. Bond funds could be included in that configuration. In the event of a negative shock to the funds’ returns (e.g., a change in monetary policy or a rise in interest rates due to any cause), investors may be tempted to redeem their shares. These outflows could force mutual funds to

rapidly sell bonds. Hence, the flow-performance relationship can lead to a vicious circle if bond sales induce transaction costs or exert negative pressure on asset prices, a case that is particularly plausible in the less liquid part of the bond funds' portfolios, as shown by Coudert and Salakhova (2020) for French bond funds. This “shadow-bank run” would be analogous to a bank run. Because this loop can be self-perpetuating and may impair global financial stability, regulators have taken measures to reduce the “first-mover advantage” that arises when funds face liquidity problems (e.g., introduction of side pockets or swing pricing rules; see AFG (2016a), and AMF (2013)). Overall, in a context of historically low interest rates, there is a renewed interest in the flow-performance relationship in the bond mutual funds case.

From a theoretical perspective, the link between flows and performance is rooted in the principal-agent relationship between the managers of mutual funds and final investors. Because investors are unable to directly observe the skills of fund managers, they will attempt to infer these skills by examining the funds' past returns (Berk and Green (2004)). Investors will thus use past returns to decide whether to buy fund shares (inflow) or sell fund shares (outflow). However, this model does not differentiate between short- and long-term returns. In contrast, Bernhardt and Davies (2009) study the reaction of the fund manager to a short-term inflow. Fund manager trades inflate stock prices such that the fund's short-term returns are increased. Their theoretical model is thus able to explain the short-run persistence of fund returns found in the empirical literature (e.g., Carhart et al. (2002)). However, fund fragility involves reverse causality (how returns affect flows). In that vein, Li et al. (2017) base their analysis on theoretical models of ambiguity aversion. When investors are uncertain about the information quality, they tend to place more weight on the worst signal. In particular, when comparing different horizons of the past performance statistics of a fund manager, the flow response of an investor is more sensitive to the horizon of the worst performance observed.

In the empirical literature, the flow-performance relationship is the subject of numerous articles examining open-ended equity mutual funds. The literature (see Sirri and Tufano (1998), and Chevalier and Ellison (1997), for American funds and Bellando and Tran-Dieu (2011), for French funds) demonstrates the existence of a convex relationship between flows and performance; i.e., investors do not redeem more of their shares in a fund that has exhibited poor performance, but well-performing funds seem to attract in-

flows. This convex form may encourage mutual fund managers to engage in risk-taking behavior; however, it does not suggest that equity funds are fragile, as they would not face massive outflows in response to poor performance. By contrast, in the case of bond mutual funds, more recent studies (Chen and Qin (2017), Goldstein et al. (2017), IMF (2015)) suggest a positive relationship for all return segments; i.e., investors will redeem their shares if the past returns have been negative. In particular, Goldstein et al. (2017) demonstrate that a fund that possesses more illiquid assets will exhibit an even sharper positive flow-performance relationship because the investors remaining in the fund will have to bear higher costs. Therefore, the remaining investors will have an incentive to redeem their shares before others do.

However, the literature does not fully address the concerns about bond fund fragility for at least three reasons. First, some studies do not use short-term raw returns as an explanatory variable for flows. For example, as in the seminal article by Sirri and Tufano (1998), Zhao (2005) uses quarterly data to build rank performance and shows that fund ranking explains flows. In the same vein, Chen and Qin (2017) use monthly data to compute the 12-months performance rank and show that it is a determinant of flows. However, we hypothesize that the raw returns should also affect investors. For example, suppose a fund has the following worst raw returns for two months: one with  $-0.1\%$ , the other with  $-5\%$ . The ranking would be equal; however, we hypothesize that investors will react more strongly when the return is  $-5\%$ . Second, when explicitly taking into account short-term returns, the extant articles do not always control for long-term performance ranks. For example, Del Guercio and Reuter (2014) show that for equity funds, short-term (monthly) returns explain flows, but they do not control for long-term rankings, which could also bear explanatory power at the expense of short-term returns. Third, the extant studies do not analyze nonlinearity for short-term raw negative returns. They do so only for long-term performances because rank performances, according to Sirri and Tufano (1998), deal with nonlinearity, i.e., the fact that flows react differently depending on the quantile of performance rank. The article of Goldstein et al. (2017) is the closest to ours, in that their main topic is fund fragility and they also study negative alphas, computed with the 12 previous months, but they do not specifically analyze the nonlinearity of negative returns.

The main contribution of our paper is to fully address concerns about bond fund

fragility by taking into account at the same time (1) the fact that flows can react to short-term, negative, raw returns (2) the need to control for long-term performance rankings, and (3) the nonlinearity in the impact of negative raw monthly returns by breaking down those negative returns into quintiles and focusing on the impact of the worst negative quintiles on flows.

To do so, we empirically study bond mutual funds domiciled in France between January 2005 and December 2017. Our main hypothesis is that investors are sensitive to short-term signals, particularly very negative signals. The reasons for analyzing the French bond market are as follows. This is an important market in Europe, as the AuM of French investment funds were the second largest in Europe, after the UK (according to EFAMA (2019)). Additionally, the French bond mutual fund market differs from the US market in three aspects. First, the type of clientele differs. The investors in French investment funds were mainly institutional (holding 55% of the AuM) at the end of 2017, which is the highest proportion among other European countries, according to EFAMA (2019). Constanzo (2011) argues that “in France, the large degree of institutional clients is partly due to the popularity of unit-linked and other wrapper products containing asset management solutions offered to retail clients via intermediaries, as well as the important role played by money market funds in cash management of many French corporations” (Constanzo (2011), p.72). In contrast, according to the ICI (2018), “retail investors (i.e., households) held the vast majority (90%) of the \$18.7 trillion in US mutual fund total net assets at year-end 2017” (ICI (2018), p.60) , although it was largely in retirement plans or accounts. Second, in France, the ownership links between funds and banks or insurance companies are strong. According to the HCSF (2018), 51% of the AuM (i.e., 712 billion euros) are invested in securities issued by the financial sector, and 63% of the liabilities of funds are held by the financial sector. Jondeau and Rockinger (2004) explain that, because banks and insurance companies are the main managers of investment funds, “barriers to investment” may occur. Therefore, an investor will not withdraw his investment from an average fund to invest it in a top fund because there might be high switching costs for transferring the money from one bank to another. Third, the channels of distribution of funds vary between the US and Europe. A report by the EC (2018) specifies that, “in continental Europe, the distribution model is still largely based on the commission-based remuneration model with banks and insurers as the most prevalent

end-client distributors” (EC (2018), p.26). In comparison, according to the ICI (2018), households that owned funds outside employer-sponsored retirement plans had purchased the funds mainly from the following two sources: investment professionals and the direct market channel. The distribution channel is important in the context of the analysis of the flow-performance relationship, as it can influence investors’ behavior. For example, Del Guercio and Reuter (2014) show that investors in direct-sold funds react to risk-adjusted measures of performances, while in contrast, investors in broker-sold funds react strongly to raw returns but not to alphas.

The results are as follows. Although we confirm the long-term impact of fund rankings (using the same variables as in Sirri and Tufano (1998)), we show that the short-term return of a fund also affects its net flows and that this effect is even stronger for the most negative returns <sup>1</sup>. To take into account the general performance of the bond funds market, we also show that the investors’ flows in one particular fund can be influenced by the median of past short-term returns of all bond funds. This result is also robust to variants in the model. First, crisis periods are susceptible to increased investor caution and even mistrust towards mutual funds (see Goldstein et al. (2017), among others). We confirm a negative effect of periods of financial stress on funds’ flows, again without altering our main result. Second, several articles show that the behaviors of institutional and retail customers differ (Chen et al. (2010)). Institutional investors are supposed to be more sophisticated and, hence, react more to risk-adjusted fund performance than to raw returns (Evans and Fahlenbrach (2012)). Furthermore, due to agency conflicts (Del Guercio and Tkak (2002)), institutional investors may implement a “scapegoating” strategy (James and Karceski (2006), Jones and Martinez (2017)), resulting in selling fund shares when short-term returns are negative, even if their sophistication would entice them not to overreact to recent past returns <sup>2</sup>. We find that both types of investors are sensitive to negative short-term returns; however, institutional investors are more sensitive in the sense that the effect of poor returns is observed for a larger range of negative short-term returns and, thus, may occur more often.

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<sup>1</sup>This result is also consistent with Li et al. (2017), who demonstrate that mutual fund investors are sensitive to performance measures (however assessed at longer horizons than in our article, i.e., 1, 3 and 5 years) and that they are more sensitive to the worst performance estimation.

<sup>2</sup>As Jones and Martinez (2017) argue, institutional investors “have reasons to value manager characteristics that are easily justified to superiors or a trustee committee. One important characteristic is an asset manager’s past performance, which is readily observable by the stakeholders” (Jones and Martinez (2017), p.2).



In summary, our results show that short-term negative raw returns are clearly interpreted as negative signals and, thus, could have a significant effect on flows. During the taper tantrum (between June and July 2013), 121 shares passed from the group of less negative short-term returns to the group of very low short-term returns. The seemingly small difference between the two coefficients still predicts surplus outflows worth approximately 33,000,000 euros for those shares. Our study supplements the existing research and seems to confirm the previously reported fragilities presented by bond funds and the risks that they pose to financial stability.

Our article is organized as follows: the second part details the hypotheses, the third part presents the data used and the descriptive statistics, and the fourth part reports and comments on the results. The last part concludes the article.

## 1.2 Hypotheses

Hypotheses H1 to H3 develop our main question, while hypotheses H4 and H5 are extensions and robustness checks.

Most studies conducted thus far demonstrate that the long-term relative return (the ranking of funds at a one-year horizon) influences the agents' investment choices (i.e., net flows). Following Del Guercio and Reuter (2014) and IMF (2015), we suggest that it is also important to include past short-term returns in the model.

Our first reason for pursuing this approach is that, by including only the ranking of long-term performance, we may understate the effect of a substantial decline or improvement in the short-term performance of a fund and, as a result, fail to detect financial fragility. Moreover, if two funds are simultaneously subject to a shock, their ranking may not be affected, whereas out- or inflows can still occur. Thus, irrespective of the change in its ranking, a mutual fund that presents a strong short-term return may be subject to important flows. Therefore, we hypothesize that because they look at past performance, investors are not able to predict future performance and invest accordingly. Thus, it is important to discuss the studies on the “smart-money effect”, i.e., the fact that investors are able to predict future performers, which makes them direct their flows from bad future performers to good future performers. In that strand, Gruber (1996), Zheng (1999) and Keswani and Stolin (2008) find that a fund that received inflows will perform better

than a fund that faced outflows, which is synonymous of a positive relation between flows and future performance. However, another strand represented by Wermers (2003), Lou (2012), Jiang and Yuksel (2017) provides a different explanation for this positive relation, namely, a “persistent-flow” hypothesis. Wermers (2003) demonstrates that investors direct their flows to funds with high past returns. In response, the managers of these funds use this money by investing into stocks with high past returns, which contributes to an increase of the price of these securities and in fine to high fund future returns. Lou (2012) argues that due to persistence in flows, funds with past inflows will receive additional inflows. Therefore, these funds will expand their existing holdings and drive up their own future performance. Jiang and Yuksel (2017) demonstrate that the relation exists for equity funds; however, the relation appears to be stronger for retail funds than for institutional funds. They argue that this finding is inconsistent with a smart-money explanation because institutional investors are more sophisticated and, therefore, should be able to better predict funds with higher performance. Furthermore, they do not find evidence of the positive flow-performance relation for bond funds. In contrast, Chen and Qin (2017) do find this positive relation for bond funds; however, once past fund performance is controlled for, investor flows do not predict future fund performance, i.e., the relationship arises because investors chase past performance and the performance is persistent. Taken as a whole, the recent literature does not seem to strongly support the smart-money effect. Therefore, we follow the opposite hypothesis, which implies that investors are not able to perfectly predict future performance and direct their investments by observing past returns.

Next, if the bond market in general is affected by a shock (positive or negative), this may generate flows irrespective of the individual short-term performance of a fund. As long as the majority of funds are subject to a decline in returns (which affects the median of short-term fund returns), it is possible that investors will withdraw their shares from a fund even if it presents a strong past return.

Indeed, investors could behave as if the individual return of a fund is composed of the following two elements: one term reflecting the more general market return (which we measure here by the median of short-term returns) and an idiosyncratic term specific to each fund (which reflects the risk level taken by a fund, among other factors). For these reasons, we believe it is important to include the median of short-term fund returns in

the model to account for the effect of global market performance. The first hypothesis can be expressed as follows:

**Hypothesis 1(a): Funds' flows are sensitive to short-term fund returns.**

**Hypothesis 1(b): In addition to short-term fund returns, funds' flows are affected by global short-term market performance.**

Next, it is indeed possible that investors do not react in the same way to positive or negative individual or median performances. The second hypothesis is thus defined as follows:

**Hypothesis 2: The relation between flows and short-term returns is not strictly linear in that investors react differently to individual and median returns depending on whether they are positive or negative.**

As we intend to study the fragilities that bond mutual funds might exhibit, we are particularly interested in studying situations with the potential to generate massive outflows, which could indeed expose mutual funds to liquidity problems; using French data, Coudert and Salakhova (2020) show that massive outflows have an important positive impact on corporate bond yields, and Galanti and Le Quéré (2016) confirm that flows affect the yields of both corporate and sovereign bonds. Thus, we want to capture the nonlinear effects of "extreme" values of short-term returns, particularly on the negative segment, as financial crisis periods are present in our sample. We enrich the model detailed in the second hypothesis by allowing for an asymmetric effect to capture the specific effect of very negative short-term returns. The third hypothesis can thus be expressed as follows:

**Hypothesis 3: The relation between flows and short-term returns is not strictly linear, and very negative returns lead to larger outflows.**

To complete the study, as financial crisis periods are present in our sample, we examine whether flows are sensitive to financial conditions. As Goldstein et al. (2017) and the IMF (2015) have demonstrated, the behaviors of investors change with the financial conditions. The effect of negative short-term fund returns could capture a simple effect of financial crisis periods. Therefore, we examine whether the effect of a crisis coincides with extreme

returns or whether it is additive to extreme returns. Specifically, we attempt to analyze whether larger flows are observed during periods of financial stress. Therefore, the fourth hypothesis can be phrased as follows:

**Hypothesis 4(a): Investors redeem more of their shares during periods of financial stress than in normal periods.**

**Hypothesis 4(b): Even controlling for financial stress periods, investors remain sensitive to very negative short-term returns.**

The last hypothesis that we examine is intended to study the potential different reactions to short-term returns of distinct types of investors. The distinction between retail investors and institutional investors is widely considered in the literature. Because of the weight of institutional investor holdings in fund assets, their redemption decisions have the potential to affect mutual funds more severely. Even though institutional investors are more sophisticated, they face agency conflicts with their own clients that may drive them to follow a “scapegoating” strategy (Del Guercio and Tkak (2002), James and Karceski (2006), Jones and Martinez (2017)). If their clients examine recent returns closely, institutional investors are compelled to react quickly to poor short-term returns by selling shares of the fund, even if their sophistication would advise them not to overreact to recent returns. We present the final hypothesis in the following terms:

**Hypothesis 5: Different types of investors do not show the same reaction to distinct types of performance.**

## 1.3 Data

### 1.3.1 Database cleaning

We use data from Thomson Reuters Eikon on shares of OPCVM (open-ended mutual) funds domiciled in France from January 2005 to December 2017. Different shares may compose a mutual fund. Each share has its own AuM, and shares can present different returns if they display different management fees. We concentrate on fund shares because they can have different characteristics; i.e., the amount of the initial investment, purchas-

ing fees, redemption fees, and management fees can differ between the shares of the same fund. Because returns, which represent a central variable in this article, are displayed net of fees in the database, it is important to study returns at the share level and not at the fund level <sup>3</sup>. For ease of readability, we sometimes use the words “fund” and “share” interchangeably when the context allows it; however, all variables and results are at the share level.

Specifically, we consider shares with a “bond” classification in the TRE database. Unfortunately, some shares classified as “bonds” in our database are classified as “diversified” or have a different classification according to the AMF database OPC-Geco <sup>4</sup>. We choose to retain shares for every month in which they are also classified as “bonds” by the AMF and thus drop the months in which shares are labeled “diversified” or other by the AMF. We drop observations for which the total net assets (TNA) are below 300,000 euros because assets under management that are too small may lead to extreme values of flows <sup>5</sup>. We also drop observations of shares with an age of less than one year to ensure a sufficient time length. Finally, the share prices (net asset value (NAV) per share) have been adjusted for splits <sup>6</sup>.

Furthermore, we excluded shares for which coupons are distributed (because their returns do not include the distributed coupons, for which data are not available) and kept only shares with accumulated coupons and excluded shares not denominated in euros (as their returns could capture movements in the foreign exchange market). The final sample includes 883 different shares from 576 bond funds. For each share and each month, we

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<sup>3</sup>Apart from different characteristics such as fees, shares may also be directed to different types of investors, who may not react in the same way to the same level of observed returns. Indeed, different shares that compose the same fund may have different minimum initial purchase requirements, which attract different clienteles. Goldstein et al. (2017) for bond funds or Chen et al. (2010) for equity funds conduct their analysis at the share-level. They argue that they focus their analysis at a share-level because the inflows or outflows of the investors may be influenced by different share characteristics. This explanation is confirmed by Nanda et al. (2009), who examine the fund decision to introduce a multiple-class structure. They indeed find that different share structures appeal to different responses of flows to fund performance.

<sup>4</sup>The AMF is the French financial market authority, which is responsible for supervising mutual funds domiciled in France. Its website gives access to the GECO database, where one can find information relating to UCI under French law.

<sup>5</sup>The main results are unchanged if we drop observations for which the TNA is below 500,000 or below 1,000,000 euros.

<sup>6</sup>As we study flows of shares, we do not retain funds with a limited period of subscription, ETF funds (the shares of which are traded on an exchange and the prices of which can differ from their intrinsic values), funds of funds, or feeder funds (the returns of which follow those of the master fund in which they are invested). Our database may still contain index, funds of funds or feeder funds, as a fund’s prospectus for merged or liquidated funds is not available.

have the NAV per share and the TNA under management. Thus, in total, there are 53,433 month-share observations <sup>7</sup>.

### 1.3.2 Variable definitions

We present here the variables of our empirical model. In table 1.1, we present some basics statistics: the mean, standard deviation, and the 5th, 25th, 50th, 75th and 95th percentiles of the distributions of the variables used in our models, in addition to the number of observations.

Table 1.1: Descriptive statistics

	Mean	Standard deviation	P5	P10	P50	P75	P95	N
Flow	-0.002	0.079	-0.115	-0.019	-0.001	0.007	0.113	53,433
Lagged raw return	0.003	0.014	-0.016	-0.002	0.002	0.008	0.022	53,433
Log(TNA)	17.27	1.59	14.468	16.286	17.376	18.396	19.62	53,433
Log(age)	2.04	0.894	0.47	1.364	2.104	2.777	3.333	53,433
Std Dev	0.01	0.01	0.001	0.004	0.008	0.013	0.024	53,433
Median	0.002	0.006	-0.008	-0.001	0.002	0.006	0.012	154

Flows is the net flows in % (truncation of observations above the 99th percentile and below the 1st percentile of the distribution). Lagged raw return is the past month's raw share return. Log(TNA) is the natural logarithm of net assets under management for the past month. Log(age) is the natural log of the number of years since the inception of the share. Std dev is the past standard deviation of monthly returns (over the past 12 months). Median is the median of the past-month share returns on all funds.

#### Measurement of the dependent variable: flows

In accordance with the majority of studies, our variable of interest is the percentage of net fund flows ( $Flow_{i,t}$ ), which corresponds to inflows minus outflows between t and t-1 as a percentage of TNA in period t-1 ( $TNA_{i,t-1}$ ). As inflows and outflows are missing from our database, we reconstruct them following the traditional method, and denote  $R_{i,t}$  the growth in a share's NAV between month t and t-1 as follows:

$$R_{i,t} = \frac{NAV_{i,t}}{NAV_{i,t-1}} - 1$$

The change in a share's TNA can be separated into two terms, i.e., a "valuation" effect (or "return" effect), and a "volume" effect linked to net inflows, as follows:

<sup>7</sup>Our final sample represents 47 billion euros in 2016, which is approximately 41% of the total 113.7 billion euros of net assets managed by UCITS French bond funds (AFG (2016b)).

$$TNA_{i,t} = TNA_{i,t-1}(1 + R_{i,t}) + Flow_{i,t} * TNA_{i,t-1}$$

Hence, the net flows between t and t-1 are computed using the following formula:

$$Flow_{i,t} = \frac{TNA_{i,t} - TNA_{i,t-1}(1 + R_{i,t})}{TNA_{i,t-1}}$$

In table 1.1, we can observe that more than half of the share-month observations correspond to outflows (negative net flows).

### Definitions of explanatory variables

The explanatory variables used in this study are performance measures, i.e., long-term relative performance and short-term raw returns.

#### 1. Long-term relative performance

The method proposed by Sirri and Tufano (1998) is usually applied to define the relative performance. This ranking is computed on performance measure at long-term horizons. This measure is initially based on the long-term raw return (at a one-year horizon), which is defined as follows:

$$R_{i,t-12,t} = \frac{NAV_{i,t}}{NAV_{i,t-12}} - 1$$

Within a category, namely, those classified by the AMF as “European bonds” and those classified as “International bonds”, shares are ranked according to their long-term performance. For each share-month, a variable  $Rank_{i,t}$  taking values between 0 and 1 is constructed. It represents the share’s performance rank standardized to 1<sup>8</sup>

The specification of Sirri and Tufano (1998) allows for the presence of a nonlinear relationship between flows and performance rank<sup>9</sup>. In our estimations, the slope of the relationship can differ across 3 groups of relative performance; the first group, LowPerf, includes only funds in the first performance quintile; the second group, MidPerf, represents funds ranked between 0.2 and 0.8; and the variable HighPerf corresponds to the highest

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<sup>8</sup>If during month t, 10% of shares have a lower performance than share X, then  $Rank_{i,t}$  for X will be equal to 0.1.

<sup>9</sup>That is, for low returns, there is no effect on flows, whereas high returns attract inflows; i.e., there is a convex shape of the flow-relative performance relationship. This result for equity mutual funds is confirmed by subsequent research.

performance quintile, as follows<sup>10</sup> :

$$LowPerf_{i,t} = Min(0.2, Rank_{i,t-1})$$

$$MidPerf_{i,t} = Min(0.6, Rank_{i,t-1} - LowPerf_{i,t})$$

$$HighPerf_{i,t} = Rank_{i,t-1} - LowPerf_{i,t} - MidPerf_{i,t}$$

To check the robustness of our results, we have also considered, as in the literature, different measures of the performances. Investors may also react to risk-adjusted measures of returns (as demonstrated in the case of bond mutual funds by Goldstein et al. (2017) among others).

We compute the same three variables with rankings based on risk-adjusted performances, namely, the Sharpe ratio and the alphas generated by a factor model. The Sharpe ratio is calculated for each fund as in Zhao (2005) by taking into account 12 rolling monthly observations of raw returns, standard deviation of returns and of the 1-month Euribor as the risk-free rate. Concerning the alphas, the literature on bond factors is rich, and in contrast to equities, there is no consensus on the “best” factors to be used<sup>11</sup>. We choose to build one model for the “European bond” funds and another for the “International bond” funds of our sample. The former includes the following three factors: the excess return of the iShares Euro Government Bond Index fund’s return over the risk-free rate<sup>12</sup>, the excess return of the iShares Euro Credit Bond Index fund’s return over the risk-free rate<sup>13</sup>, and the excess return of the EuroStoxx 600 total return index return over the risk-free rate<sup>14</sup>. The latter includes the following two factors: the excess return of the T Rowe Price Global Aggregate Bond fund’s return over the risk-free rate<sup>15</sup>,

<sup>10</sup>For a technical presentation of the Sirri and Tufano variables, see for example, Bellando and Tran Dieu (2011).

<sup>11</sup>Recent articles have proposed bond risk factors based on bond characteristics (Bai et al. (2019) for example). In our case, because the portfolio of bond funds is not available, we cannot rebuild these factors based on the authors’ methodology.

<sup>12</sup>The iShares Euro Government Bond Index fund is an index fund that tracks the returns of the FTSE EMU Government Bond Index (an index “designed to reflect the performance of the euro-denominated EMU government bond market”, according to <https://www.blackrock.com/uk/individual/products/229063/blackrock-blk-euro-gov-bond-index-inst-eur-acc-fund>).

<sup>13</sup>The iShares Euro Credit Bond Index fund is an index fund that tracks the returns of the FTSE EuroBIG ex Domestic Treasury Index (an index designed to reflect the performance of the euro-denominated non-government bond market, according to <https://www.blackrock.com/ch/individual/en/products/229056/blackrock-blk-euro-credit-bond-index-inst-eur-acc-fund>).

<sup>14</sup>The Eurostoxx 600 total return index reflects the performance of the European equity market.

<sup>15</sup>The T Rowe Price Global Aggregate Bond is a fund whose benchmark is the Bloomberg Barclays



and the excess return of the FTSE all world total return index return over the risk-free rate. In both cases, we take the 12-month Euribor<sup>16</sup> as the risk-free rate.

## 2. Short-term raw returns

The return of share “i” between month t-1 and month t is defined by the following formula:

$$R_{i,t} = \frac{NAV_{i,t}}{NAV_{i,t-1}} - 1$$

The monthly returns (see table 1.1) are positive on average (0.3%) and amount to an annual return of approximately 3.7%. However, for 5% of observations, the monthly return is at most -1.6%, which corresponds to approximately -18% per year. In the regressions, we will use the previous month return; thus, the variable is labeled Lagged raw return<sup>17</sup>.

We also define dummies for the quintiles of negative returns, where the bounds of the quintiles are defined over the whole sample of negative returns. For example, IN-0-20 is equal to 1 if fund i’s negative raw return in the previous month is in the bottom 20% of the short-term negative returns, and zero otherwise.

### The control variables<sup>18</sup>

The following variables are widely used in the existing literature (for example, Goldstein et al. (2017) and Chen and Qin (2017) for bond mutual funds and Ferreira et al. (2012) for equity mutual funds).

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Global Aggregate (which includes both corporate and government bonds – hence, our choice to not include other government bond factors in the regressions). As we could not find a bond fund that indexes the Barclays Global Aggregate index, we have considered the T Rowe Price Global Aggregate Bond, as its performances approach the index returns most closely compared to other funds with the same benchmark.

<sup>16</sup>The choice of a risk-free rate could differ. The 1-month T-bill rate is usually considered in the factor models, but this rate may not be the correct risk-free rate in our case, as we concentrate on the study of French bond funds and not US bond funds. In this case, the 1-month French Treasury Bill rate could have been used, but we do not dispose of data for this rate before 31-12-2014.

<sup>17</sup>The lagged raw return is measured with raw returns in all regressions. The risk-adjusted measures of performance (such as the Sharpe ratio or the alphas) require a certain history of data (usually 12 or 24 months) to be constructed. Therefore, the effect of a particularly low-performing month may be diluted by the length of the historical performances that are needed to calculate more sophisticated performance measures. As we want to precisely capture the effect of a sudden, absolute return shock on flows, computing Sharpe ratios or alpha for a one-month returns would not be appropriate. Thus, the lagged raw return is measured with raw returns in all regressions.

<sup>18</sup>As it has been demonstrated in the literature that flows exhibit a strong positive autocorrelation, we also included the share lagged flows as a control variable. Appendix 2 proves that results remain robust when introducing this additional control variable.

1. The age of each share

It is important to control for the share's age, as a share can benefit from more marketing following its creation. This can attract new investors irrespective of the share's performance. The definition of this variable varies across articles, and we adopt the measure used by Goldstein et al. (2017). Consequently, the natural logarithm of the share's age, measured in years since its creation, is used as a control variable. We expect flows to decrease as the share grows older.

2. The size of each share

According to the literature, the size of each share is calculated as the natural logarithm of the past-month AuM. Previous studies demonstrate that if net flows are not proportional to the share's size, the percentage of net flows should be smaller as the share grows in size. As our dependent variable is the percentage net flows, we expect the results to show a negative relationship between the dependent variable and share size.

3. The standard deviation of monthly returns

As is common practice in the literature, this variable is calculated as the standard deviation of the past 12 months of returns. We include this as a standard control variable because net flows could be influenced by investors' sensitivity to risk. We expect flows to be negatively related to the standard deviations of returns.

## 1.4 Empirical findings

### 1.4.1 Empirical Specifications

To limit the influence of outliers, we drop observations above the 99th percentile and below the 1st percentile of the distribution of flows<sup>19</sup>.

In every estimation, we add share fixed effects to control for characteristics that are constant over time and could be correlated with other variables in the model, notably

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<sup>19</sup>Unfortunately, the data displays some cases of outliers that need to be eliminated. For example, there are 28 observations for which the monthly flows are higher than -90%. This may be due to the misreporting of the total net assets of these shares. As we are interested in extreme negative returns and outflows, we are cautious not to bias our results because of outliers. The literature also attempts to eliminate the outliers; Goldstein et al. (2017), for example, winsorize the flows at the 1% and 99% levels. However, given our attention to extreme negative values, winsorization is not appropriate.

management fees <sup>20</sup> , which could be unchanged over the life of the share but negatively correlated with the share's return. We also cluster errors at the fund level to allow for the autocorrelation of residuals within a given fund <sup>21</sup>. It is known that flows show autocorrelation. This is usually addressed by introducing past period flows as a regressor. In Appendix 2 we redo all regressions with past flows as a control variable. We observe that the results remain globally robust. However, the nonlinearity loses significance in some cases<sup>22</sup>. However, we chose to include these results in the Appendix, as the lagged flow may be correlated with the residual if the regression is using a fund share class fixed effect, which is our case (see also Goldstein et al. (2017), p.602). Fama-MacBeth regressions could have been used instead of fixed effect regressions. Petersen (2009) demonstrates that in the presence of a unit fixed term effect, the Fama-Macbeth method produces biased estimates and significance levels. He argues that this is the case because the Fama-Macbeth method “was developed to account for the correlation between observations on different firms in the same year, not to account for correlation between observations on the same firm in different years” (Petersen (2009), p. 451). Therefore, as long as we suspect that a fixed effect may exist, we cannot use the Fama-Macbeth procedure. Thus, we include share fixed effects in our regressions (the within estimation method in the panel framework being used). Other papers also consider fixed effects and show that their results are robust when controlling for the share fixed effect or fund fixed effect (Goldstein et al. (2017), Zhao (2005), Molestina Vivar et al. (2020)).

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<sup>20</sup>It is true that competition may have stiffened over the sample period, and this may affect the fees. To control for this, we redo all regressions with two fixed effects (year and share fixed effects) and again with one share-year fixed effect. The results (available upon request) are mostly unchanged.

<sup>21</sup>Furthermore, the correlations between explanatory variables are moderate. The highest correlations (of approximately 0.54) are between LowPerf and MidPerf and between MidPerf and HighPerf. This can be explained by the construction of the variables (MidPerf will be different than 0 if LowPerf is 0.2, while the HighPerf will be different than 0 as long as MidPerf is 0.6). The subsequent highest correlation (-0.54) is between the lagged raw return and IN-0-20. This can be explained again by the variable's construction; IN-0-20 will take the value of 1 if the lagged raw return is below a certain threshold and will take the value of 0 if not. All other correlations lie between -0.36 and +0.46. Taken as a whole, we do not believe that those correlations are detrimental to our specifications.

<sup>22</sup>IN-0-20 and IN-20-100 are still significant at the 1% level, but the null for the test of equality between the two is sometimes not rejected

### 1.4.2 Short-term returns' impact on flows

We first investigate whether short-term returns influence investors' decisions. In the following equation, H1-a implies that  $\beta_4$  is positive and significantly different from zero.

$$Flow_{i,t} = \beta_0 + \beta_1 LowPerf_{i,t} + \beta_2 MidPerf_{i,t} + \beta_3 HighPerf_{i,t} + \beta_4 R_{i,t-1} + \beta_5 Controls_{i,t} + \gamma_i + \varepsilon_{i,t} \quad (1.1)$$

The results are given in the columns 1, 4, and 7 of table 1.2. We first comment on the control variables and the variables concerning the relative long-term returns. As the results regarding these variables are identical when testing H1-b to H5, we only comment on them here.

In accordance with the literature, bigger ( $Log(TNA)$ ) and older ( $Log(age)$ ) shares present lower net flows. In contrast, while we expected a negative and significant relationship between the standard deviation of monthly returns and flows,  $Stddev$  is insignificant in our estimations. However, for this variable, Chen and Qin (2017) find significance for only 3 of 6 specifications, and Cashman et al. (2014) find significance in only 1 of 3 specification when studying net flows.

Concerning long-term performance ranks,  $LowPerf$ ,  $MidPerf$  and  $HighPerf$  are significant in all specifications.  $LowPerf$  and  $ighPerf$  show larger coefficients than  $MidPerf$ . Whatever the initial ranking of a fund, an increase in the ranking is rewarded with inflows, and a decrease in the ranking is punished with outflows. However, if the initial position of the share's ranking is in the middle segment, the impact of rank on flows is weaker (the coefficient of  $MidPerf$  is lower). This coincides with the results of Chen and Qin (2017) for US bond funds and can lead to risk-taking incentives or tournament phenomena, as Chevalier and Ellison (1997), Ferreira et al. (2012) and Kim (2019) have shown for equity funds. In contrast, the high coefficient for  $LowPerf$  indicates a sanction for poor performance. This effect indicates precautionary behavior by investors and aligns with the results of Chen and Qin (2017) and the IMF (2015) for US bond funds. Note that it also indicates that investors in bond funds react strongly to poor relative performance, and this effect could complement that on absolute short-term returns. Specifically, table 1.2 indicates that the raw short-term return is an important determinant of flows and confirms the value of including this variable in addition to the Sirri-Tufano effects. For

example, the coefficient of 0.38 for Lagged raw return in column 1 means that a fund with a 1-percentage-point increase (decrease) in the past month's raw return will have, all else equal, a surplus inflow (outflow) of 0.38 percentage points. This positive and significant relation between flows and short-term returns confirms the findings in the literature (Del Guercio and Reuter (2014), Cashman et al. (2014), IMF (2015)); however, to the best of our knowledge, our article is the first to show that both long-term rankings and short-term raw returns are important for investor decisions. Our hypothesis H1-a seems thus validated.

In this regard, the studies on short-term performance persistence must be discussed here<sup>23</sup>; as long-term performance subsumes short-term performances, persistence can create correlation between the two. However, our regressions contain a short-term performance variable (measured by the share's past-month raw return) and longer-term relative performance variables from Sirri and Tufano (1998), i.e., performance ranks, which are constructed based on the 12-month returns within the same AMF category of bond funds. This approach alleviates (although not entirely) the issue of a possible strong correlation between the short-term and the long-term performance. Indeed, the mentioned literature mostly examines the persistence of funds' returns, and not of funds' performance ranks. We verify that the correlations between the monthly Lagged raw return and the performance ranks variables are low, i.e., 0.13 (*LowPerf*), 0.17 (*MidPerf*) and 0.14 (*HighPerf*).

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<sup>23</sup>The majority of studies conducted on bond funds reach the same conclusion, i.e., performance exhibits persistence (Polwitoon and Tawatnuntachai (2006), Huij and Derwall (2008)). Du et al. (2009) confirm for bond funds the findings of Bollen and Busse (2004) about equity funds regarding the existence of a short-term performance persistence. Chen and Qin (2017) also find evidence of performance persistence, although at a longer horizon (they find that the fund return in the prior 12 months predicts the next month's fund alpha). All the aforementioned studies examined US bond mutual funds. In the European market, Silva et al. (2005), and Grose et al. (2014) also find persistence in the performances of European bond funds.

Table 1.2: Reaction to short-term absolute returns at the individual and market levels

	Raw return			Sharpe ratio			Alpha		
	Flows (1)	Flows (2)	Flows (3)	Flows (4)	Flows (5)	Flows (6)	Flows (7)	Flows (8)	Flows (9)
Low_perf	0.053*** (3.81)	0.054*** (3.85)	0.053*** (3.82)	0.056*** (4.55)	0.057*** (4.61)	0.055*** (4.48)	0.022* (1.81)	0.022* (1.79)	0.023* (1.90)
Mid_perf	0.013*** (4.05)	0.014*** (4.18)	0.012*** (3.66)	0.022*** (7.22)	0.023*** (7.28)	0.022*** (7.02)	0.011*** (3.57)	0.011*** (3.60)	0.011*** (3.65)
High_perf	0.063*** (4.19)	0.065*** (4.30)	0.064*** (4.26)	0.050*** (3.12)	0.051*** (3.15)	0.047*** (2.93)	0.039*** (2.59)	0.040*** (2.62)	0.040*** (2.68)
Lagged raw return	0.380*** (11.53)	0.309*** (8.98)	0.235*** (3.57)	0.391*** (12.07)	0.328*** (9.54)	0.233*** (3.55)	0.435*** (11.01)	0.376*** (8.90)	0.259*** (3.97)
Median		0.369*** (4.48)	0.076 (0.59)		0.336*** (4.08)	0.051 (0.40)		0.312*** (3.62)	-0.002 (-0.02)
Log(TNA)	-0.006*** (-6.92)	-0.006*** (-6.90)	-0.006*** (-6.96)	-0.006*** (-7.31)	-0.006*** (-7.29)	-0.006*** (-7.35)	-0.006*** (-5.84)	-0.005*** (-5.82)	-0.006*** (-5.91)
Std dev	-0.129 (-1.44)	-0.144 (-1.60)	-0.127 (-1.37)	-0.091 (-1.07)	-0.106 (-1.24)	-0.077 (-0.84)	-0.123 (-1.50)	-0.138* (-1.68)	-0.099 (-1.10)
Log(Age)	-0.007*** (-3.93)	-0.007*** (-3.91)	-0.007*** (-3.91)	-0.006*** (-3.48)	-0.006*** (-3.47)	-0.006*** (-3.52)	-0.002 (-0.78)	-0.002 (-0.72)	-0.002 (-0.74)
Lagged raw return * I(ret_neg)			-0.078 (-0.77)			-0.032 (-0.33)			-0.059 (-0.60)
Median * I(Med_neg)			0.273 (1.30)			0.279 (1.33)			0.207 (0.97)
I(ret_neg)			-0.009*** (-7.06)			-0.008*** (-6.84)			-0.011*** (-8.19)
I(Med_neg)			0.001 (0.81)			0.001 (0.69)			0.001 (0.60)
Intercept	0.093*** (6.07)	0.092*** (5.99)	0.096*** (6.32)	0.094*** (6.14)	0.093*** (6.07)	0.097*** (6.42)	0.088*** (4.64)	0.087*** (4.58)	0.091*** (4.88)
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund
Adj. R2	0.016	0.017	0.019	0.019	0.019	0.021	0.012	0.012	0.015
Observations	53,433	53,433	53,433	53,418	53,418	53,418	45,458	45,458	45,458

The dependent variable is the net flows in % (truncation of observations above the 99th percentile and below the 1st percentile of the distribution). LowPerf, MidPerf, and HighPerf are indicators of relative long-term performance (12 months), constructed as in Sirri and Tufano (1998), with the following: raw returns (columns 1–3), the Sharpe ratio (4–6), and alpha (7–9). Lagged raw return is the past month's raw share return. Median is the median of past-month share returns on all funds.  $I(\text{ret\_neg}) = 1$  if the share lagged monthly return is negative, and 0 otherwise.  $I(\text{Med\_neg}) = 1$  if the median of lagged monthly returns is negative, and 0 otherwise. Interaction terms between  $I(\text{ret\_neg})$  and Lagged raw return and between  $I(\text{Med\_neg})$  and Median have been introduced to allow for the presence of different slopes in the relations between the positive/negative segments of lagged returns and median returns. Control variables include the natural logarithm of net assets under management for the past month ( $\log(\text{TNA})$ ), the natural log of the number of years since the inception of the share ( $\log(\text{age})$ ) and the past standard deviation of monthly returns (over the past 12 months: Std dev). We use fixed effects at the share level and clustered errors by fund. T statistics are in parentheses. The asterisks indicate the p-values (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ).

Next, hypothesis H1-b tests whether, beyond individual funds' performances, the global return of the fund market could influence flows. We thus add the *Median* variable, which is the median of the past-month shares' returns. It is intended to capture positive (negative) shocks affecting numerous funds, which could increase (decrease) the monthly median of performance. To a certain extent, the Median variable is a way to introduce time fixed effects, as it captures market events that may influence all funds' returns at the same point of time.

We thus proceed to this second regression, the results of which are reported in table 1.2, columns 2, 5, and 8.

$$\begin{aligned}
 Flow_{i,t} = & \beta_0 + \beta_1 LowPerf_{i,t} + \beta_2 MidPerf_{i,t} + \beta_3 HighPerf_{i,t} + \beta_4 R_{i,t-1} + \beta_5 Median_t + \\
 & + \beta_6 Controls_{i,t} + \gamma_i + \varepsilon_{i,t}
 \end{aligned} \tag{1.2}$$

Compared with the first regression, the results are globally similar. The *Median* variable has a positive and statistically significant coefficient. Investors, thus, also react to the global performance of bond funds. Interestingly, the Lagged raw return is slightly reduced but remains significant at the 1% level. This confirms that the fragility of a fund is augmented with a global decrease in the bond fund market. Hypothesis 1-b is thus validated.

We now attempt to capture the nonlinear effects of short-term returns. First, we hypothesize that investors may not react in the same way to negative and positive returns. To test H2, we use the following regression, in which we add interaction terms with dummy variables that indicate the signs of past individual, or median, returns.

$$\begin{aligned}
 Flow_{i,t} = & \beta_0 + \beta_1 LowPerf_{i,t} + \beta_2 MidPerf_{i,t} + \beta_3 HighPerf_{i,t} + \beta_4 R_{i,t-1} \\
 & + \beta_5 R_{i,t-1} \times I(Ret_{neg}) + \beta_6 Median_t + \beta_7 Median_t \times I(Med_{neg}) \\
 & + \beta_8 I(Ret_{neg}) + \beta_9 I(Med_{neg}) + \beta_{10} Controls_{i,t} + \gamma_i + \varepsilon_{i,t}
 \end{aligned} \tag{1.3}$$

The new variables  $I(Ret_{neg})$  and  $I(Med_{neg})$  are equal to 1 when the past individual or median return, respectively, is negative. If the reaction is stronger when the signal is negative, we expect the coefficients  $\beta_5$  and  $\beta_7$  to be significantly positive. In addition,  $\beta_8$

and  $\beta_9$  could capture an additional negative effect on net flows independent of the level of the variables. Columns 3, 6, and 9 of table 1.2 present the results.

We interpret the coefficient of the interacted variables  $\beta_5$  and  $\beta_7$  as slopes and the coefficients for dummy variables  $\beta_8$  and  $\beta_9$  as intercepts. Concerning the global market effect, as  $\beta_7$  and  $\beta_9$  are not significant, we find that the *Median* does not have a particular impact depending on whether it is positive or negative. Turning now to the individual effect,  $\beta_5$  is not significant, indicating that the strength of the impact on flows is the same for negative and positive returns. However,  $\beta_8$  is significant and negative; when the individual return is negative, the intercept is lower. Although the reaction of flows (slope) is the same for a positive or negative return, there is an additional outflow of 0.9 percentage points (column 3) when the return is negative. This leads to exploring further the negative part of returns.

To test hypothesis 3, we decompose the negative returns into quintiles. Initially, we introduced the five quintiles in the regression, and all were significant. However, we tested for equality between the coefficients. The tests showed that  $IN - 0 - 20$  (a dummy equal to 1 if the individual raw return in the previous month is in the bottom 20% of the short-term negative returns, and zero otherwise) is significantly lower than the other coefficients. The other four quintile coefficients are not significantly different from one another; hence, they can be grouped into a single dummy variable,  $IN - 20 - 100$  (that takes a value of 1 if the individual raw return in the previous month is between the 20th and 100th percentiles of negative returns)<sup>24</sup>. This leads to our main model, which will henceforth be our benchmark model and includes dummies for the most negative ( $IN - 0 - 20$ ) and the other negative ( $IN - 20 - 100$ ) returns, as follows:

$$\begin{aligned} Flow_{i,t} = & \beta_0 + \beta_1 LowPerf_{i,t} + \beta_2 MidPerf_{i,t} + \beta_3 HighPerf_{i,t} + \beta_4 R_{i,t-1} + \beta_5 Median_t + \\ & + \beta_6 IN-0-20 + \beta_7 IN-20-100 + \beta_8 Controls_{i,t} + \gamma_i + \varepsilon_{i,t} \end{aligned} \quad (1.4)$$

The results are reported in table 1.3. The control variables and performance rankings remain unchanged. Investors are still sensitive to the past-month raw short-term performance (the coefficient of 0.148 is significantly positive at the 1% level).

<sup>24</sup>For results of the main regressions that include all five negative quintiles please see Appendix 1. Results remain robust when including all quintiles.



In contrast, the short-term flow-performance relationship exhibits shifts on the negative side of returns. The coefficients of the dummy variables  $IN - 0 - 20$  and  $IN - 20 - 100$  are both significantly negative and significantly different (at the 5% level), with the greatest outflows observed for the worst returns. Note that these effects are cumulative with the linear effect of returns. Our results mean that outflows could be particularly severe for funds with low short-term raw returns (the “slope” effect) and the worst negative returns (the “shift in constant” effect).

Although the difference between the two dummy coefficients may not seem considerable (only 0.004 in value), they still predict important outflows during crisis periods. For example, during the taper tantrum (between June and July 2013), 121 shares passed from the group of less negative short-term returns (namely,  $IN - 20 - 100$ ) to the group of very low short-term returns (namely,  $IN - 0 - 20$ ). The seemingly small difference between the two coefficients still predicts surplus outflows for those shares that are worth approximately 33,000,000 euros.

We note that the results are qualitatively unchanged whether we use raw returns, Sharpe ratios, or alphas to generate the long-term performance rankings. However, *LowPerf* becomes less significant when using an alpha-based measure of long-term performance.

Table 1.3: Flow reactions to the most extreme short-term negative returns

	Raw return	Sharpe ratio	Alpha
	Flows	Flows	Flows
	(1)	(2)	(3)
Low_perf	0.053*** (3.78)	0.055*** (4.45)	0.023* (1.90)
Mid_perf	0.012*** (3.64)	0.021*** (6.99)	0.011*** (3.63)
High_perf	0.064*** (4.28)	0.047*** (2.94)	0.040*** (2.65)
Lagged raw return	0.148*** (4.17)	0.170*** (4.73)	0.185*** (4.50)
Median	0.128 (1.49)	0.108 (1.27)	0.034 (0.39)
Log(TNA)	-0.006*** (-6.93)	-0.006*** (-7.32)	-0.006*** (-5.88)
Std dev	-0.080 (-0.91)	-0.045 (-0.53)	-0.059 (-0.71)
Log(age)	-0.007*** (-3.88)	-0.006*** (-3.47)	-0.002 (-0.75)
IN-0-20	-0.013*** (-5.69)	-0.013*** (-5.50)	-0.015*** (-5.96)
IN-20-100	-0.009*** (-7.17)	-0.008*** (-6.99)	-0.010*** (-8.45)
Intercept	0.096*** (6.28)	0.097*** (6.36)	0.091*** (4.84)
H0: IN-0-20=IN-20-100	0.016**	0.016**	0.034**
Fund FE	Yes	Yes	Yes
Cluster	Fund	Fund	Fund
Adj. R2	0.019	0.021	0.015
Observations	53,433	53,418	45,458

The dependent variable is the net flows in % (truncation of observations above the 99th percentile and below the 1st percentile of the distribution). LowPerf, MidPerf, and HighPerf are indicators of relative long-term performance (12 months), constructed as in Sirri and Tufano (1998), with the following: raw returns (column 1), the Sharpe ratio (column 2), and alpha (column 3). Lagged raw return is the past-month raw share return. Median is the median of the past-month share returns of all funds.

IN-0-20 = 1 if the individual raw return of the previous month is in the bottom 20% of the worst negative returns, and zero otherwise. IN-20-100 = 1 if the individual raw return in the previous month is between the 20th percentile of negative returns and a 0% return, and 0 otherwise. The control variables include the natural logarithm of net assets under management in the past month (log(TNA)), the natural log of the number of years since the inception of the share (log(age)) and the past standard deviation of monthly returns (over the past 12 months: Std dev). We use fixed effects at the share level and clustered errors by fund. T statistics are in parentheses. The asterisks indicate the p-values (\*\*\*)

p<0.01, \*\* p<0.05, \* p<0.1).

Furthermore, the coefficients for the *Median* variable are no longer significant. Our explanation for this finding is that the global effect of the median may be dominated by that of the very negative returns ( $IN - 0 - 20$ ). Indeed, a complementary analysis (not reported) shows that when the median return is very low, the fraction of shares below the 20th percentile of negative returns is large. Such periods coincide with periods of stress in the bond market (during the sovereign debt crisis at the end of 2011 or during the taper tantrum of 2013). It is thus interesting to check whether the effect of very low returns is cumulative with that of a general context of crisis and not specific to the bond funds sector. This is the aim of the next subsection.

### 1.4.3 The impact of financial stress periods

We now investigate whether investors behave in a different manner depending on whether they are in a period of global financial stress. We consider the CISS, the VIX and the VSTOXX as indicators of financial stress. Our aim is to check whether our results are driven by the impact of general financial stress or not. We run the following regression:

$$\begin{aligned} Flow_{i,t} = & \beta_0 + \beta_1 LowPerf_{i,t} + \beta_2 MidPerf_{i,t} + \beta_3 HighPerf_{i,t} + \beta_4 R_{i,t-1} + \beta_5 Median_t + \\ & + \beta_6 I(crisis) + \beta_7 IN-0-20 + \beta_8 IN-20-100 + \beta_9 Controls_{i,t} + \gamma_i + \varepsilon_{i,t} \end{aligned} \quad (1.5)$$

The new variable here is a dummy  $I(crisis)$ , which takes the value of 1 if the indicator is above the 90th percentile of its distribution (high stress). Since the effect of  $IN - 0 - 20$  could be linked to a bond market crisis, the introduction of a crisis dummy allows us to examine whether general financial stress is adding to or replacing the effect of the returns of individual funds on the flow of funds. If  $IN - 0 - 20$  is no longer significant, this means that the shift we observed was simply the consequence of general financial distress.

The results are presented in table 1.4. We confirm that periods of financial stress generate supplementary outflows from funds, in line with the literature (IMF (2015)). We emphasize that funds suffer additional outflows in stressed periods, independent of the level of their returns (approximately +0.6 percentage points in terms of outflows, as indicated by the  $I(Crisis)$  coefficient in the VIX case, column 2) compared to normal times. Unsurprisingly, H4-a is validated.

Table 1.4: The role of financial stress periods

	Raw return			Sharpe ratio			Alpha		
	CISS	VIX	VSTOXX	CISS	VIX	VSTOXX	CISS	VIX	VSTOXX
	Flows (1)	Flows (2)	Flows (3)	Flows (4)	Flows (5)	Flows (6)	Flows (7)	Flows (8)	Flows (9)
Low_perf	0.054*** (3.92)	0.054*** (3.91)	0.055*** (3.96)	0.055*** (4.45)	0.055*** (4.45)	0.055*** (4.46)	0.024* (1.95)	0.024* (1.94)	0.024* (1.96)
Mid_perf	0.012*** (3.71)	0.012*** (3.69)	0.012*** (3.73)	0.022*** (7.08)	0.022*** (7.08)	0.022*** (7.13)	0.011*** (3.67)	0.011*** (3.66)	0.011*** (3.69)
High_perf	0.064*** (4.31)	0.064*** (4.30)	0.064*** (4.31)	0.048*** (3.00)	0.048*** (2.99)	0.048*** (3.01)	0.040*** (2.65)	0.040*** (2.66)	0.040*** (2.66)
Lagged raw return	0.144*** (4.03)	0.142*** (3.96)	0.142*** (3.95)	0.166*** (4.58)	0.165*** (4.52)	0.164*** (4.51)	0.182*** (4.38)	0.181*** (4.33)	0.180*** (4.29)
I(Crisis)	-0.005*** (-2.82)	-0.006*** (-3.83)	-0.007*** (-4.62)	-0.006*** (-3.01)	-0.006*** (-4.00)	-0.008*** (-4.77)	-0.004** (-2.21)	-0.004*** (-2.77)	-0.006*** (-3.83)
Median	0.154* (1.82)	0.147* (1.72)	0.136 (1.59)	0.136 (1.62)	0.129 (1.50)	0.117 (1.37)	0.051 (0.60)	0.044 (0.51)	0.035 (0.41)
Log(TNA)	-0.006*** (-6.95)	-0.006*** (-6.94)	-0.006*** (-6.97)	-0.006*** (-7.35)	-0.006*** (-7.34)	-0.006*** (-7.37)	-0.006*** (-5.90)	-0.006*** (-5.88)	-0.006*** (-5.90)
Std dev	-0.034 (-0.38)	-0.039 (-0.44)	-0.024 (-0.28)	0.004 (0.05)	-0.002 (-0.02)	0.013 (0.15)	-0.026 (-0.30)	-0.031 (-0.37)	-0.017 (-0.21)
Log(age)	-0.007*** (-4.09)	-0.007*** (-4.09)	-0.008*** (-4.18)	-0.007*** (-3.69)	-0.007*** (-3.68)	-0.007*** (-3.78)	-0.002 (-1.04)	-0.002 (-1.01)	-0.003 (-1.17)
IN-0-20	-0.013*** (-5.47)	-0.013*** (-5.51)	-0.012*** (-5.38)	-0.012*** (-5.26)	-0.012*** (-5.30)	-0.012*** (-5.17)	-0.014*** (-5.85)	-0.014*** (-5.88)	-0.014*** (-5.79)
IN-20-100	-0.008*** (-7.16)	-0.009*** (-7.22)	-0.008*** (-7.12)	-0.008*** (-6.97)	-0.008*** (-7.03)	-0.008*** (-6.91)	-0.010*** (-8.49)	-0.010*** (-8.53)	-0.010*** (-8.47)
Intercept	0.098*** (6.33)	0.098*** (6.33)	0.099*** (6.37)	0.099*** (6.42)	0.098*** (6.42)	0.099*** (6.46)	0.093*** (4.92)	0.093*** (4.90)	0.094*** (4.97)
H0: IN-0-20=IN-20-100	0.033**	0.032**	0.039**	0.034**	0.032**	0.039**	0.052*	0.05*	0.059
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund
Adj. R2	0.019	0.019	0.019	0.021	0.021	0.022	0.015	0.015	0.015
Observations	53,433	53,433	53,433	53,418	53,418	53,418	45,458	45,458	45,458

The dependent variable is the net flows in % (truncation of observations above the 99th percentile and below the 1st percentile of the distribution). LowPerf, MidPerf, and HighPerf are indicators of relative long-term performance (12 months), constructed as in Sirri and Tufano (1998), with the following: raw returns (column 1–3), the Sharpe ratio (columns 4–6), and alpha (columns 7–9). Lagged raw return is the past-month raw share return. Median is the median of past-month share returns of all funds.

$I(\text{Crisis}) = 1$  if the indicator is above the 90th percentile of its distribution (high stress), and 0 otherwise. The Crisis indicators are as follows: the CISS (column 1,4,7), the VIX (columns 2,5,8), and the VSTOXX (columns 3,6,9).  $IN-0-20 = 1$  if the individual raw return of the previous month is in the bottom 20% of the worst negative returns, and zero otherwise.  $IN-20-100 = 1$  if the individual raw return in the previous month is between the 20th percentile of negative returns and a 0% return, and 0 otherwise. The control variables include the natural logarithm of net assets under management in the past month ( $\log(\text{TNA})$ ), the natural log of the number of years since the inception of the share ( $\log(\text{age})$ ) and the past standard deviation of monthly returns (over the past 12 months: Std dev). We use fixed effects at the share level and clustered errors by fund. T statistics are in parentheses. The asterisks indicate the p-values (\*\*\*)  $p < 0.01$ , (\*\*)  $p < 0.05$ , (\*)  $p < 0.1$ ).

More importantly, H4-b is also validated, because  $IN - 0 - 20$  is still significant (at the 1% level) throughout all the specifications. Furthermore, the test for equality of coefficients confirms that  $IN - 0 - 20$  is significantly lower than  $IN - 20 - 100$  at the 5% (columns 1–6) or 10% (with long-term performance based on alphas, columns 7–9) level. This means that investors redeem more, all else equal, from funds that exhibit the worst negative monthly raw returns, in addition to outflows due to a systemic financial stress. This could constitute a major concern for regulators to the extent that these effects are

additive.

#### 1.4.4 The impact of the types of investors

Finally, we want to determine whether investors react differently according to their type. As our database does not provide information on whether the client of the fund is a retail investor or an institutional investor, we use the minimum initial investment requirement in each part to identify the two types of clients. We suppose, as a proxy, that a fund with a minimum initial investment above the 10,000-euro threshold is mainly dedicated to institutional investors<sup>25</sup>.

We apply the same regression as model (3) to each of the two subsamples.

$$\begin{aligned} Flow_{i,t} = & \beta_0 + \beta_1 LowPerf_{i,t} + \beta_2 MidPerf_{i,t} + \beta_3 HighPerf_{i,t} + \beta_4 R_{i,t-1} + \beta_5 Median_t + \\ & + \beta_6 IN-0-20 + \beta_7 IN-20-100 + \beta_8 Controls_{i,t} + \gamma_i + \varepsilon_{i,t} \end{aligned} \quad (1.6)$$

The results are presented in table 1.5.

Institutional investors' behaviors differ from retail investors' behaviors in several ways. First, institutional investors do not seem to react to good relative performance (the coefficient for *HighPerf* is not significantly different from 0). This result echoes that of Ferreira et al. (2012), who find that institutional investors are less sensitive than retail investors to very good relative performance. Second, institutional investors also react less than retail investors to short-term returns; i.e., the coefficients are both positive, but at the 1% level for retail, and at most at the 5% level, for institutional investors. However, unlike retail investors, institutional investors seem to be significantly sensitive to the standard deviation of funds' returns (columns 4–9), except when the performance ranks use alphas (columns 10–12).

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<sup>25</sup>This yields 37,966 observations for retail shares and 15,152 observations for institutional shares. We also check the robustness of these results using a threshold of 100,000 euros. This does not change the results for the "retail" subsample, but for the "institutional" subsample, *LowPerf* and past raw returns become non-significant.

Table 1.5: Differential sensitivity according to investor type

	Retail shres			Institutional shares								
	Raw return Flows (1)	Sharpe Flows (2)	Alpha Flows (3)	Raw return Flows (4)	Raw return Flows (5)	Raw return Flows (6)	Sharpe Flows (7)	Sharpe Flows (8)	Sharpe Flows (9)	Alpha Flows (10)	Alpha Flows (11)	Alpha Flows (12)
Low_perf	0.056*** (3.81)	0.058*** (4.51)	0.025* (1.75)	0.049* (1.89)	0.049* (1.90)	0.050* (1.94)	0.059** (2.57)	0.059** (2.56)	0.060*** (2.62)	0.016 (0.70)	0.016 (0.71)	0.016 (0.70)
Mid_perf	0.008** (2.51)	0.016*** (5.09)	0.009*** (2.80)	0.020*** (3.03)	0.020*** (3.00)	0.020*** (3.04)	0.031*** (4.78)	0.031*** (4.77)	0.031*** (4.75)	0.019*** (2.94)	0.019*** (2.92)	0.019*** (2.95)
High_perf	0.085*** (5.34)	0.066*** (3.91)	0.039*** (2.66)	0.015 (0.59)	0.015 (0.60)	0.015 (0.57)	0.013 (0.46)	0.013 (0.46)	0.013 (0.45)	0.031 (1.16)	0.031 (1.16)	0.031 (1.16)
Lagged raw return	0.181*** (4.04)	0.211*** (4.54)	0.209*** (4.09)	0.098* (1.66)	0.079 (1.40)	0.108* (1.94)	0.107* (1.83)	0.091 (1.63)	0.122** (2.24)	0.146** (2.23)	0.112** (1.90)	0.144** (2.40)
Median	0.164* (1.70)	0.133 (1.38)	0.054 (0.55)	0.040 (0.23)	0.020 (0.11)	0.026 (0.15)	0.052 (0.29)	0.033 (0.19)	0.041 (0.23)	-0.019 (-0.10)	-0.043 (-0.24)	-0.033 (-0.19)
Log(TNA)	-0.006*** (-6.05)	-0.006*** (-6.21)	-0.006*** (-5.78)	-0.005*** (-3.36)	-0.005*** (-3.36)	-0.005*** (-3.38)	-0.006*** (-3.80)	-0.006*** (-3.79)	-0.006*** (-3.81)	-0.005*** (-2.67)	-0.005*** (-2.65)	-0.005*** (-2.67)
St dev	0.013 (0.11)	0.057 (0.51)	0.011 (0.10)	-0.283** (-2.45)	-0.273** (-2.37)	-0.292** (-2.55)	-0.277** (-2.28)	-0.268** (-2.20)	-0.290** (-2.41)	-0.193 (-1.56)	-0.174 (-1.42)	-0.195 (-1.60)
Log(age)	-0.007*** (-3.25)	-0.006*** (-2.98)	-0.002 (-0.97)	-0.007** (-2.30)	-0.008** (-2.32)	-0.008** (-2.36)	-0.006** (-2.00)	-0.006** (-2.03)	-0.007** (-2.05)	-0.001 (-0.17)	-0.001 (-0.20)	-0.001 (-0.23)
IN-0-20	-0.012*** (-4.56)	-0.012*** (-4.43)	-0.015*** (-5.09)	-0.015*** (-3.80)			-0.014*** (-3.65)			-0.014*** (-3.58)		
IN-20-100	-0.007*** (-5.87)	-0.007*** (-5.67)	-0.010*** (-7.09)	-0.011*** (-4.66)			-0.010*** (-4.48)			-0.012*** (-5.35)		
IN-0-40					-0.016*** (-4.69)			-0.015*** (-4.56)			-0.017*** (-5.42)	
IN-40-100					-0.009*** (-4.11)			-0.009*** (-3.90)			-0.011*** (-4.63)	
IN-0-80						-0.013*** (-4.84)			-0.012*** (-4.61)			-0.014*** (-5.45)
IN-80-100						-0.006** (-2.25)			-0.006** (-2.20)			-0.008*** (-2.61)
Intercept	0.094*** (5.40)	0.092*** (5.37)	0.092*** (4.94)	0.096*** (3.33)	0.097*** (3.34)	0.097*** (3.35)	0.105*** (3.48)	0.105*** (3.48)	0.106*** (3.50)	0.089** (2.26)	0.089** (2.25)	0.090** (2.28)
H0: IN-0-20=IN-20-100	0.032**	0.033**	0.034**	0.189			0.189			0.473		
H0: IN-0-40=IN-40-100					0.023**			0.03**			0.026**	
H0: IN-0-80=IN-80-100						0.032**			0.075*			0.114
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund
Adj. R2	0.021	0.023	0.017	0.016	0.016	0.016	0.020	0.020	0.020	0.012	0.013	0.013
Observations	37,966	37,966	32,701	15,152	15,152	15,152	15,137	15,137	15,137	12,547	12,547	12,547

The sample has been separated into retail shares (with a minimum initial investment requirement lower than 10,000 euros) and institutional shares (with a minimum initial investment requirement higher than 10,000 euros). The dependent variable is the net flows in % (truncation of observations above the 99th percentile and below the 1st percentile of the distribution). LowPerf, MidPerf, and HighPerf are indicators of relative long-term performance (12 months), constructed as in Sirri and Tufano (1998), with the following: raw returns (column 1, 4–6), the Sharpe ratio (columns 2,7–9), and alpha (columns 3, 10–12). Lagged raw return is the past-month raw share return. Median is the median of the past month's share returns of all funds. IN-0-20 = 1 if the individual raw return in the previous month is in the bottom 20% of the worst negative returns, and zero otherwise. IN-0-40 = 1 if the individual raw return in the previous month is in the bottom 40% of the worst negative returns, and zero otherwise.

IN-0-80 = 1 if the individual raw return in the previous month is in the bottom 80% of the worst negative returns, and zero otherwise. IN-20-100 = 1 if the individual raw return in the previous month is between the 20th percentile of negative returns and a 0% return, and 0 otherwise. IN-40-100 = 1 if the individual raw return in the previous month is between the 40th percentile of negative returns and a 0% return, and 0 otherwise. IN-80-100 = 1 if the individual raw return in the previous month is between the 80th percentile of negative returns and a 0% return, and 0 otherwise. The control variables include the natural logarithm of net assets under management in the past month (log(TNA)), the natural log of the number of years since the inception of the share (log(age)) and past standard deviation of monthly returns (over the past 12 months: Std dev). We use fixed effects at the share level and clustered errors by fund. T statistics are in parentheses. The asterisks indicate the p-values (\*\*\*)

$p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ).

Interestingly, contrary to the retail investor subsample, the effect of intermediate negative returns ( $IN - 20 - 100$ ) is slightly stronger (columns 1, 2, 3 vs 4, 7, 10). At the bottom of table 1.5, the test of the difference between the two coefficients confirms that, in line with previous tests, there is a shift (the  $IN - 0 - 20$  coefficient is significantly different from the  $IN - 20 - 100$  coefficient) for retail investors; however, this is not the case for institutional investors (columns 4, 7, 10). It seems that institutional investors do not react to the same level of negative returns. We thus redo the tests for equal coefficients on the two subsamples (retail and institutional) and find that the 40th percentile is a more significant threshold for institutional investors (columns 5, 8 and 11), which means that institutional investors' supplementary outflows occur at a less negative level of returns – they react as soon as the return falls below the 40% worst negative returns, instead of 20%. This means that they react to negative returns that are closer to zero. We also mention the 80th percentile threshold (columns 6, 9, and 12) because  $IN - 0 - 80$  is significantly different from  $IN - 80 - 100$  with raw returns (column 6); however, it is less robust; i.e., there is only 10% level of significance with the Sharpe ratios (column 9) and no significance with alphas (column 12).

In summary, we show that institutional investors are also sensitive to short-term raw returns, which is consistent with the literature related to agency conflicts concerning the institutional clients of mutual funds (James and Karceski (2006), Jones and Martinez (2017)). As James and Karceski (2006) argue, “pension fund sponsors, corporate treasurers and trustees may delegate money management to outside managers in order to avoid responsibility for poor performance. This can lead to the selection of money managers based on prior performance – similar to the way retail customers appear to select mutual funds.” (James and Karceski (2006), p. 2788). We confirm the findings in the literature that show that the behaviors of retail and institutional investors differ. Moreover, we add to that literature by showing that institutional investors are in fact more sensitive to negative signals, especially concerning short-term negative raw returns of bond mutual funds. This result is important in that stronger and more frequent reports of institutional investors could increase the magnitude of outflows.

## 1.5 Conclusion

Negative shocks affecting bond funds' returns may trigger a negative feedback loop between flows and returns, which could be unfavorable for investors, mutual funds and markets. In this paper, we focus on the first part of the loop, i.e., the effect of returns on flows. Several results confirm this proposition, i.e., very negative short-term returns do not change the slope of the relationship between returns and flows but lead to nonlinear effects (if returns fall below a specific threshold, additional outflows will occur). Crises or periods of financial stress also contribute to supplementary outflows. Finally, for shares with higher minimum initial investment requirements (used as a proxy for institutional shares), additional outflows seem to occur at less negative levels of short-term returns.

The existence of a negative relation between returns and outflows represents the first step in demonstrating the presence of a negative loop between flows and performance. The second step would be to demonstrate that outflows exert a negative pressure on the prices of traded securities (as shown by Coudert and Salakhova (2020)), which negatively impacts the returns of funds, causing future outflows to take place.

However, mutual funds could take measures to alleviate the possibility of the occurrence of such a loop. A possible solution might be to hold more liquid assets and sell them in the first place to satisfy redemptions. Some recent studies show, on the contrary, that in the current context of low interest rates, international fixed income funds and euro area bond funds have reduced the share of liquid products (cash, government bonds) and have increased their exposure to high-yield corporate debt to boost their returns (IMF (2019), ECB (2019))<sup>26</sup>. This risk-taking behavior could make them more fragile in the event of a shock. Another possibility would be to charge investors a higher redemption fee to discourage redemptions. However, the growing competition in the mutual fund industry could discourage funds from setting up more restrictive measures on redemptions.

To conclude, our results are in line with regulators' concerns about the fragility of bond funds upon adverse market events and underline the interest in strengthening mechanisms that remain optional in Europe, such as the introduction of an anti-dilution tax or swing pricing rules for fund shares<sup>27</sup>.

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<sup>26</sup>See also Choi and Kronlund (2018) for an empirical estimation of this behavior of US corporate bonds funds.

<sup>27</sup>The extent to which mutual funds take such precautionary measures remains to be determined, as such protection mechanisms can only be activated if they are mentioned in the fund's prospectus and if



## 1.6 Appendix 1

### Results with all quintiles of negative returns

Table 1.6: Flow reactions to the most extreme short-term negative returns (with all quintiles)

	Raw return	Sharpe ratio	Alpha
	Flows	Flows	Flows
	(1)	(2)	(3)
Low_perf	0.053*** (3.79)	0.055*** (4.45)	0.023* (1.90)
Mid_perf	0.012*** (3.64)	0.022*** (7.02)	0.011*** (3.64)
High_perf	0.064*** (4.28)	0.047*** (2.94)	0.040*** (2.65)
Lagged raw return	0.145*** (3.96)	0.169*** (4.59)	0.182*** (4.35)
Median	0.125 (1.45)	0.109 (1.26)	0.029 (0.34)
IN-0-20	-0.013*** (-5.48)	-0.013*** (-5.24)	-0.015*** (-5.83)
IN-20-40	-0.009*** (-4.93)	-0.009*** (-4.67)	-0.011*** (-5.83)
IN-40-60	-0.008*** (-5.07)	-0.007*** (-4.74)	-0.011*** (-6.10)
IN-60-80	-0.009*** (-5.45)	-0.008*** (-5.19)	-0.011*** (-6.50)
IN-80-100	-0.008*** (-5.32)	-0.008*** (-5.34)	-0.009*** (-5.68)
Intercept	0.096*** (6.28)	0.097*** (6.36)	0.091*** (4.84)
H0: IN-0-20=IN-20-40	0.041**	0.035**	0.054*
H0: IN-20-20=IN-40-60=IN-60-80=IN-80-100	0.877	0.897	0.867
Fund FE	Yes	Yes	Yes
Cluster	Fund	Fund	Fund
Adj. R2	0.019	0.021	0.015
Observations	53,433	53,418	45,458

The dependent variable is the net flows in % (truncation of observations above the 99th percentile and below the 1st percentile of the distribution). LowPerf, MidPerf, and HighPerf are indicators of relative long-term performance (12 months), constructed as in Sirri and Tufano (1998), with the following: raw returns (column 1), the Sharpe ratio (column 2), and alpha (column 3). Lagged raw return is the past-month raw share return. Median is the median of the past-month share returns of all funds.

IN-0-20 = 1 if the individual raw return of the previous month is in the bottom 20% of the worst negative returns, and zero otherwise. IN-20-40 = 1 if the individual raw return of the previous month is between the 20th percentile of negative returns and the 40th percentile of negative returns, and 0 otherwise. IN-40-60 = 1 if the individual raw return of the previous month is between the 40th percentile of negative returns and the 60th percentile of negative returns, and 0 otherwise. IN-60-80 = 1 if the individual raw return of the previous month is between the 60th percentile of negative returns and the 80th percentile of negative returns, and 0 otherwise. IN-80-100 = 1 if the individual raw return in the previous month is between the 80th percentile of negative returns and a 0% return, and 0 otherwise. The control variables (which are not shown here in order to conserve space) include the natural logarithm of net assets under management in the past month ( $\log(\text{TNA})$ ), the natural log of the number of years since the inception of the share ( $\log(\text{age})$ ) and the past standard deviation of monthly returns (over the past 12 months: Std dev). We use fixed effects at the share level and clustered errors by fund. T statistics are in parentheses. The asterisks indicate the p-values (\*\*\*)  $p < 0.01$ , (\*\*)  $p < 0.05$ , (\*)  $p < 0.1$ ).

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investors are aware of their existence.

Table 1.7: The role of financial stress periods (with all quintiles)

	Raw return			Sharpe ratio			Alpha		
	CISS	VIX	VSTOXX	CISS	VIX	VSTOXX	CISS	VIX	VSTOXX
	Flows (1)	Flows (2)	Flows (3)	Flows (4)	Flows (5)	Flows (6)	Flows (7)	Flows (8)	Flows (9)
Low_perf	0.055*** (3.92)	0.054*** (3.91)	0.055*** (3.97)	0.055*** (4.45)	0.055*** (4.44)	0.055*** (4.45)	0.024* (1.95)	0.024* (1.94)	0.024** (1.97)
Mid_perf	0.012*** (3.71)	0.012*** (3.69)	0.012*** (3.73)	0.022*** (7.10)	0.022*** (7.11)	0.022*** (7.16)	0.011*** (3.67)	0.011*** (3.66)	0.011*** (3.69)
High_perf	0.064*** (4.31)	0.064*** (4.30)	0.064*** (4.31)	0.048*** (3.00)	0.048*** (2.99)	0.048*** (3.02)	0.040*** (2.65)	0.040*** (2.66)	0.040*** (2.66)
Lagged raw return	0.141*** (3.84)	0.140*** (3.76)	0.139*** (3.75)	0.166*** (4.47)	0.165*** (4.39)	0.164*** (4.39)	0.179*** (4.24)	0.177*** (4.19)	0.176*** (4.15)
I(Crisis)	-0.005*** (-2.81)	-0.006*** (-3.82)	-0.007*** (-4.61)	-0.006*** (-3.00)	-0.006*** (-4.00)	-0.008*** (-4.77)	-0.004** (-2.20)	-0.004*** (-2.77)	-0.006*** (-3.83)
Median	0.152* (1.79)	0.145* (1.68)	0.134 (1.56)	0.137 (1.62)	0.129 (1.50)	0.117 (1.37)	0.047 (0.55)	0.040 (0.47)	0.031 (0.36)
IN-0-20	-0.013*** (-5.26)	-0.013*** (-5.30)	-0.013*** (-5.18)	-0.012*** (-4.99)	-0.012*** (-5.04)	-0.012*** (-4.91)	-0.014*** (-5.72)	-0.015*** (-5.75)	-0.014*** (-5.66)
IN-20-40	-0.009*** (-4.87)	-0.009*** (-4.93)	-0.009*** (-4.86)	-0.008*** (-4.59)	-0.008*** (-4.66)	-0.008*** (-4.57)	-0.011*** (-5.83)	-0.011*** (-5.88)	-0.011*** (-5.83)
IN-40-60	-0.008*** (-5.06)	-0.008*** (-5.13)	-0.008*** (-5.05)	-0.007*** (-4.72)	-0.007*** (-4.79)	-0.007*** (-4.70)	-0.011*** (-6.16)	-0.011*** (-6.20)	-0.011*** (-6.16)
IN-60-80	-0.009*** (-5.45)	-0.009*** (-5.47)	-0.009*** (-5.38)	-0.008*** (-5.19)	-0.008*** (-5.21)	-0.008*** (-5.10)	-0.011*** (-6.53)	-0.011*** (-6.54)	-0.011*** (-6.48)
IN-80-100	-0.008*** (-5.33)	-0.008*** (-5.37)	-0.008*** (-5.29)	-0.008*** (-5.36)	-0.008*** (-5.40)	-0.008*** (-5.32)	-0.010 (-5.71)	-0.010 (-5.73)	-0.009*** (-5.69)
Intercept	0.098*** (6.33)	0.098*** (6.33)	0.099*** (6.37)	0.099*** (6.42)	0.098*** (6.42)	0.099*** (6.47)	0.093*** (4.92)	0.093*** (4.91)	0.094*** (4.97)
H0: IN-0-20=IN-200-100	0.068*	0.069*	0.08*	0.062*	0.062*	0.072*	0.075*	0.074*	0.085*
H0: IN-20-20=IN-40-60=IN-60-80=IN-80-100	0.898	0.897	0.907	0.908	0.909	0.912	0.873	0.871	0.881
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund
Adj. R2	0.019	0.019	0.019	0.021	0.021	0.022	0.015	0.015	0.015
Observations	53,433	53,433	53,433	53,418	53,418	53,418	45,458	45,458	45,458

The dependent variable is the net flows in % (truncation of observations above the 99th percentile and below the 1st percentile of the distribution). LowPerf, MidPerf, and HighPerf are indicators of relative long-term performance (12 months), constructed as in Sirri and Tufano (1998), with the following: raw returns (column 1–3), the Sharpe ratio (columns 4–6), and alpha (columns 7–9). Lagged raw return is the past-month raw share return. Median is the median of past-month share returns of all funds.

$I(\text{Crisis}) = 1$  if the indicator is above the 90th percentile of its distribution (high stress), and 0 otherwise. The Crisis indicators are as follows: the CISS (column 1,4,7), the VIX (columns 2,5,8), and the VSTOXX (columns 3,6,9).  $\text{IN-0-20} = 1$  if the individual raw return of the previous month is in the bottom 20% of the worst negative returns, and zero otherwise.  $\text{IN-20-40} = 1$  if the individual raw return of the previous month is between the 20th percentile of negative returns and the 40th percentile of negative returns, and 0 otherwise.  $\text{IN-40-60} = 1$  if the individual raw return of the previous month is between the 40th percentile of negative returns and the 60th percentile of negative returns, and 0 otherwise.  $\text{IN-60-80} = 1$  if the individual raw return of the previous month is between the 60th percentile of negative returns and the 80th percentile of negative returns, and 0 otherwise.

$\text{IN-80-100} = 1$  if the individual raw return in the previous month is between the 80th percentile of negative returns and a 0% return, and 0 otherwise. The control variables (which are not shown here in order to conserve space) include the natural logarithm of net assets under management in the past month ( $\log(\text{TNA})$ ), the natural log of the number of years since the inception of the share ( $\log(\text{age})$ ) and the past standard deviation of monthly returns (over the past 12 months: Std dev). We use fixed effects at the share level and clustered errors by fund. T statistics are in parentheses. The asterisks indicate the p-values (\*\*\*)  $p < 0.01$ , (\*\*)  $p < 0.05$ , (\*)  $p < 0.1$ ).

Table 1.8: Differential sensitivity according to investor type (with all quintiles)

	Retail shares			Institutional shares		
	Raw return	Sharpe	Alpha	Raw return	Sharpe	Alpha
	Flows (1)	Flows (2)	Flows (3)	Flows (4)	Flows (5)	Flows (6)
Low_perf	0.056*** (3.82)	0.058*** (4.52)	0.025* (1.73)	0.050* (1.92)	0.059** (2.57)	0.016 (0.71)
Mid_perf	0.008** (2.53)	0.016*** (5.12)	0.009*** (2.81)	0.020*** (3.01)	0.031*** (4.75)	0.019*** (2.92)
High_perf	0.085*** (5.34)	0.066*** (3.92)	0.039*** (2.65)	0.015 (0.57)	0.013 (0.45)	0.031 (1.15)
Lagged raw return	0.192*** (4.13)	0.224*** (4.67)	0.220*** (4.14)	0.066 (1.11)	0.080 (1.35)	0.116* (1.82)
Median	0.175* (1.79)	0.146 (1.50)	0.061 (0.62)	0.007 (0.04)	0.023 (0.13)	-0.049 (-0.27)
IN-0-20	-0.011*** (-4.11)	-0.011*** (-3.95)	-0.014*** (-4.65)	-0.017*** (-4.16)	-0.016*** (-3.97)	-0.016*** (-4.00)
IN-20-40	-0.006*** (-3.10)	-0.006*** (-2.86)	-0.008*** (-3.76)	-0.016*** (-4.21)	-0.015*** (-4.05)	-0.018*** (-5.23)
IN-40-60	-0.007*** (-3.81)	-0.006*** (-3.62)	-0.010*** (-5.13)	-0.012*** (-3.92)	-0.010*** (-3.50)	-0.012*** (-3.67)
IN-60-80	-0.008*** (-4.66)	-0.007*** (-4.38)	-0.011*** (-5.86)	-0.011*** (-3.03)	-0.010*** (-2.86)	-0.012*** (-3.20)
IN-80-100	-0.009*** (-5.00)	-0.009*** (-5.07)	-0.010*** (-5.27)	-0.006** (-2.34)	-0.006** (-2.29)	-0.008*** (-2.65)
Intercept	0.094*** (5.39)	0.092*** (5.36)	0.092*** (4.93)	0.097*** (3.35)	0.106*** (3.50)	0.089** (2.26)
H0: IN-0-20=IN-20-40	0.02**	0.012**	0.012**	0.827	0.791	0.653
H0: IN-20-20=IN-40-60=IN-60-80=IN-80-100	0.679	0.527	0.672	0.305	0.522	0.644
H0: IN-40-60=IN-60-80=IN-80-100				0.305	0.522	0.644
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Fund	Fund	Fund	Fund	Fund	Fund
Adj. R2	0.021	0.023	0.017	0.016	0.02	0.013
Observations	37,966	37,966	32,701	15,152	15,137	12,547

The dependent variable is the net flows in % (truncation of observations above the 99th percentile and below the 1st percentile of the distribution). LowPerf, MidPerf, and HighPerf are indicators of relative long-term performance (12 months), constructed as in Sirri and Tufano (1998), with the following: raw returns (column 1–3), the Sharpe ratio (columns 4–6), and alpha (columns 7–9). Lagged raw return is the past-month raw share return. Median is the median of past-month share returns of all funds.

I(Crisis) = 1 if the indicator is above the 90th percentile of its distribution (high stress), and 0 otherwise. The Crisis indicators are as follows: the CISS (column 1,4,7), the VIX (columns 2,5,8), and the VSTOXX (columns 3,6,9). IN-0-20 = 1 if the individual raw return of the previous month is in the bottom 20% of the worst negative returns, and zero otherwise. IN-20-40 = 1 if the individual raw return of the previous month is between the 20th percentile of negative returns and the 40th percentile of negative returns, and 0 otherwise. IN-40-60 = 1 if the individual raw return of the previous month is between the 40th percentile of negative returns and the 60th percentile of negative returns, and 0 otherwise. IN-60-80 = 1 if the individual raw return of the previous month is between the 60th percentile of negative returns and the 80th percentile of negative returns, and 0 otherwise.

IN-80-100 = 1 if the individual raw return in the previous month is between the 80th percentile of negative returns and a 0% return, and 0 otherwise. The control variables (which are not shown here in order to conserve space) include the natural logarithm of net assets under management in the past month ( $\log(\text{TNA})$ ), the natural log of the number of years since the inception of the share ( $\log(\text{age})$ ) and the past standard deviation of monthly returns (over the past 12 months: Std dev). We use fixed effects at the share level and clustered errors by fund. T statistics are in parentheses. The asterisks indicate the p-values (\*\*\*)  $p < 0.01$ , (\*\*)  $p < 0.05$ , (\*)  $p < 0.1$ ).

## 1.7 Appendix 2

### Results controlling for the lagged flows

Table 1.9: Reaction to short-term absolute returns at the individual and market levels (with lagged flows)

	Raw return			Sharpe ratio			Alpha		
	Flows (1)	Flows (2)	Flows (3)	Flows (4)	Flows (5)	Flows (6)	Flows (7)	Flows (8)	Flows (9)
Low_perf	0.046*** (3.93)	0.047*** (3.98)	0.047*** (3.95)	0.048*** (4.58)	0.049*** (4.66)	0.047*** (4.52)	0.024** (2.37)	0.024** (2.34)	0.026** (2.47)
Mid_perf	0.012*** (3.98)	0.012*** (4.15)	0.011*** (3.63)	0.021*** (7.84)	0.021*** (7.92)	0.020*** (7.65)	0.009*** (3.66)	0.010*** (3.69)	0.010*** (3.74)
High_perf	0.053*** (4.04)	0.054*** (4.17)	0.053*** (4.12)	0.042*** (3.04)	0.043*** (3.08)	0.039*** (2.85)	0.031** (2.30)	0.032** (2.34)	0.033** (2.41)
Lagged raw return	0.322*** (10.56)	0.248*** (7.62)	0.203*** (3.37)	0.331*** (11.17)	0.263*** (8.17)	0.200*** (3.33)	0.374*** (10.32)	0.311*** (7.95)	0.230*** (3.64)
Median		0.385*** (4.90)	0.117 (1.01)		0.358*** (4.56)	0.097 (0.83)		0.339*** (4.18)	0.045 (0.38)
Log(TNA)	-0.007*** (-8.89)	-0.007*** (-8.88)	-0.007*** (-8.92)	-0.007*** (-9.19)	-0.007*** (-9.18)	-0.007*** (-9.24)	-0.007*** (-7.83)	-0.007*** (-7.80)	-0.007*** (-7.89)
Std dev	-0.098 (-1.25)	-0.114 (-1.45)	-0.112 (-1.37)	-0.059 (-0.79)	-0.076 (-1.01)	-0.062 (-0.77)	-0.109 (-1.50)	-0.126* (-1.71)	-0.105 (-1.30)
Log(Age)	-0.006*** (-3.49)	-0.006*** (-3.46)	-0.005*** (-3.45)	-0.005*** (-3.02)	-0.005*** (-3.00)	-0.005*** (-3.04)	-0.002 (-1.01)	-0.002 (-0.94)	-0.002 (-0.94)
Lagged raw return * I(ret_neg)			-0.110 (-1.16)			-0.069 (-0.73)			-0.102 (-1.07)
Median * I(Med_neg)			0.303 (1.51)			0.309 (1.54)			0.218 (1.07)
I(ret_neg)			-0.008*** (-6.94)			-0.007*** (-6.67)			-0.010*** (-8.04)
I(Med_neg)			0.001 (1.18)			0.001 (1.02)			0.001 (0.77)
Lagged flows	0.142*** (12.99)	0.142*** (13.00)	0.141*** (12.94)	0.140*** (12.85)	0.140*** (12.86)	0.139*** (12.80)	0.136*** (11.61)	0.136*** (11.63)	0.135*** (11.53)
Intercept	0.117*** (7.91)	0.115*** (7.83)	0.119*** (8.10)	0.117*** (7.90)	0.116*** (7.83)	0.120*** (8.13)	0.118*** (6.45)	0.117*** (6.38)	0.121*** (6.63)
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund
Adj. R2	0.037	0.038	0.039	0.039	0.040	0.041	0.031	0.031	0.034
Observations	51,938	51,938	51,938	51,923	51,923	51,923	44,568	44,568	44,568

The dependent variable is the net flows in % (truncation of observations above the 99th percentile and below the 1st percentile of the distribution). LowPerf, MidPerf, and HighPerf are indicators of relative long-term performance (12 months), constructed as in Sirri and Tufano (1998), with the following: raw returns (columns 1–3), the Sharpe ratio (4–6), and alpha (7–9). Lagged raw return is the past month's raw share return. Median is the median of past-month share returns on all funds.  $I(\text{ret\_neg}) = 1$  if the share lagged monthly return is negative, and 0 otherwise.  $I(\text{Med\_neg}) = 1$  if the median of lagged monthly returns is negative, and 0 otherwise. Interaction terms between  $I(\text{ret\_neg})$  and Lagged raw return and between  $I(\text{Med\_neg})$  and Median have been introduced to allow for the presence of different slopes in the relations between the positive/negative segments of lagged returns and median returns. Control variables include the natural logarithm of net assets under management for the past month ( $\log(\text{TNA})$ ), the natural log of the number of years since the inception of the share ( $\log(\text{age})$ ), the past standard deviation of monthly returns (over the past 12 months: Std dev) and lagged share flows. We use fixed effects at the share level and clustered errors by fund. T statistics are in parentheses. The asterisks indicate the p-values (\*\*\*)  $p < 0.01$ , (\*\*)  $p < 0.05$ , (\*)  $p < 0.1$ ).

Table 1.10: Flow reactions to the most extreme short-term negative returns (with lagged flows)

	Raw return	Sharpe ratio	Alpha
	Flows	Flows	Flows
	(1)	(2)	(3)
Low_perf	0.046*** (3.90)	0.047*** (4.51)	0.026** (2.45)
Mid_perf	0.011*** (3.62)	0.020*** (7.61)	0.010*** (3.73)
High_perf	0.054*** (4.14)	0.040*** (2.87)	0.032** (2.38)
Lagged raw return	0.105*** (3.11)	0.123*** (3.64)	0.142*** (3.52)
Median	0.167** (2.10)	0.154* (1.93)	0.083 (1.04)
Log(TNA)	-0.007*** (-8.90)	-0.007*** (-9.21)	-0.007*** (-7.86)
Std dev	-0.057 (-0.74)	-0.021 (-0.29)	-0.056 (-0.76)
Log(age)	-0.005*** (-3.44)	-0.005*** (-3.01)	-0.002 (-0.97)
IN-0-20	-0.012*** (-5.45)	-0.011*** (-5.27)	-0.013*** (-5.51)
IN-20-100	-0.008*** (-7.02)	-0.007*** (-6.78)	-0.010*** (-8.24)
Lagged flows	0.141*** (12.92)	0.139*** (12.78)	0.134*** (11.50)
Intercept	0.119*** (8.09)	0.119*** (8.09)	0.121*** (6.62)
H0: IN-0-20=IN-20-100	0.027**	0.026**	0.085*
Fund FE	Yes	Yes	Yes
Cluster	Fund	Fund	Fund
Adj. R2	0.039	0.041	0.034
Observations	51,938	51,923	44,568

The dependent variable is the net flows in % (truncation of observations above the 99th percentile and below the 1st percentile of the distribution). LowPerf, MidPerf, and HighPerf are indicators of relative long-term performance (12 months), constructed as in Sirri and Tufano (1998), with the following: raw returns (column 1), the Sharpe ratio (column 2), and alpha (column 3). Lagged raw return is the past-month raw share return. Median is the median of the past-month share returns of all funds.

IN-0-20 = 1 if the individual raw return of the previous month is in the bottom 20% of the worst negative returns, and zero otherwise. IN-20-100 = 1 if the individual raw return in the previous month is between the 20th percentile of negative returns and a 0% return, and 0 otherwise. The control variables include the natural logarithm of net assets under management in the past month (log(TNA)), the natural log of the number of years since the inception of the share (log(age)), the past standard deviation of monthly returns (over the past 12 months: Std dev) and lagged share flows. We use fixed effects at the share level and clustered errors by fund. T statistics are in parentheses. The asterisks indicate the p-values (\*\*\*) p<0.01, \*\* p<0.05, \* p<0.1).

Table 1.11: The role of financial stress periods (with lagged flows)

	Raw return			Sharpe ratio			Alpha		
	CISS	VIX	VSTOXX	CISS	VIX	VSTOXX	CISS	VIX	VSTOXX
	Flows (1)	Flows (2)	Flows (3)	Flows (4)	Flows (5)	Flows (6)	Flows (7)	Flows (8)	Flows (9)
Low_perf	0.048*** (4.06)	0.048*** (4.04)	0.048*** (4.11)	0.047*** (4.50)	0.047*** (4.50)	0.047*** (4.51)	0.026** (2.52)	0.026** (2.50)	0.026** (2.52)
Mid_perf	0.011*** (3.69)	0.011*** (3.68)	0.011*** (3.71)	0.020*** (7.70)	0.020*** (7.71)	0.020*** (7.77)	0.010*** (3.77)	0.010*** (3.76)	0.010*** (3.79)
High_perf	0.054*** (4.17)	0.054*** (4.16)	0.054*** (4.18)	0.040*** (2.93)	0.040*** (2.92)	0.040*** (2.95)	0.032** (2.38)	0.032** (2.38)	0.032** (2.38)
Lagged raw return	0.101*** (2.97)	0.099*** (2.90)	0.098*** (2.88)	0.119*** (3.50)	0.117*** (3.43)	0.117*** (3.41)	0.138*** (3.40)	0.137*** (3.36)	0.136*** (3.32)
I(Crisis)	-0.005*** (-3.19)	-0.005*** (-4.04)	-0.007*** (-5.00)	-0.006*** (-3.42)	-0.006*** (-4.26)	-0.007*** (-5.20)	-0.005*** (-2.87)	-0.004*** (-3.15)	-0.006*** (-4.45)
Median	0.193** (2.46)	0.185** (2.33)	0.175** (2.21)	0.181** (2.31)	0.173** (2.17)	0.161** (2.03)	0.102 (1.31)	0.094 (1.18)	0.084 (1.06)
Log(TNA)	-0.007*** (-8.91)	-0.007*** (-8.90)	-0.007*** (-8.92)	-0.007*** (-9.24)	-0.007*** (-9.22)	-0.007*** (-9.25)	-0.007*** (-7.88)	-0.007*** (-7.86)	-0.007*** (-7.87)
Std dev	-0.012 (-0.16)	-0.019 (-0.25)	-0.004 (-0.05)	0.028 (0.36)	0.019 (0.26)	0.035 (0.46)	-0.019 (-0.25)	-0.028 (-0.39)	-0.014 (-0.18)
Log(age)	-0.006*** (-3.69)	-0.006*** (-3.68)	-0.006*** (-3.80)	-0.005*** (-3.27)	-0.005*** (-3.26)	-0.005*** (-3.37)	-0.003 (-1.33)	-0.003 (-1.26)	-0.003 (-1.46)
IN-0-20	-0.011*** (-5.21)	-0.011*** (-5.27)	-0.011*** (-5.14)	-0.011*** (-4.99)	-0.011*** (-5.07)	-0.011*** (-4.92)	-0.013*** (-5.36)	-0.013*** (-5.42)	-0.012*** (-5.32)
IN-20-100	-0.008*** (-7.00)	-0.008*** (-7.07)	-0.008*** (-6.96)	-0.007*** (-6.74)	-0.007*** (-6.82)	-0.007*** (-6.69)	-0.010*** (-8.28)	-0.010*** (-8.31)	-0.010*** (-8.25)
Lagged flows	0.141*** (12.90)	0.141*** (12.90)	0.140*** (12.88)	0.138*** (12.75)	0.138*** (12.75)	0.138*** (12.73)	0.134*** (11.48)	0.134*** (11.48)	0.134*** (11.45)
Intercept	0.121*** (8.13)	0.121*** (8.13)	0.121*** (8.17)	0.121*** (8.15)	0.121*** (8.15)	0.122*** (8.19)	0.123*** (6.71)	0.123*** (6.68)	0.124*** (6.76)
H0: IN-0-20=IN-200-100	0.054*	0.051*	0.062*	0.054*	0.05*	0.061*	0.133	0.122	0.143
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund
Adj. R2	0.039	0.039	0.040	0.041	0.041	0.042	0.034	0.034	0.034
Observations	51,938	51,938	51,938	51,923	51,923	51,923	44,568	44,568	44,568

The dependent variable is the net flows in % (truncation of observations above the 99th percentile and below the 1st percentile of the distribution). LowPerf, MidPerf, and HighPerf are indicators of relative long-term performance (12 months), constructed as in Sirri and Tufano (1998), with the following: raw returns (column 1–3), the Sharpe ratio (columns 4–6), and alpha (columns 7–9). Lagged raw return is the past-month raw share return. Median is the median of past-month share returns of all funds.

$I(\text{Crisis}) = 1$  if the indicator is above the 90th percentile of its distribution (high stress), and 0 otherwise. The Crisis indicators are as follows: the CISS (column 1,4,7), the VIX (columns 2,5,8), and the VSTOXX (columns 3,6,9).  $\text{IN-0-20} = 1$  if the individual raw return of the previous month is in the

bottom 20% of the worst negative returns, and zero otherwise.  $\text{IN-20-100} = 1$  if the individual raw return in the previous month is between the 20th percentile of negative returns and a 0% return, and 0 otherwise. The control variables include the natural logarithm of net assets under management in the

past month ( $\log(\text{TNA})$ ), the natural log of the number of years since the inception of the share ( $\log(\text{age})$ ), the past standard deviation of monthly returns (over the past 12 months: Std dev) and lagged share flows. We use fixed effects at the share level and clustered errors by fund. T statistics are in parentheses. The asterisks indicate the p-values (\*\*\*)  $p < 0.01$ , (\*\*)  $p < 0.05$ , (\*)  $p < 0.1$ ).

Table 1.12: Differential sensitivity according to investor type (with lagged flows)

	Retail shres			Institutional shares								
	Raw return Flows (1)	Sharpe Flows (2)	Alpha Flows (3)	Raw return Flows (4)	Raw return Flows (5)	Raw return Flows (6)	Sharpe Flows (7)	Sharpe Flows (8)	Sharpe Flows (9)	Alpha Flows (10)	Alpha Flows (11)	Alpha Flows (12)
Low_perf	0.045*** (3.71)	0.051*** (4.51)	0.026** (2.18)	0.051** (2.23)	0.052** (2.24)	0.053** (2.29)	0.051*** (2.60)	0.051** (2.59)	0.052*** (2.66)	0.023 (1.16)	0.023 (1.18)	0.023 (1.17)
Mid_perf	0.008*** (3.00)	0.014*** (5.46)	0.007*** (2.66)	0.014** (2.27)	0.014** (2.24)	0.014** (2.27)	0.029*** (5.05)	0.029*** (5.03)	0.028*** (5.00)	0.019*** (3.22)	0.018*** (3.18)	0.018*** (3.22)
High_perf	0.068*** (5.10)	0.059*** (4.04)	0.034*** (2.66)	0.022 (0.89)	0.022 (0.90)	0.021 (0.86)	0.007 (0.31)	0.007 (0.30)	0.007 (0.29)	0.016 (0.64)	0.016 (0.63)	0.016 (0.64)
Lagged raw return	0.149*** (3.51)	0.171*** (4.00)	0.171*** (3.46)	0.037 (0.67)	0.010 (0.18)	0.042 (0.73)	0.046 (0.82)	0.022 (0.38)	0.056 (0.97)	0.096 (1.49)	0.052 (0.90)	0.086 (1.41)
Median	0.183** (2.06)	0.160* (1.81)	0.097 (1.07)	0.113 (0.66)	0.089 (0.52)	0.098 (0.58)	0.125 (0.73)	0.103 (0.59)	0.113 (0.66)	0.037 (0.22)	0.009 (0.05)	0.019 (0.11)
Log(TNA)	-0.007*** (-7.44)	-0.007*** (-7.57)	-0.007*** (-7.49)	-0.007*** (-4.75)	-0.007*** (-4.75)	-0.007*** (-4.77)	-0.008*** (-5.07)	-0.008*** (-5.07)	-0.008*** (-5.09)	-0.007*** (-3.59)	-0.007*** (-3.56)	-0.007*** (-3.58)
Std dev	0.019 (0.18)	0.065 (0.68)	0.005 (0.05)	-0.231** (-2.13)	-0.215** (-2.00)	-0.237** (-2.22)	-0.222* (-1.95)	-0.209* (-1.82)	-0.232** (-2.06)	-0.172 (-1.52)	-0.148 (-1.30)	-0.171 (-1.53)
Log(age)	-0.005*** (-2.96)	-0.005*** (-2.64)	-0.002 (-1.06)	-0.006** (-1.99)	-0.006** (-2.03)	-0.006** (-2.06)	-0.005* (-1.72)	-0.005* (-1.76)	-0.005* (-1.78)	-0.002 (-0.35)	-0.002 (-0.39)	-0.002 (-0.43)
IN-0-20	-0.011*** (-4.37)	-0.011*** (-4.27)	-0.013*** (-4.68)	-0.013*** (-3.57)			-0.012*** (-3.38)			-0.013*** (-3.31)		
IN-20-100	-0.007*** (-5.76)	-0.007*** (-5.57)	-0.009*** (-6.83)	-0.009*** (-4.32)			-0.008*** (-4.05)			-0.011*** (-5.11)		
IN-0-40					-0.015*** (-4.90)			-0.014*** (-4.68)			-0.017*** (-5.75)	
IN-40-100					-0.008*** (-3.64)			-0.007*** (-3.36)			-0.009*** (-4.28)	
IN-0-80						-0.012*** (-4.57)			-0.011*** (-4.24)			-0.013*** (-5.27)
IN-80-100						-0.005* (-1.79)			-0.005* (-1.72)			-0.007** (-2.22)
Lagged flows	0.145*** (9.47)	0.144*** (9.38)	0.143*** (8.60)	0.132*** (9.12)	0.132*** (9.12)	0.132*** (9.10)	0.129*** (9.06)	0.128*** (9.05)	0.129*** (9.04)	0.118*** (7.57)	0.118*** (7.56)	0.118*** (7.56)
Intercept	0.115*** (6.72)	0.112*** (6.62)	0.122*** (6.53)	0.124*** (4.57)	0.124*** (4.59)	0.125*** (4.60)	0.132*** (4.67)	0.132*** (4.68)	0.133*** (4.69)	0.116*** (3.07)	0.116*** (3.07)	0.117*** (3.09)
H0: IN-0-20=IN-20-100	0.057*	0.055*	0.084*	0.225			0.299			0.595		
H0: IN-0-40=IN-40-100					0.008***			0.011**			0.008***	
H0: IN-0-80=IN-80-100						0.038**		0.078*				0.94*
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund	Fund
Adj. R2	0.043	0.045	0.038	0.033	0.033	0.033	0.036	0.037	0.036	0.027	0.027	0.027
Observations	37,038	37,038	32,117	14,607	14,607	14,607	14,592	14,592	14,592	12,248	12,248	12,248

The sample has been separated into retail shares (with a minimum initial investment requirement lower than 10,000 euros) and institutional shares (with a minimum initial investment requirement higher than 10,000 euros). The dependent variable is the net flows in % (truncation of observations above the 99th percentile and below the 1st percentile of the distribution). LowPerf, MidPerf, and HighPerf are indicators of relative long-term performance (12 months), constructed as in Sirri and Tufano (1998), with the following: raw returns (column 1, 4–6), the Sharpe ratio (columns 2,7–9), and alpha (columns 3, 10-12). Lagged raw return is the past-month raw share return. Median is the median of the past month's share returns of all funds. IN-0-20 = 1 if the individual raw return in the previous month is in the bottom 20% of the worst negative returns, and zero otherwise. IN-0-40 = 1 if the individual raw return in the previous month is in the bottom 40% of the worst negative returns, and zero otherwise. IN-0-80 = 1 if the individual raw return in the previous month is in the bottom 80% of the worst negative returns, and zero otherwise. IN-20-100 = 1 if the individual raw return in the previous month is between the 20th percentile of negative returns and a 0% return, and 0 otherwise. IN-40-100 = 1 if the individual raw return in the previous month is between the 40th percentile of negative returns and a 0% return, and 0 otherwise. IN-80-100 = 1 if the individual raw return in the previous month is between the 80th percentile of negative returns and a 0% return, and 0 otherwise. The control variables include the natural logarithm of net assets under management in the past month (log(TNA)), the natural log of the number of years since the inception of the share (log(age)), past standard deviation of monthly returns (over the past 12 months: Std dev) and lagged share flows. We use fixed effects at the share level and clustered errors by fund. T statistics are in parentheses. The asterisks indicate the p-values (\*\*\*)  $p < 0.01$ , (\*\*)  $p < 0.05$ , (\*)  $p < 0.1$ .

# Chapter 2

## Are Ethical and Green Investment Funds More Resilient?

### 2.1 Introduction

Assets under management of global ESG funds have soared in the last years, reaching almost €1.3 trillion in June 2021, from €0.5 trillion in 2015 (Figure 1, left panel). This trend is expected to continue thanks to the gradual wealth transfer to millennials and rising investor awareness of climate change and related policies, also driven by the increased frequency and severity of natural catastrophes.

In March 2020, during the worst market turmoil since 2008, ESG equity and bond funds experienced between 3% and 4% lower outflows than their non-ESG peers. Also, ESG equity (ESG bond) funds recovered much faster, showing an overall c.25% (c.20%) growth of assets under management (AuM) in 2020, while non-ESG funds barely returned to the levels of AuM at the beginning of 2020 (Figure 1, middle panel). The higher resilience of ESG fund flows to the market shock may be explained only partially by their higher returns, as ESG and non-ESG funds exhibit similar monthly performance. The return of ESG bond funds in March 2020 was -7% vs. -9% for their non-ESG peers, while ESG and non-ESG equity funds displayed a return of -29% (Figure 1, right panel).

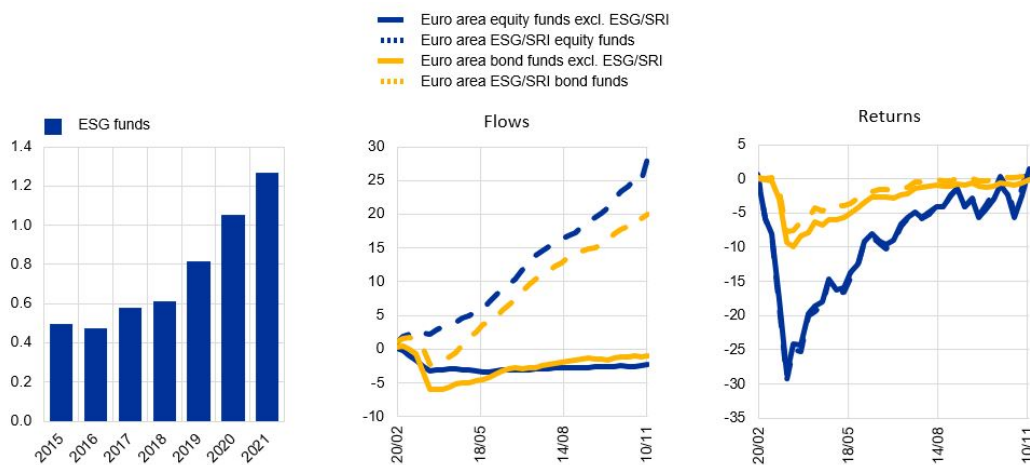
In this paper, we are interested in analysing whether investors in ESG and Environmental-focused funds (E-funds)<sup>1</sup> are less sensitive to negative performance compared to non-ESG

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<sup>1</sup>In the remainder of the paper we use Environmental-focused funds, E-funds and green (or green ESG) funds interchangeably.



Figure 2.1: Growth of ESG funds and performance during the COVID-19 turmoil



Source: Bloomberg Finance L.P., EPFR Global and authors calculations

fund investors.

The literature provides several theoretical justifications to this hypothesis. First, ESG investors have been shown to be willing to forgo short-term returns and volatility to pursue their ethical and environmental goals. Hartzmark and Sussman (2019) and Dottling and Kim (2020) argue that investors may value sustainability more than performance and therefore they are more committed to funds that share these values in their mandates. In addition, Krueger et al. (2020) shows, based on survey results, that institutional investors may account for climate risks in their decisions also because of considerations related to investors' reputation, investors' moral/ethical concerns, and legal/fiduciary duties. Riedl and Smeets (2017) also suggest that ESG investors are more committed to long-term investment horizons and therefore pose lower risks in terms of demand volatility. Finally, investors may expect higher risk-adjusted returns from sustainable investments in the future, as a result of carbon policies. Kuang and Liang (2021) support this hypothesis by showing that investors are more sensitive to poor performance of funds with a higher carbon risk portfolio.

We construct a unique dataset by combining a number of data sources and classifying funds as ESG or non-ESG. We obtain flows, returns and portfolios of euro area funds from Lipper Refinitiv. We identify retail and institutional fund shares using ECB Securities Holdings Statistics by Sector (SHSS), and we assess funds' portfolio liquidity using the ECB Centralised Securities Database (CSDB). We classify ESG- and E-focused funds

as those that market themselves as such via the use of certain words in their names, e.g. "Climate", "Environment", "Sustainable", "Green", "ESG" etc. We use this approach as there is no regulatory standard or label to identify ESG/E-funds. Data providers, such as Morningstar and Bloomberg, provide information if a fund is classified as ESG by looking at the names and prospectuses or by analysing their assets. However, these classifications provided by different providers correlate only partially, raising concerns about greenwashing (Boffo and Patalano (2021), Berg et al. (2020)). We argue that looking at fund names is the easiest way in which investors can identify ESG funds. IMF (2021) confirms that labels are an important driver of fund flows. In our analysis, we focus purely on investors' perception of a fund being ESG/Environmental and not if a fund truly pursues ESG/Environmental investment strategy, in contrast for example to Kuang and Liang (2021), who study the flow-performance relationship of funds, according to the exposure of their portfolio to carbon risk.

We run an econometric analysis to estimate the flow-performance relationship of ESG- and E-focused equity and bond funds, compared to their non-ESG peers, adapting the state-of-art specification by Goldstein et al. (2017). In addition, we explore how the results vary across institutional and retail investors and according to the liquidity of funds' assets and wider market conditions. Our results suggest that both retail and institutional investors in ESG and E-funds are less sensitive to past negative performance, even in periods of market distress and illiquidity, suggesting a higher resilience of these funds. The results are robust to alternative specifications and inclusions of controls. In particular, the lower sensitivity of ESG fund flows to negative returns is not explained by the rapid growth of the ESG fund sector. At the same time, we find that the difference between the sensitivities of ESG and non-ESG funds is statistically different only for ESG equity funds.

These results suggest that financial markets can help support the transition to a more sustainable economy by channeling capital from investors to sustainable projects particularly if it is demonstrated that investors are less sensitive to low(er) performance. The continuing shift towards ESG and E-funds can help foster the green transition, especially because it is mostly focused in the equity markets, which have been shown to be effective in financing green projects (see De Haas and Popov (2019)). However, greenwashing represents a risk both for the green transition and financial stability and, in the absence of

clear standards of ESG/E-labels, investors' confidence in the market may be undermined, leading to significant outflows. A consistent, harmonized and verified ESG/E-ecolabel would help reduce such uncertainty and greenwashing risk.

The rest of the paper is structured as follows. We review the literature in Section 2.2. Section 2.3 presents the hypotheses construction. Section 2.4 presents the data and the descriptive statistics of our sample. Section 2.5 describes the empirical specifications and the main results. Finally, section 2.6 concludes and discusses the policy implications of our results.

## 2.2 Literature review

Our paper contributes to several strands of literature. First, it complements existing research on investor behaviour and their sensitivity to past returns. The flow-performance relationship has been extensively studied for conventional funds (see Sirri and Tufano (1998), Chevalier and Ellison (1997), Chen et al. (2010) for equity funds or Goldstein et al. (2017), Chen and Qin (2017), Falato et al. (2021a) for bond funds). Several studies have added to this literature by analysing whether ESG or SRI funds display a different flow-performance relationship than conventional funds (see Renneboog et al. (2011), El Ghouli and Karoui (2017), Benson and Humphrey (2008), Bollen (2007)). They reach the conclusion that investors in socially responsible funds display a weaker flow-performance relationship (at least on the segment of poor returns) compared to their traditional peers. However, Bialkowski and Starks (2016) show that in contrast to the aforementioned studies, SRI investors do not display resilience to poor performance, a finding they explain by the growing number of socially responsible funds in the market.

We add to this literature by using a more recent sample of ESG and conventional funds (covering January 2016 until December 2020), which allows us to study the impact of the COVID-19 crisis. Also, as ESG indicators incorporate three factors (namely the E, S and G factor respectively), we further distinguish funds having an environmental focus. Moreover, we study the presence of a potential different flow-performance relationship between ESG funds and conventional funds for both equity and bond samples. Although equity funds manage most of the assets of funds classified as ESG, bond funds play an increasing role in the sustainable industry. Also, for bond funds, the sensitivity of

investors to poor performances (which has been demonstrated by Goldstein et al. (2017), Chen and Qin (2017)) might have financial stability implications. The illiquidity of the assets that bond funds might hold may lead to a stronger first-mover advantage in this type of funds, potentially leading managers to fire-sale their assets in order to reimburse investors wishing to redeem in response to poor performance. Our results suggest that for both equity and bond funds samples, investors in ESG or in environmental-focused funds show resilience to past poor returns, which would allow sustainable funds to provide a stable source of financing for the green transition. This result is in line with the findings by IMF (2021) that use a quantile regression specification for a sample of sustainable investment funds worldwide.

Second, our paper contributes to the literature studying whether investors react differently to sustainability indicators depending on their type (namely retail or institutional). Our findings suggest that both types of clientele show greater resilience to poor returns in ESG funds. Our results complement the ones of Dottling and Kim (2020) which show that retail investors redeemed during the COVID-19 shock even from the high-sustainability funds, which they interpret as retail investors perceiving sustainability as being a luxury good during periods of economic distress. Our results are in line with those of Hartzmark and Sussman (2019), Pastor and Vorsatz (2020), which also find that retail, as well as institutional investors favour investments in high-sustainability funds. However, we add to this literature by specifically testing whether the different types of clientele display a distinct sensitivity to past returns. Our results are complementary to those of Kuang and Liang (2021), who find that institutional investors are more responsive to the carbon risk exposures of investment funds' portfolios, unlike retail investors. This, indeed, is plausible, as institutional investors have a larger capacity to access and analyse investment funds' asset holdings.

## 2.3 Hypotheses

The construction of our hypotheses is based on the view that the clientele of ESG funds displays different characteristics from the one in traditional funds. Notably, as previously explained, a rich literature on the characteristics of ESG investors emerged recently.

First, Dottling and Kim (2020), Hartzmark and Sussman (2019), Pastor and Vorsatz

(2020), Bauer et al. (2021) argue that investors in sustainable funds are committed to their mandates and that they might value sustainability more than performance. Also, according to Krueger et al. (2020), survey results indicate that the protection of the investors' reputations, their moral/ethical considerations, as well as their legal/fiduciary duties incentivize institutional investors to include climate risks considerations into their decisions. Second, the absence of sensitivity to past 1-month performance in ESG funds might be driven by a longer-term investment horizon displayed by investors in this type of funds (see Riedl and Smeets (2017), Dottling and Kim (2020)). Finally, another plausible explanation for our findings consists of the existence of a belief that sustainable investments will generate higher future returns<sup>2</sup>.

These characteristics might have important implications from a financial stability point of view. Indeed, the existence of strategic complementarities is well acknowledged in the mutual funds literature: remaining investors will bear the consequences of potential costly liquidations that a manager undertakes in order to reimburse an investor that wishes to redeem. Therefore, an investor will be incentivised to redeem before others do. A flow-performance loop could hence emerge with potential detrimental effects especially during crisis periods: investors would redeem following negative performance, which would impair future performance if the fund performs procyclical sales, contributing to future redemptions. However, this flow-performance loop would disappear if investors do not redeem following negative returns. This might indeed be the case in ESG funds, if ESG investors value more the sustainability of their investments over their performance. This leads to the first hypothesis.

**Hypothesis 1: Investors in non-ESG bond and equity funds redeem following negative performance, while investors in ESG funds are not sensitive to past poor performance.**

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<sup>2</sup>The literature provides mixed evidence on whether sustainable investments help achieve higher returns or lower the portfolio risk. Hartzmark and Sussman (2019) do not find evidence that high-sustainability funds outperform low-sustainability ones. In the same vein, Gibson Brandon et al. (2020) demonstrate that returns are not higher in responsible investing. On the other hand, Pastor and Vorsatz (2020), Ferriani and Natoli (2020), Ammann et al. (2019) show that low-ESG risk funds outperform high-ESG risk funds. Nofsinger and Varma (2014) demonstrate that market stress plays a role in the performance of SRI investments: they outperform during periods of market distress, but they underperform during normal periods. However, the shift towards more assets invested in sustainable products may cause a potentially higher risk-adjusted investment performance. Gibson Brandon and Kruger (2018) prove that a higher performance is achieved if more investments are made into assets with higher environmental characteristics by institutional investors.

If investors in ESG funds prove to be more resilient to past poor performance, it would be interesting to examine the type of clientele that drives this result. In traditional funds, it has been demonstrated that both retail and institutional investors redeem following negative performance (see Goldstein et al. (2017) for bond funds and Chen et al. (2010) for equity funds). In ESG funds, we may hypothesise that retail and institutional investors do not react to an increase of a negative performance: in the case of retail investors this could happen due to increasing environmental concerns, while in the case of institutional investors they may be committed to their mandates (Dottling and Kim (2020), Bauer et al. (2021), Pastor et al. (2021)). This leads to the second hypothesis:

**Hypothesis 2: Contrary to traditional funds, retail and institutional investors in ESG funds do not redeem following negative performance.**

Financial conditions may also play a role in the investors' decision to withdraw following negative performances. Indeed, investors will be more incentivised to redeem during stress periods as the liquidity cost of redeeming investors will be higher. However, climate change and environmental concerns are not contingent to worsening financial conditions. To this respect, we construct the third hypothesis as follows:

**Hypothesis 3: Investors in ESG funds prove to be resilient to past poor performance during normal, as well as stressed periods.**

Given that bonds are less liquid than equities, the illiquidity of the assets may play a role in the flow-performance sensitivity in the corporate bond sample, as demonstrated by Goldstein et al. (2017). The reason is that it is more costly to liquidate illiquid positions than liquid holdings, which increases the first-mover advantage in illiquid bond funds. However, given that several studies provided evidence that ESG investors value sustainability more than performance, the illiquidity of bond funds holdings may not influence their investment decisions. This leads to the fourth hypothesis.

**Hypothesis 4: Investors in ESG funds prove to be resilient to past poor performance independently to the illiquidity of the assets held by the fund.**

## 2.4 Data

### 2.4.1 Sample construction

We obtain our two variables of interest (namely the monthly values of assets under management and the raw monthly return) from Lipper Refinitiv database. Our sample consists of bond and equity funds domiciled in the Euro Area (only mutual funds are comprised in our sample). In September 2020, the initial sample covers 57% of the assets managed by Euro Area bond funds and approximately 60% of the assets managed by Euro Area domiciled equity funds respectively. The sample covers the period from January 2016 until December 2020 at a monthly frequency, and the analysis is pursued at a share level. A fund typically issues multiple shares targeted to different investors: a larger minimum initial investment and smaller fees attract institutional investors. As our analysis also aims to differentiate investors' reaction to past returns depending on their type, we choose fund shares as our unit of observation.

ESG/E shares are defined as such if their name contains specific words. To identify ESG funds, we look at such words in funds' names as "ESG", "SRI", "Social", "Environment", "Climate", "Sustainable", "Green", "Governance", "Carbon", "Transition", "Ecology", "Responsible", "Durable", "Ethical". The E funds are a subset of ESG funds, and their names contain a sub-range of words specifically linked to environmental concerns, such as "Environment", "Climate", "Sustainable", "Green", "Carbon", "Ecology"<sup>3</sup>. To define retail and institutional shares, we use ECB internal database on securities holdings statistics at a sector level (SHSS). According to the ECB SDW, the SHSS provide information on holdings of securities by euro area resident sectors at a quarterly frequency. Retail (institutional) shares are identified as those where retail (institutional) investors hold more than 50% of funds' total net assets. Finally, we employ Lipper Refinitiv fund portfolio level data and ECB consolidated securities database (CSDB) to compute the share of a fund's portfolio invested liquid assets. This allows us to create a variable accounting for the fund's liquidity. However, we use the fund's liquidity measure only on the bond fund sample, as stocks in which equity funds invest are liquid instruments. The fund's liquidity measure displays the percentage of the portfolio invested in high quality assets, namely cash and cash equivalents, bonds from euro area governments, supranationals, central

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<sup>3</sup>In the dictionary of search words, we include all these words in different European languages.

banks as well as non-Euro Area government bonds that have an AA/AAA rating.

We follow several steps in order to arrive at the final sample. First, we use the Lipper schemes variable (indicator of the type of assets that asset managers invest in) in order to keep only corporate bond funds from the sample of overall bond funds. Second, for both equity and corporate bond samples, we keep funds with a global, European or emerging markets investment focus. We follow this strategy in order to keep only a homogeneous group of funds for our analysis and therefore eliminate funds investing only in a single country. Third, in order to avoid incubation bias, we eliminate shares with less than 5 million Euros of assets under management and an age of less than one year. Finally, in order to ensure a certain history of flows for our analysis, we keep only shares displaying at least 12 consecutive non-missing observations of flows. The analysis covers only UCITS funds. Our sample covers 1,803 and 9,437 non-ESG shares, and 206 and 1,274 ESG shares, of active corporate bond and equity funds domiciled in the Euro Area.

## 2.4.2 Descriptive statistics

Figures 2.2 and 2.3 present the summary statistics for equity and bond funds respectively. Flows are defined in relative terms over the previous month assets. Over the sample period, non-ESG equity funds record an average outflow of -0.11%, while ESG equity funds record an average inflow of 0.66%. The average inflow is also bigger for ESG funds in the bond funds sample (0.84% average monthly inflow for ESG funds compared to 0.34% for conventional counterparts). Excess returns are defined as the share's raw return in excess of the risk-free rate (monthly yield of 10-year AAA-rated government bonds issued by Euro Area countries). The median monthly excess return for non-ESG equity funds is slightly lower than the one reported by ESG or green ESG counterparts (0.98% compared to 1.19% and 1.31% respectively). On the contrary, for bond funds, the median monthly return is positive and slightly higher for non-ESG funds than for the ESG or green ESG counterparts (0.34% compared to 0.29% and 0.23% respectively). The median age of a conventional equity fund is around 6.5 years, while the one of a green ESG fund is approximately 6 years. Bond green ESG funds are only slightly younger than their traditional counterparts. On average, bond non-ESG funds hold more liquid assets in their portfolio compared to the ESG counterparts (on average, 4.45% of their portfolio is invested in high quality assets compared to 2.91% reported by ESG bond funds).



Figure 2.2: Summary statistics (equity funds)

		Mean	Std Dev	P5	P50	P95	N
<b>Non-ESG</b>	Flows(%)	-0.11	3.72	-8.37	-0.04	9.08	380 909
	Return(%)	0.69	4.33	-6.74	0.98	6.77	380 909
	Ln(TNA)	17.67	1.38	15.73	17.51	20.17	380 909
	Ln(age)	1.86	0.83	0.4	1.89	3.08	380 909
<b>All ESG</b>	Flows(%)	0.66	3.89	-7.27	0	9.46	42 856
	Return(%)	0.86	4.37	-6.92	1.19	7.15	42 856
	Ln(TNA)	17.71	1.33	15.74	17.61	20.02	42 856
	Ln(age)	1.71	0.89	0.25	1.73	3.04	42 856
<b>Green ESG</b>	Flows(%)	0.88	4.05	-6.9	0.02	9.46	21 647
	Return(%)	0.98	4.38	-6.91	1.31	7.62	21 647
	Ln(TNA)	17.57	1.31	15.69	17.43	19.93	21 647
	Ln(age)	1.72	0.88	0.25	1.79	3.02	21 647

Figure 2.3: Summary statistics (bond funds)

		Mean	Std Dev	P5	P50	P95	N
<b>Non-ESG</b>	Flows(%)	0.34	4.79	-9.69	0	12.56	54 522
	Return(%)	0.3	2.18	-2.37	0.34	3.19	54 522
	Ln(TNA)	17.69	1.41	15.72	17.56	20.23	54 522
	Ln(age)	1.74	0.69	0.46	1.79	2.85	54 522
	HQLA	4.45	8.09	-0.68	3.15	14.59	54 522
<b>All ESG</b>	Flows(%)	0.84	5.08	-9.69	0	12.56	4 442
	Return(%)	0.28	1.85	-1.73	0.29	2.74	4 442
	Ln(TNA)	17.67	1.16	15.96	17.52	19.87	4 442
	Ln(age)	1.49	0.79	0.24	1.49	2.75	4 442
	HQLA	2.91	3.98	-1.59	2.49	9.03	4 442
<b>Green ESG</b>	Flows(%)	0.89	4.9	-8.46	0.01	12.56	2 117
	Return(%)	0.25	1.7	-1.69	0.23	2.49	2 117
	Ln(TNA)	17.93	1.3	15.95	17.8	20.05	2 117
	Ln(age)	1.67	0.89	0.25	1.66	3.4	2 117
	HQLA	3.38	3.98	-0.62	2.62	9.62	2 117

Figure 2.4 displays the evolution of assets managed by bond and equity funds from January 2016 until December 2020. This evolution is further split between conventional funds and ESG funds. We can observe that over the sample period, the assets managed by the overall system increased (by approximately 50% for bond funds and by 55% for equity funds respectively). The assets managed by ESG funds account for an increasing part of the total assets managed by mutual funds. ESG bond funds managed around 5% of the total assets in 2016 and around 10.5% in December 2020. The same evolution is reported by equity ESG funds: beginning 2016 they managed 6.4% of the total assets compared to 13.8% in December 2020.

Figure 2.5 shows the effect of the COVID-19 crisis on the assets managed by bond

and equity funds as well as on their returns. We generally observe strong outflows in March 2020, although less massive in ESG funds compared to non-ESG counterparts (traditional bond funds suffered outflows of 13% in March 2020 compared to 9% recorded by ESG peers). The difference between the two samples gets slightly smaller in the equity funds sample (22% of outflows recorded by conventional equity funds compared to approximately 19.6% reported by ESG peers). ESG funds recovered faster than their non-ESG counterparts in the months following the crisis. In 2020, ESG bond funds increased their assets under management by approximately 22.6%, while non-ESG peers saw a slight increase in the assets under management (1.6%). In the equity sample, ESG funds managed 22% more assets in December 2020 compared to January 2020. On the contrary, non-ESG funds did not completely recover during the same time period: end 2020 they managed 1% less assets than in January 2020.

Figure 2.4: Evolution of TNA and share of ESG funds by type

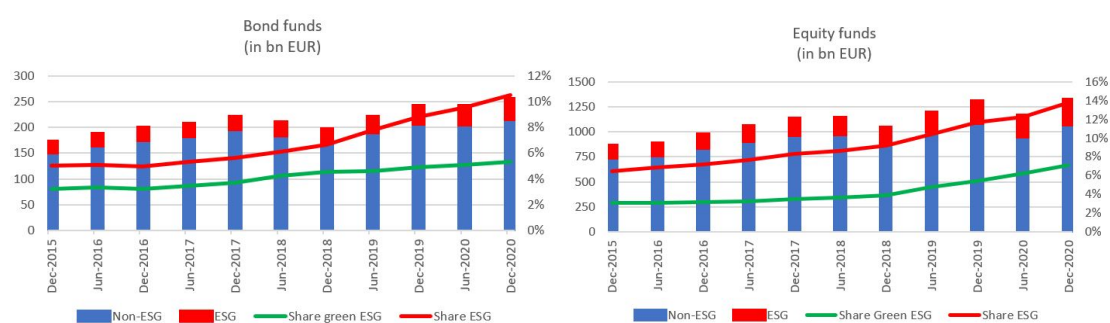


Figure 2.5: Cumulative flows and returns in 2020 by type

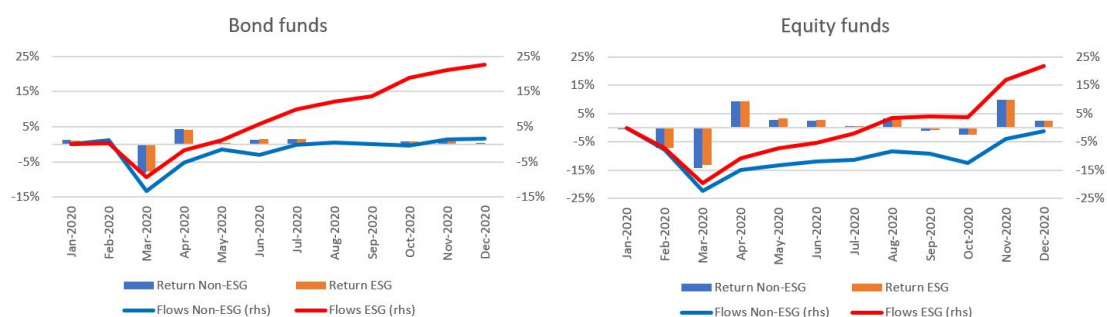
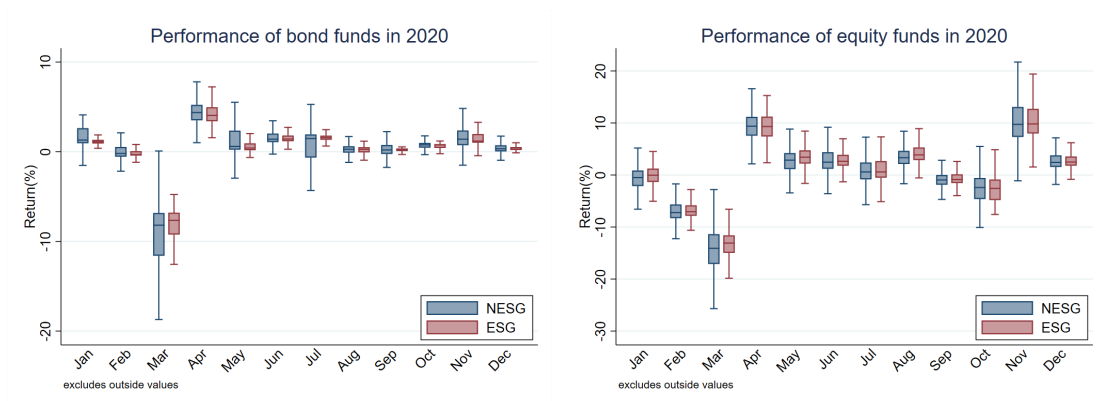


Figure 2.5 also displays the median monthly excess return by fund type. We can observe that the ESG and non-ESG counterparts were displaying a similar return. The interquartile range of performance is shown in figure 2.6. On average, ESG funds (both

bond and equity) show higher returns than the non-ESG peers, but the difference between the two samples is small. Bond ESG funds show less volatile returns compared to their non-ESG counterparts (however, this may be due to a smaller sample of ESG bond funds).

Figure 2.6: Monthly interquartile range of excess returns in 2020



## 2.5 Empirical findings

### 2.5.1 Baseline regression

We employ a model as in Goldstein et al. (2017). The model allows us to test the existence of a potential non-linearity in the flow-performance relationship. Indeed, investors may react differently to positive and negative returns. A difference in investors' response between positive and negative returns might have financial stability consequences especially during crisis periods. If it is demonstrated that investors withdraw in response to past negative returns, their behaviour may have a detrimental effect if managers need to fire-sell assets in order to respond to outflows.

In this section we report the results on the sensitivity of E-focused, ESG and non-ESG funds' flows following past performance. We employ a baseline regression of the following form to test the flow-performance relationship for ESG and non-ESG funds:

$$\begin{aligned}
 Flows_{i,t} = & \alpha + \beta_1 RetPosESG_{i,t-1} + \beta_2 RetPosNESG_{i,t-1} + \beta_3 RetNegESG_{i,t-1} + \\
 & + \beta_4 RetNegNESG_{i,t-1} + \beta_5 I(LaggedReturn < 0)_{i,t-1} + \\
 & + \beta_6 I(LaggedReturn < 0)_{i,t-1} \times ESG + \beta_7 ESG + \\
 & + \gamma Controls_{i,t} + \delta_i + \lambda_{ESG,t} + \epsilon_{i,t},
 \end{aligned} \tag{2.1}$$

where the dependent variable represents the share's relative net flows between month  $t$  and  $t-1$ . The four main independent variables account for non-linearities at the share's past excess return levels<sup>4 5</sup>: *RetPosESG* is the past positive return of ESG shares and 0 otherwise. *RetPosNESG* is the past positive return of non-ESG share and 0 otherwise. *RetNegESG* is the past negative return of ESG share and 0 otherwise. *RetNegNESG* is the past negative return of non-ESG share and 0 otherwise. *ESG* is an indicator variable equal to one if the fund is marketing itself as taking into account ESG criteria in its investment decisions and zero otherwise.  $I(\text{LaggedReturn} < 0)$  is an indicator variable equal to one if the share displays a negative past excess performance and zero otherwise. The baseline coefficients of interest are based on a triple-interaction term between the share's past return, the  $I(\text{LaggedReturn} < 0)$  dummy and the *ESG* dummy. The reported results and t-statistics are based on selected sums of coefficients. Appendix 1 (table 2.7) provides an explanation of how the four coefficients of interest are constructed.  $Controls_{i,t}$  comprise a series of lagged control variables, such as the natural logarithm of age, size, past flows of the share, as well as the standard deviation of the past 12 monthly excess returns, which represents a proxy for the riskiness of the fund's portfolio. In order to account for unobserved time-fixed share-level effects, we introduce fixed effects at the share level. Moreover, month fixed effects need to be introduced to control for the growing assets under management of investment funds. However, as figure 2.4 shows, the positive trend in assets is more pronounced for funds labeled as ESG compared to traditional peers. Therefore, in order to take into account this different trend we introduce crossed ESG and month fixed effects. Furthermore, we cluster errors by share class to allow for intertemporal dependence of regression residuals across shares.

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<sup>4</sup>Instead of using the past level of raw returns, one could also rank funds between themselves and construct a ranking variable, as in Sirri and Tufano (1998). However, we chose not to pursue this strategy in order to test the non-linearity of the relationship. While it can be true that investors compare a fund's performance to its peers, a ranking strategy would not be adapted to measure an investor's reaction to a common shock that affect funds similarly (as it was the case during the COVID-19 turmoil). In addition, as an alternative performance definition, we employ past raw returns (instead of excess performances) and unreported tables show that our results remain unchanged across specifications.

<sup>5</sup>The excess performance is calculated as the difference between the raw return and the monthly yield of 10-year AAA-rated government bonds issued by Euro Area countries.

Columns 1 and 2 in Table 2.1 present the results for the baseline specification of the flow-performance relationship for ESG and Environmentally-focused equity funds respectively. All the control variables exhibit significant and expected effects, in particular, age, size and lower volatility of returns reduce the net flows, while flows also show certain persistence. Our main result is that investors in ESG and E-funds do not show statistically significant sensitivity to past negative performance, while investors in non-ESG equity funds respond to a 1 pp decrease in the negative returns by increasing their outflows of 0.069 pp. The difference in behaviour between investors in ESG and non-ESG equity funds is also statistically significant, at 5% . As demonstrated by Goldstein et al. (2017), the positive flow-performance relationship in corporate bond funds may have negative implications for markets and financial stability due to a first-mover advantage and low liquidity of funds' assets. Columns 3 and 4 in Table 2.1 present the results for the same specification for ESG and green corporate bond funds respectively. We confirm the finding of Goldstein et al. (2017), namely that flows into corporate bond funds are sensitive to past negative performance with an 1 pp decrease in the negative returns leading to 0.077-0.082 pp higher outflows. In contrast, the sensitivity of flows into ESG and green bond funds appear to be negative but not statistically significant. However, the difference between the coefficients of ESG/green and non-ESG negative returns is not statistically significant. One reason behind this result can be a much smaller sample for ESG and environmental bond funds.

As previously mentioned, we define ESG/E- focused funds by using the name of the funds. However, it is important to test the robustness of our baseline result when using other classifications, such as the Morningstar globes (which would allow us to identify ESG funds as in Hartzmark and Sussman (2019) for example)

We first test the robustness of our results with respect to Morningstar globes in table 2.2. Columns 1 and 3 show the baseline results, where ESG funds are classified as such based on the name of the fund, while columns 2 and 4 show the results when using the Morningstar globes classification. However, as the Morningstar globes began to be consistently reported starting with 2019, table 2.2 presents the results of our baseline regression ran on a sample covering January 2019 until December 2020 (this also provides an explanation regarding the difference in the number of observations in columns 1 and 3 in table 2.2 compared to columns 1 and 3 in table 2.1). In columns 2 and 4, ESG funds

Table 2.1: Flow-performance relation: ESG versus non-ESG peers  
 Specification using name classification and excess returns

	Equity funds		Bond funds	
	(1)	(2)	(3)	(4)
	All ESG Flows	Green ESG Flows	All ESG Flows	Green ESG Flows
Ret Pos ESG	0.059*** (3.42)	0.097*** (3.73)	-0.172 (-1.11)	-0.022 (-0.10)
Ret Pos NESG	0.051*** (10.12)	0.052*** (10.16)	0.021 (0.75)	0.021 (0.73)
Ret Neg ESG	0.015 (0.56)	0.056 (1.48)	0.127 (0.79)	-0.123 (-0.80)
Ret Neg NESG	0.069*** (10.69)	0.068*** (10.66)	0.077*** (2.83)	0.077*** (2.84)
I(Lagged Return<0)	-0.001*** (-4.60)	-0.001*** (-4.59)	-0.001** (-2.05)	-0.001** (-2.07)
I(ESG) x I(Lagged Return<0)	0.000 (0.29)	0.001 (1.24)	0.001 (0.50)	0.005 (1.07)
Ln(age)	-0.009*** (-12.50)	-0.009*** (-12.17)	-0.007*** (-3.42)	-0.007*** (-3.15)
Ln(size)	-0.009*** (-29.84)	-0.010*** (-29.21)	-0.014*** (-14.61)	-0.013*** (-13.84)
Lagged Flows	0.170*** (50.12)	0.171*** (49.13)	0.153*** (21.89)	0.152*** (20.99)
Std Dev Ret	-0.002*** (-14.79)	-0.002*** (-14.72)	-0.003*** (-6.17)	-0.003*** (-6.12)
Constant	0.193*** (33.94)	0.194*** (33.18)	0.262*** (15.74)	0.257*** (14.85)
Share FE	Yes	Yes	Yes	Yes
Month x ESG FE	Yes	Yes	Yes	Yes
Cluster	Share	Share	Share	Share
H0: Ret Neg ESG = Ret Neg NESG	0.046**	0.736	0.761	0.198
Adj. R <sup>2</sup>	0.2	0.198	0.154	0.152
Observations	324 022	307 903	64 467	61 417
Sample	Name classification, Excess returns			

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the flow-performance relationship for ESG and for non-ESG funds. We regress share's flows on share's past excess returns. An asymmetry in investor response is tested with respect to past negative and positive performance. Moreover, we also test an asymmetry in investor response to past returns with respect to a share being considered an ESG or a conventional fund share. The following control variables are introduced: Ln(age) indicates the past natural logarithm of share's age (expressed in years), Ln(size) indicates the past natural logarithm of share's size, share's lagged flows and the standard deviation of the past 12 monthly returns. The sample covers January 2016 - December 2020 and is at a monthly frequency. ESG/E-funds are defined according to the use of certain words in funds' names. The first 2 columns show the results for equity funds (the Green ESG are considered instead of All ESG in the second column), while the 2 last columns show the results for bond funds. Share fixed effects and crossed month and ESG fixed effects are introduced. Observations are clustered at a share level.

Table 2.2: Flow-performance relation: ESG versus Non-ESG peers  
Specification using name classification or Morningstar globes

	Equity funds		Bond funds	
	(1)	(2)	(3)	(4)
	Name	Globes	Name	Globes
	All ESG		All ESG	
	Flows	Flows	Flows	Flows
Ret Pos ESG	0.037*	-0.000	-0.229	0.157
	(1.91)	(-0.01)	(-1.36)	(0.89)
Ret Pos NESG	0.033***	0.039***	0.006	0.005
	(5.69)	(4.24)	(0.21)	(0.11)
Ret Neg ESG	-0.002	0.072***	0.045	-0.290
	(-0.07)	(4.07)	(0.27)	(-1.52)
Ret Neg NESG	0.057***	0.040***	0.094***	0.134***
	(7.63)	(3.37)	(2.89)	(3.43)
I(Lagged Return<0)	-0.001**	-0.001	-0.000	0.000
	(-2.39)	(-1.07)	(-0.29)	(0.15)
I(ESG) x I(Lagged Return<0)	-0.000	-0.000	-0.001	0.001
	(-0.40)	(-0.40)	(-0.25)	(0.18)
Ln(age)	-0.003**	-0.001	-0.001	0.003
	(-2.44)	(-0.55)	(-0.13)	(0.51)
Ln(size)	-0.015***	-0.015***	-0.024***	-0.024***
	(-24.00)	(-17.81)	(-16.67)	(-13.46)
Lagged Flows	0.115***	0.111***	0.117***	0.111***
	(29.23)	(21.09)	(14.07)	(10.53)
Std Dev Ret	-0.003***	-0.002***	-0.003***	-0.002***
	(-12.74)	(-7.87)	(-4.79)	(-3.14)
Constant	0.281***	0.275***	0.432***	0.436***
	(25.40)	(18.48)	(16.51)	(12.91)
Share FE	Yes	Yes	Yes	Yes
Month x ESG FE	Yes	Yes	Yes	Yes
Cluster	Share	Share	Share	Share
H0: Ret Neg ESG = Ret Neg NESG	0.063*	0.125	0.779	0.03**
Adj. R <sup>2</sup>	0.23	0.22	0.18	0.17
Observations	176 292	97 695	35 015	21 939
Sample	Name or Morningstar globes classification, Excess returns			

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the flow-performance relationship for ESG and for non-ESG funds. We regress share's flows on share's past excess returns. An asymmetry in investor response is tested with respect to past negative and positive performance. Moreover, we also test an asymmetry in investor response to past returns with respect to a share being considered an ESG or a conventional fund share. The following control variables are introduced: Ln(age) indicates the past natural logarithm of share's age (expressed in years), Ln(size) indicates the past natural logarithm of share's size, share's lagged flows and the standard deviation of the past 12 monthly returns. The sample covers January 2019 - December 2020 and is at a monthly frequency. In columns 1 and 3 ESG funds are defined according to the use of certain words in funds' names. In columns 2 and 4 ESG funds are defined as those having 4 or 5 globes assigned by Morningstar. The first 2 columns show the results for equity funds, while the 2 last columns show the results for bond funds. Share fixed effects and crossed month and ESG fixed effects are introduced. Observations are clustered at a share level.

are defined as those having 4 or 5 globes according to Morningstar. Non-ESG funds are defined as having 1, 2 or 3 globes according to Morningstar<sup>6</sup>. However, it may happen that a fund switches from being considered as ESG to non-ESG (for example if it switches from 3 to 4 globes). We choose to drop from the analysis these funds as we prefer analysing funds that consistently report being ESG or non-ESG<sup>7</sup>. This choice explains the different number of observations between columns 1 and 2 (3 and 4 respectively).

Columns 1 and 2 report the results for the equity sample. We observe that the effect of past positive returns (either in the case of ESG funds or non-ESG) is robust between the two classifications. However, higher past negative returns seem to lead to stronger outflows in the ESG funds classified as such by Morningstar globes. This finding is in contrast with the insignificant coefficient found for the ESG funds defined according to the name. This result may indicate that in equity funds, investors are naive and blindly trust the name of the fund<sup>8</sup>. However, in the bond fund space, we observe that results are robust when considering the two different classifications of funds. The analysis of the distribution of funds based on each classification also helps explaining the result. In the bond fund space, around 60% of the ESG funds classified according to the name are also classified as being ESG based on the Morningstar globes. However, this ratio falls to almost 30% in the equity fund space, which suggests a low overlap between the two classifications.

As we study a sample of funds domiciled in the Euro Area, one may argue that our results could also be driven by stronger environmental concerns in Europe compared to the US. In order to examine this question, the first two columns of the tables in Appendix 2 separate equity fund shares in table 2.10 (bond funds respectively in table 2.11) between Euro-Area based and non Euro-Area based shares. We define a share as being based in the Euro-Area if the SHSS (which reports the shares detained by Euro-Area investors) explains more than 75% of the share's assets at least once during our sample history. Non Euro-Area shares are defined as such if the SHSS always explains less than 75% of the share's assets. If the findings were driven by our sample choice, we could

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<sup>6</sup>Missing values of the globes are not taken into account, meaning that a fund will always be considered ESG if it always had 4 or 5 globes irrespective of the number of missing observations.

<sup>7</sup>The effect of losing or gaining globes on flows would be an interesting analysis in itself. However, this analysis is beyond the scope of this work.

<sup>8</sup>The sophistication of the underlying investors does not seem to play a role in explaining the results, as in unreported results we observe that both retail and institutional investors redeem more following an increase of the negative performance in ESG funds defined by using the Morningstar globes



expect that the coefficient  $RetNegESG$  of Euro-Area based shares is insignificant, while the same coefficient would be statistically significant in the Non Euro-Area shares. We observe that this is never the case, either in the equity sample (table 2.10) or in the bond sample (table 2.11). In order to test the robustness of this result, we also separate shares according to their currency of denomination. Here we suppose that EUR/GBP-denominated shares have mostly European investors, while USD-denominated shares are mostly invested by Non-European investors. We observe that our previous results are robust to this specification as the coefficient of our variable of interest  $RetNegESG$  does not display a statistical significance (however, in table 2.11 one column has a positive and significant coefficient for the  $RetNegESG$  in the USD sample). Based on these results, we can therefore infer that our results are not driven by stronger environmental concerns displayed by European investors.

### 2.5.2 Difference in behavior between retail and institutional investors

Using the same baseline specification (specification 2.1), we test if retail and institutional investors respond differently to past negative performance. We split the sample between retail and institutional shares respectively. A share is considered as being a retail (institutional) share if retails (institutionals) detain more than 50% of the assets<sup>9</sup>. Kuang and Liang (2021) find that institutional investors are sensitive to higher carbon risk in funds' portfolios while retail investors are not. The main rationale behind that finding is possibly a larger capacity of institutional investors to access and analyse investment funds' portfolios. In our case, we do not necessarily expect retail and institutional investors to behave differently as we focus on investors' perception of a fund being ESG/E-focused by looking at its name that is equally available for both types of investors. Using a sustainability fund classification based on the Morningstar globes, Hartzmark and Sussman (2019), Pastor and Vorsatz (2020) find that both retail and institutional investors prefer to invest into high-sustainability funds.

Tables 2.3 and 2.4 report the results for equity and bond funds respectively. For the equity funds, our results suggest that retail and institutional investors behave similarly, i.e. they are sensitive to past negative performance in non-ESG funds but not in ESG/E-

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<sup>9</sup>A 75% threshold has also been tested and results remain globally unchanged.

funds. However, the difference in the coefficients displays a low significance or is not anymore significant. For bond funds, the main results are confirmed, however, the split of the sample into retail and institutional investors leads to loss in power with coefficients remaining significant but only at 10% for the retail sample. Also in the retail space, investors reward past good performers with inflows, as shown by the positive and significant coefficient of *RetPosNESG*.

In order to test the robustness of this result, we also use the Lipper classification (instead of the SHSS classification) in order to differentiate between retail and institutional shares. Appendix 3 presents the results: table 2.12 shows the results for the sample of equity funds and table 2.13 displays the results for the sample of bond funds respectively. While our results remain robust when using the Lipper classification for the equity fund sample, some differences appear in the bond sample results. In this latter sample, although our coefficient of interest (*RetNegESG*) remains globally insignificant across the retail or institutional specifications, we observe that the coefficient *RetNegNESG* loses its significance in the institutional sample. This result contradicts previous findings (Goldstein et al. (2017) for example), who demonstrate that institutional investors in bond funds are also sensitive to past negative performances. However, a potential explanation of this difference in results may come from the criteria used to differentiate between retail and institutional share classes.

Table 2.3: The effect of share's clientele on the flow-performance relation of equity funds : ESG versus non-ESG peers  
Specification using name classification and excess returns

	Equity funds			
	(1)	(2)	(3)	(4)
	Instit	Retail	Instit	Retail
	All ESG		Green ESG	
	Flows	Flows	Flows	Flows
Ret Pos ESG	0.075** (2.35)	0.161*** (3.74)	0.101** (2.05)	0.169*** (3.33)
Ret Pos NESG	0.058*** (6.12)	0.067*** (6.83)	0.057*** (6.10)	0.067*** (6.91)
Ret Neg ESG	0.017 (0.33)	0.015 (0.28)	0.076 (1.05)	0.074 (1.11)
Ret Neg NESG	0.102*** (8.32)	0.067*** (5.93)	0.102*** (8.33)	0.066*** (5.88)
I(Lagged Return<0)	-0.001** (-2.05)	-0.001*** (-2.85)	-0.001** (-2.05)	-0.001*** (-2.83)
I(ESG) x I(Lagged Return<0)	-0.000 (-0.18)	0.002 (1.03)	0.001 (0.30)	0.003* (1.68)
Ln(age)	-0.008*** (-6.80)	-0.016*** (-9.61)	-0.008*** (-6.52)	-0.016*** (-9.21)
Ln(size)	-0.010*** (-19.11)	-0.009*** (-10.17)	-0.010*** (-18.72)	-0.009*** (-10.28)
Lagged Flows	0.143*** (28.77)	0.275*** (27.77)	0.144*** (28.04)	0.275*** (27.30)
Std Dev Ret	-0.003*** (-8.55)	-0.003*** (-10.06)	-0.002*** (-8.37)	-0.003*** (-10.14)
Constant	0.202*** (21.81)	0.195*** (12.66)	0.202*** (21.30)	0.197*** (12.62)
Share FE	Yes	Yes	Yes	Yes
Month x ESG FE	Yes	Yes	Yes	Yes
Cluster	Share	Share	Share	Share
H0: Ret Neg ESG = Ret Neg NESG	0.092*	0.354	0.724	0.909
Adj. R <sup>2</sup>	0.153	0.344	0.154	0.341
Observations	114 363	59 416	108 642	58 012
Sample	Name classification, Excess returns			

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the flow-performance relationship for ESG and for non-ESG funds split by clientele. A share is considered as institutional if institutional investors detain more than 50% of its assets. A share is considered as retail if retail investors detain more than 50% of its assets. We regress share's flows on share's past excess returns. An asymmetry in investor response is tested with respect to past negative and positive performance. Moreover, we also test an asymmetry in investor response to past returns with respect to a share being considered an ESG or a conventional fund share. The following control variables are introduced: Ln(age) indicates the past natural logarithm of share's age (expressed in years), Ln(size) indicates the past natural logarithm of share's size, share's lagged flows and the standard deviation of the past 12 monthly returns. The sample covers January 2016 - December 2020 and is at a monthly frequency. ESG/E-funds are defined according to the use of certain words in funds' names. The first 2 columns show the results for all ESG funds (the Green ESG are considered instead of All ESG in the last 2 columns). Share fixed effects and crossed month and ESG fixed effects are introduced. Observations are clustered at a share level.

Table 2.4: The effect of share's clientele on the flow-performance relation of bond funds : ESG versus non-ESG peers  
Specification using name classification and excess returns

	Bond funds			
	(1)	(2)	(3)	(4)
	Instit	Retail	Instit	Retail
	All ESG		Green ESG	
	Flows	Flows	Flows	Flows
Ret Pos ESG	-0.130 (-0.55)	0.431 (1.07)	0.005 (0.01)	1.110*** (4.53)
Ret Pos NESG	0.024 (0.42)	0.191** (2.52)	0.021 (0.36)	0.189** (2.50)
Ret Neg ESG	0.034 (0.12)	0.298 (0.87)	-0.415 (-0.78)	0.671 (1.45)
Ret Neg NESG	0.124*** (2.60)	0.110* (1.82)	0.126*** (2.64)	0.111* (1.84)
I(Lagged Return<0)	-0.002* (-1.78)	-0.001 (-0.93)	-0.002* (-1.82)	-0.001 (-0.95)
I(ESG) x I(Lagged Return<0)	0.003 (0.62)	0.002 (0.25)	0.007 (0.77)	0.013* (1.91)
Ln(age)	-0.008** (-2.52)	-0.006 (-1.15)	-0.008** (-2.35)	-0.004 (-0.72)
Ln(size)	-0.012*** (-8.28)	-0.014*** (-5.22)	-0.011*** (-7.76)	-0.014*** (-4.99)
Lagged Flows	0.123*** (12.75)	0.252*** (12.77)	0.120*** (11.99)	0.250*** (12.35)
Std Dev Ret	-0.002*** (-2.67)	-0.008*** (-5.65)	-0.002** (-2.53)	-0.008*** (-5.65)
Constant	0.235*** (9.10)	0.268*** (5.44)	0.228*** (8.49)	0.263*** (5.14)
Share FE	Yes	Yes	Yes	Yes
Month x ESG FE	Yes	Yes	Yes	Yes
Cluster	Share	Share	Share	Share
H0: Ret Neg ESG = Ret Neg NESG	0.761	0.586	0.311	0.229
Adj. R <sup>2</sup>	0.128	0.294	0.126	0.292
Observations	25 737	9 623	24 172	9 342
Sample	Name classification, Excess returns			

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the flow-performance relationship for ESG and for non-ESG funds split by clientele. A share is considered as institutional if institutional investors detain more than 50% of its assets. A share is considered as retail if retail investors detain more than 50% of its assets. We regress share's flows on share's past excess returns. An asymmetry in investor response is tested with respect to past negative and positive performance. Moreover, we also test an asymmetry in investor response to past returns with respect to a share being considered an ESG or a conventional fund share. The following control variables are introduced: Ln(age) indicates the past natural logarithm of share's age (expressed in years), Ln(size) indicates the past natural logarithm of share's size, share's lagged flows and the standard deviation of the past 12 monthly returns. The sample covers January 2016 - December 2020 and is at a monthly frequency. ESG/E-funds are defined according to the use of certain words in funds' names. The first 2 columns show the results for all ESG funds (the Green ESG are considered instead of All ESG in the last 2 columns). Share fixed effects and crossed month and ESG fixed effects are introduced. Observations are clustered at a share level.

### 2.5.3 The effect of crisis periods

In this section, we analyse if our results are confirmed during periods of stress: more specifically, if ESG/green investors remain in the poorly performing funds during periods of high market uncertainty. Pastor and Vorsatz (2020) demonstrate that the outflows experienced by funds during the COVID-19 turmoil can be explained by the sustainability globes granted by Morningstar. They have proven that low-sustainability funds experienced the highest outflows, while their high-sustainability peers suffered significantly less outflows. In the conventional fund sample, Goldstein et al. (2017) demonstrate that investors redeem more following negative performances under stressed market conditions. This behaviour may intensify the first-mover advantages as selling assets without accepting a discount might prove to be difficult during crisis periods. From a financial stability point of view, it is therefore interesting to analyse whether ESG/green funds are resilient during turmoils. In order to test this hypothesis, we define a stress period when the VIX level is above 90<sup>th</sup> percentile of its distribution. In our sample, we have several such periods with March 2020 being the most significant market turmoil seen since the Global financial crisis of 2008. The regression to be tested will therefore take the following form:

$$\begin{aligned}
 Flows_{i,t} = & \alpha + \beta_1 RetPosESG_{i,t-1} Crisis + \beta_2 RetPosESG_{i,t-1} Non - Crisis + \\
 & + \beta_3 RetPosNESG_{i,t-1} Crisis + \beta_4 RetPosNESG_{i,t-1} Non - Crisis + \\
 & + \beta_5 RetNegESG_{i,t-1} Crisis + \beta_6 RetNegESG_{i,t-1} Non - Crisis + \\
 & + \beta_7 RetNegNESG_{i,t-1} Crisis + \beta_8 RetNegNESG_{i,t-1} Non - Crisis + \\
 & + \beta_9 I(LaggedReturn < 0)_{i,t-1} + \beta_{10} ESG + \beta_{11} Crisis_{i,t} + \\
 & + \beta_{12} I(LaggedReturn < 0)_{i,t-1} \times ESG + \beta_{13} ESG \times Crisis + \\
 & + \beta_{14} I(LaggedReturn < 0)_{i,t-1} \times Crisis_{i,t} + \\
 & + \beta_{15} I(LaggedReturn < 0)_{i,t-1} \times ESG \times Crisis_{i,t} + \\
 & + \gamma Controls_{i,t} + \delta_i + \lambda_{ESG,t} + \epsilon_{i,t},
 \end{aligned} \tag{2.2}$$

where the dependent variable represents the share's relative net flows between month t and t-1. The eight main independent variables account for non-linearities with respect to the share's past excess return levels and the market conditions: *RetPosESG Crisis* is the

past positive return of ESG shares during crisis periods and 0 otherwise.  $RetPosESG Non-Crisis$  is the past positive return of ESG shares during normal periods and 0 otherwise.  $RetPosNESG Crisis$  is the past positive return of non-ESG shares during crisis periods and 0 otherwise.  $RetPosNESG Non-Crisis$  is the past positive return of non-ESG share during normal periods and 0 otherwise. The four other return terms represent the cases where the past return was negative.  $ESG$  is an indicator variable equal to one if the fund is marketing itself as taking into account ESG criteria in its investment decisions and zero otherwise.  $I(LaggedReturn < 0)$  is an indicator variable equal to one if the share displays a negative past excess performance and zero otherwise.  $Crisis$  is a dummy variable equal to one if the month's VIX level is above its 90<sup>th</sup> percentile of its distribution and zero otherwise. The baseline coefficients of interest are based on a four-interaction term between the share's past return, the  $I(LaggedReturn < 0)$  dummy, the  $ESG$  dummy and the  $Crisis$  dummy. The reported results and t-statistics are based on selected sums of coefficients. Appendix 1 (table 2.8) provides an explanation of how the eight coefficients of interest are constructed. Controls and fixed-effects are the same as in specification (2.1).

Table 2.5 reports the results for both equity and corporate bond funds. For ease of visualisation we report only the coefficients related to negative returns. Our baseline result is confirmed: during periods of stress, flows into ESG/E-funds remain less sensitive to past negative performance in both bond and equity sample (indeed, the coefficient  $Ret Neg ESG Crisis$  is insignificant across all four specifications). In contrast, investors redeem following negative performances in conventional funds. As demonstrated by Goldstein et al. (2017), investors in bond funds redeem more in response to negative returns under stressed market conditions (in columns 3 and 4,  $Ret Neg NESG Crisis$  is highly positive and significant, while the coefficient  $Ret Neg NESG Non-Crisis$  is positive but insignificant). Regarding the equity conventional sample of funds, investors redeem following negative performances under both normal and stressed market conditions.

Table 2.5: The effect of crises periods on the flow-performance relation : ESG versus non-ESG peers  
Specification using name classification and excess returns

	Equity funds		Bond funds	
	(1)	(2)	(3)	(4)
	All ESG	Green ESG	All ESG	Green ESG
	Flows	Flows	Flows	Flows
Ret Neg ESG Non-Crisis	0.020 (0.66)	0.052 (1.20)	0.254 (1.06)	-0.262 (-0.97)
Ret Neg ESG Crisis	0.009 (0.21)	0.063 (1.04)	0.013 (0.07)	-0.012 (-0.07)
Ret Neg NESG Non-Crisis	0.072*** (8.92)	0.072*** (8.89)	0.000 (0.00)	-0.000 (-0.01)
Ret Neg NESG Crisis	0.065*** (6.81)	0.065*** (6.79)	0.112*** (3.33)	0.113*** (3.35)
I(ESG) x I(Lagged Return<0)	0.000 (0.23)	0.001 (0.70)	0.003 (0.93)	0.006 (1.14)
I(Lagged Return<0) x I(Crisis)	0.000 (0.57)	0.000 (0.58)	0.004** (2.14)	0.004** (2.14)
I(ESG) x I(Crisis) I(Lagged Return<0)	-0.000 (-0.03)	0.002 (0.60)	-0.002 (-0.33)	-0.001 (-0.12)
I(Lagged Return<0)	-0.001*** (-4.23)	-0.001*** (-4.22)	-0.002*** (-3.65)	-0.002*** (-3.68)
Constant	0.193*** (33.95)	0.194*** (33.18)	0.263*** (15.75)	0.257*** (14.86)
Share FE	Yes	Yes	Yes	Yes
Month x ESG FE	Yes	Yes	Yes	Yes
Cluster	Share	Share	Share	Share
Controls	Yes	Yes	Yes	Yes
H0: Ret Neg ESG Crisis = Ret Neg NESG Crisis	0.21	0.978	0.601	0.505
Adj. R <sup>2</sup>	0.197	0.198	0.154	0.153
Observations	324 022	307 903	64 467	61 417
Sample	Name classification, Excess returns			

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the effect of crisis periods on the flow-performance relationship for ESG and for non-ESG funds. We regress share's flows on share's past excess returns. An asymmetry in investor response is tested with respect to past negative and positive performance. Moreover, we also test an asymmetry in investor response to past returns with respect to a share being considered an ESG or a conventional fund share. We use an indicator variable in order to capture periods of crisis: I(Crisis) equals one if the VIX in the respective month is above its 90th percentile. For ease of visualisation, the terms related to the positive returns are not reported. The following control variables are introduced: Ln(age) indicates the past natural logarithm of share's age (expressed in years), Ln(size) indicates the past natural logarithm of share's size, share's lagged flows and the standard deviation of the past 12 monthly returns. The sample covers January 2016 - December 2020 and is at a monthly frequency. ESG/E-funds are defined according to the use of certain words in funds' names. The first 2 columns show the results for equity funds (the Green ESG are considered instead of All ESG in the second column), while the 2 last columns show the results for bond funds. Share fixed effects and crossed month and ESG fixed effects are introduced. Observations are clustered at a share level.

### 2.5.4 The effect of the liquidity of the portfolio

In this section we are interested in analysing whether investors remain insensitive to past negative performances in the ESG corporate bond funds with less liquid assets. Indeed, Goldstein et al. (2017) demonstrated that the first-mover advantage is larger in funds with less liquid assets. Therefore, investors will react stronger to past negative returns in such funds since the fund will need to potentially sell less liquid assets in order to reimburse redeeming investors which could lead to bigger losses in value.

The regression to be tested takes the following form:

$$\begin{aligned}
Flows_{i,t} = & \alpha + \beta_1 RetPosESG_{i,t-1}Liq + \beta_2 RetPosESG_{i,t-1}Illiq + \\
& + \beta_3 RetPosNESG_{i,t-1}Liq + \beta_4 RetPosNESG_{i,t-1}Illiq + \\
& + \beta_5 RetNegESG_{i,t-1}Liq + \beta_6 RetNegESG_{i,t-1}Illiq + \\
& + \beta_7 RetNegNESG_{i,t-1}Liq + \beta_8 RetNegNESG_{i,t-1}Illiq + \\
& + \beta_9 I(LaggedReturn < 0)_{i,t-1} + \beta_{10} ESG + \beta_{11} Illiquid_{i,t-1} + \\
& + \beta_{12} I(LaggedReturn < 0)_{i,t-1} \times ESG + \beta_{13} ESG \times Illiquid_{i,t-1} + \\
& + \beta_{14} I(LaggedReturn < 0)_{i,t-1} \times Illiquid_{i,t-1} + \\
& + \beta_{15} I(LaggedReturn < 0)_{i,t-1} \times ESG \times Illiquid_{i,t-1} + \\
& + \gamma Controls_{i,t} + \delta_i + \lambda_{ESG,t} + \epsilon_{i,t},
\end{aligned} \tag{2.3}$$

where the dependent variable represents the share's relative net flows between month t and t-1. The eight main independent variables account for non-linearities with respect to the share's past excess return levels and the illiquidity of the fund's portfolio: *RetPosESG Liq* is the past positive return of ESG liquid shares and 0 otherwise. *RetPosESG Illiq* is the past positive return of ESG illiquid shares and 0 otherwise. *RetPosNESG Liq* is the past positive return of non-ESG liquid shares and 0 otherwise. *RetPosNESG Illiq* is the past positive return of non-ESG illiquid shares and 0 otherwise. The four other return terms represent the cases where the past return was negative. *ESG* is an indicator variable equal to one if the fund is marketing itself as taking into account ESG criteria in its investment decisions and zero otherwise. *I(LaggedReturn < 0)* is an indicator variable equal to one if the share displays a negative past excess performance and zero



otherwise. *Illiquid* is an indicator variable that equals one if a fund is illiquid and zero otherwise. We identify funds as illiquid if they hold less than 1% of their portfolio<sup>10</sup> in liquid assets<sup>11</sup>. The baseline coefficients of interest are based on a four-interaction term between the share's past return, the  $I(\text{LaggedReturn} < 0)$  dummy, the *ESG* dummy and the *Illiquid* dummy. The reported results and t-statistics are based on selected sums of coefficients. Appendix 1 (table 2.9) provides an explanation of how the eight coefficients of interest are constructed. Controls and fixed-effects are the same as in specification (2.1).

Table 2.6 shows the results for the corporate bond sample. For ease of visualisation we report only the coefficients related to negative returns. We observe that our main result remains robust, when controlling for the illiquidity of the fund assets. ESG investors turn out to be less sensitive to past performance even in funds with less liquid assets (indeed, the coefficient *Ret Neg ESG Illiq* is positive and insignificant in column 1). However, we observe that when considering green ESG funds, the coefficient of the variable *Ret Neg ESG Illiq* is negative and highly significant. This finding suggests that in response to a more negative performance, investors reward illiquid shares with inflows. However, this counterintuitive finding is essentially explained by a small number of observations of illiquid green ESG funds with negative past returns occurring in April 2020, when the industry recorded inflows, while the lagged values of returns correspond to the turmoil period in March.

In contrast, in the conventional bond sample, we observe that investors in less liquid non-ESG funds are more sensitive to past negative performance compared to investors in more liquid conventional funds (indeed, the coefficient *Ret Neg NESG Illiq* is positive and highly significant and its size is almost the double of the coefficient *Ret Neg NESG Liq*). This finding is in line with the results of Goldstein et al. (2017) who demonstrate that investors are highly sensitive to negative returns in less liquid funds. Nevertheless, the difference in coefficients of past negative returns between illiquid ESG and non-ESG funds remains statistically insignificant.

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<sup>10</sup>The threshold is defined as the 25 percentile of the distribution. Other thresholds are considered, namely the median or the 10th percentile and the results remain unchanged.

<sup>11</sup>The fund's liquidity measure displays the percentage of the portfolio invested in high quality assets, namely cash and cash equivalents, bonds from euro area governments, supranationals, central banks as well as non-Euro Area government bonds that have an AA/AAA rating.

Table 2.6: The effect of liquidity on the flow-performance relation: ESG versus non-ESG peers  
 Specification using name classification and excess returns

	(1)	(2)
	All ESG	Green ESG
	Flows	Flows
Ret Neg ESG Liq	0.185 (1.04)	-0.200 (-1.45)
Ret Neg ESG Illiq	0.208 (0.99)	-1.067*** (-3.64)
Ret Neg NESG Liq	0.081*** (2.62)	0.081*** (2.62)
Ret Neg NESG Illiq	0.159*** (3.84)	0.159*** (3.83)
I(Lagged Return<0)	-0.001 (-1.54)	-0.001 (-1.57)
I(Illiquid)	-0.001 (-0.71)	-0.001 (-0.71)
I(Lagged Return<0) x I(Illiquid)	0.001 (0.41)	0.001 (0.41)
I(ESG) x I(Lagged Return<0)	0.003 (0.99)	0.004 (0.78)
I(Illiquid) x I(ESG)	-0.005 (-1.26)	-0.010 (-1.50)
I(ESG) x I(Illiquid) x I(Lagged Return<0)	-0.001 (-0.22)	0.007 (1.22)
Constant	0.262*** (13.29)	0.255*** (12.54)
Share FE	Yes	Yes
Month x ESG FE	Yes	Yes
Cluster	Share	Share
H0: Ret Neg ESG Illiq=Ret Neg NESG Illiq	0.819	0.000***
Adj. R <sup>2</sup>	0.154	0.152
Observations	49 081	47 064
Sample	Name classification, Excess returns	

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the effect of the liquidity on the flow-performance relationship for ESG and for non-ESG funds. We regress share's flows on share's past excess returns. An asymmetry in investor response is tested with respect to past negative and positive performance. Moreover, we also test an asymmetry in investor response to past returns with respect to a share being considered an ESG or a conventional fund share. We use an indicator variable in order to capture the fund's liquidity: I(illiquid) equals one if the fund invests less than 1% of its portfolio in liquid assets. For ease of visualisation, the terms related to the positive returns are not reported. The following control variables are introduced:

past level of the portfolio invested in liquid assets, Ln(age) indicates the past natural logarithm of share's age (expressed in years), Ln(size) indicates the past natural logarithm of share's size, share's lagged flows and the standard deviation of the past 12 monthly returns. The sample covers January 2016 - December 2020 and is at a monthly frequency. ESG/E-funds are defined according to the use of certain words in funds' names. The 2 columns show the results for bond funds (the Green ESG are considered instead of All ESG in the second column). Share fixed effects and crossed month and ESG fixed effects are introduced. Observations are clustered at a share level.

### 2.5.5 Discussion

Our results suggest that investors in ESG and Environmental-focused funds are less sensitive to past negative performance, with no significant difference between retail and institutional investors. The results are robust to alternative specifications. The lower sensitivity of ESG flows to negative returns is not explained by the recent growth trend in the ESG/E-fund sector, as we control for this trend by using time\*ESG fixed effects. Also, investors in funds with an environmental objective remain less sensitive to negative returns in both calm and crisis times. Finally, the results are not explained by funds' liquidity: investors in ESG/E-funds with less liquid assets are still less sensitive to past negative returns.

However, in the bond fund sample, we find that the coefficients of the sensitivity to past negative returns for ESG and non-ESG funds are not statistically different. One possible explanation is that the ESG bond fund sample is relatively small or that ESG data suffer from greenwashing risk, due to the absence of clear standards for the identification of ESG funds. Indeed, ESG and non-ESG funds show similar performance over the considered period. But a quick glance at their portfolios suggests that their holdings do not differ significantly, at least, at a sectoral level. It is possible that ESG funds hold assets in firms with best-in-class ESG ratings, but this will be subject to future analysis. In the absence of clear and unique standards of what an ESG fund can hold, investors may not always be fully aware and certain of funds' commitments to their ethical goals. And this can affect investors' behavior as well.

Furthermore, it is also important to note that our results may be extended by considering alternative ESG flag measures. First, we consider that a fund is an ESG one if the name contains at least one of the words identified as being linked to integrating ESG criteria. While this measure has the advantage of being simple to construct, it also lays on the hypothesis that fund investors take into account only the name of the fund when deciding whether a fund is an ESG one or not. In order to address this drawback, one may consider testing the robustness of our results by using an ESG fund flag constructed based on other providers' measures. Second, the ESG flag is constructed based on fund names as of November 2020. However, as we do not have a time-series dataset regarding fund names, a drawback of our measure is represented by the potential name changes which are not taken into account by our measure. Indeed, as IMF (2021) shows, in the

last years an increasing number of funds switched their strategies in order to integrate ESG criteria, which can result in name changes. In turn, name changes have the potential to influence investors' decisions. Integrating a time-varying ESG flag would allow us to account for this potential effect, while testing the robustness of our findings.

## 2.6 Conclusion and policy implications

ESG funds have been growing rapidly in recent years, reflecting the increasing awareness of climate change-related risk among investors and their interest in financing the transition towards a net-zero emission economy. But further growth may be inhibited if greenwashing concerns related to the classification of these funds are left unaddressed. Given their increasing market footprint, it is important, from a financial stability perspective, to analyse the flow-performance relationship of ESG funds .

In this paper, we show that both retail and institutional investors in ESG and E-funds are less sensitive to past negative performance. This behaviour is also robust after controlling for crisis periods and for the liquidity of funds' assets, reflecting a more stable and committed investor base. These findings are indicative of a higher resilience of flows in ESG and E-funds. A weaker flow-performance relationship of ESG and E-funds suggests that effective green finance can help to foster an orderly transition and reduce vulnerability to climate-related risks. In addition, it is beneficial for financial stability, as ESG managers would not need to sell their assets in response to outflows in periods of market distress. However, the difference in the sensitivity to past negative performances between ESG/E funds and non-ESG peers is not statistically different in the bond fund sector, potentially due to the smaller sample of ESG/Environmental-focused funds or to the presence of a greenwashing risk.

It is challenging to decide which funds should be defined as ESG/E in the absence of a common definition and/or regulatory label. The overlap between ESG labels provided by different data providers such as Morningstar, Lipper and Bloomberg is limited. While not being part of our analysis, we acknowledge that it may be also confusing for investors to define an ESG/E fund. We argue that consistent, harmonized and verified ESG/E labels can help address uncertainty around definition of ESG/E funds, risks of greenwashing and misselling, thereby contributing to further growth of the ESG fund sector and funding of

the transition to low-carbon economy. The development of ESG equity markets may be particularly valuable given that countries with a higher share of equity funding tend to reduce their carbon footprint more rapidly.

## 2.7 Appendix 1

### Table 2.1 coefficients

For ease of visualisation, we report in the baseline result table 2.1 interpretable coefficients related to the interaction term  $Return_{i,t-1} \times I(LaggedReturn < 0) \times ESG$  (each possible outcome being considered). The following table displays how these different outcomes are built from the interaction term:

Table 2.7: Creation of the coefficients to be reported in the results table 2.1

Term	Formula
Ret Pos ESG	$Return_{i,t-1} + Return_{i,t-1} \times ESG$
Ret Pos NESG	$Return_{i,t-1}$
Ret Neg ESG	$Return_{i,t-1} + Return_{i,t-1} \times ESG$ $+ Return_{i,t-1} \times I(LaggedReturn < 0)$ $+ Return_{i,t-1} \times I(LaggedReturn < 0) \times ESG$
Ret Neg NESG	$Return_{i,t-1} + Return_{i,t-1} \times$ $I(LaggedReturn < 0)$

## Table 2.5 coefficients

For ease of visualisation, we report in the result table 2.5 interpretable coefficients related to the interaction term  $Return_{i,t-1} \times I(LaggedReturn < 0) \times ESG \times Crisis$  (each possible outcome being considered). The following table displays how these different outcomes are built from the interaction term:

Table 2.8: Creation of the coefficients to be reported in the results table 2.5

Term	Formula
Ret Pos ESG Crisis	$Return_{i,t-1} + Return_{i,t-1} \times ESG + Return_{i,t-1} \times Crisis + Return_{i,t-1} \times Crisis \times ESG$
Ret Pos ESG Non-Crisis	$Return_{i,t-1} + Return_{i,t-1} \times ESG$
Ret Neg ESG Crisis	$Return_{i,t-1} + Return_{i,t-1} \times I(LaggedReturn < 0) + Return_{i,t-1} \times I(LaggedReturn < 0) \times ESG + Return_{i,t-1} \times I(LaggedReturn < 0) \times ESG \times Crisis + Return_{i,t-1} \times ESG + Return_{i,t-1} \times Crisis + Return_{i,t-1} \times Crisis \times ESG + Return_{i,t-1} \times I(LaggedReturn < 0) \times Crisis$
Ret Neg ESG Non-Crisis	$Return_{i,t-1} + Return_{i,t-1} \times I(LaggedReturn < 0) + Return_{i,t-1} \times I(LaggedReturn < 0) \times ESG + Return_{i,t-1} \times ESG$
Ret Pos NESG Crisis	$Return_{i,t-1} + Return_{i,t-1} \times Crisis$
Ret Pos NESG Non-Crisis	$Return_{i,t-1}$
Ret Neg NESG Crisis	$Return_{i,t-1} + Return_{i,t-1} \times I(LaggedReturn < 0) + Return_{i,t-1} \times Crisis + Return_{i,t-1} \times I(LaggedReturn < 0) \times Crisis$
Ret Neg Nescg Non-Crisis	$Return_{i,t-1} + Return_{i,t-1} \times I(LaggedReturn < 0)$

## Table 2.6 coefficients

For ease of visualisation, we report in the result table 2.6 interpretable coefficients related to the interaction term  $Return_{i,t-1} \times I(LaggedReturn < 0) \times ESG \times Illiquid$  (each possible outcome being considered). The following table displays how these different outcomes are built from the interaction term:

Table 2.9: Creation of the coefficients to be reported in the results table 2.6

Term	Formula
Ret Pos ESG Illiq	$Return_{i,t-1} + Return_{i,t-1} \times ESG + Return_{i,t-1} \times Illiquid + Return_{i,t-1} \times Illiquid \times ESG$
Ret Pos ESG Liq	$Return_{i,t-1} + Return_{i,t-1} \times ESG$
Ret Neg ESG Illiq	$Return_{i,t-1} + Return_{i,t-1} \times I(LaggedReturn < 0) + Return_{i,t-1} \times I(LaggedReturn < 0) \times ESG + Return_{i,t-1} \times I(LaggedReturn < 0) \times ESG \times Illiquid + Return_{i,t-1} \times ESG + Return_{i,t-1} \times Illiquid + Return_{i,t-1} \times Illiquid \times ESG + Return_{i,t-1} \times I(LaggedReturn < 0) \times Illiquid$
Ret Neg ESG Liq	$Return_{i,t-1} + Return_{i,t-1} \times I(LaggedReturn < 0) + Return_{i,t-1} \times I(LaggedReturn < 0) \times ESG + Return_{i,t-1} \times ESG$
Ret Pos NESG Illiq	$Return_{i,t-1} + Return_{i,t-1} \times Illiquid$
Ret Pos NESG Liq	$Return_{i,t-1}$
Ret Neg NESG Illiq	$Return_{i,t-1} + Return_{i,t-1} \times I(LaggedReturn < 0) + Return_{i,t-1} \times Illiquid + Return_{i,t-1} \times I(LaggedReturn < 0) \times Illiquid$
Ret Neg Nesg Liq	$Return_{i,t-1} + Return_{i,t-1} \times I(LaggedReturn < 0)$



## 2.8 Appendix 2

Table 2.10: The effect of European's clientele on the flow-performance relation of equity funds : ESG versus non-ESG peers  
Specification using name classification and excess returns

	Equity funds			
	(1)	(2)	(3)	(4)
	EA	Non-EA	USD	EUR/GBP
	All ESG		All ESG	
	Flows	Flows	Flows	Flows
Ret Pos ESG	0.100*** (3.91)	0.056* (1.75)	-0.006 (-0.12)	0.073*** (3.61)
Ret Pos NESG	0.066*** (9.05)	0.042*** (4.92)	0.061*** (5.37)	0.054*** (8.77)
Ret Neg ESG	0.023 (0.61)	-0.016 (-0.36)	-0.014 (-0.23)	0.015 (0.49)
Ret Neg NESG	0.092*** (10.34)	0.049*** (4.38)	0.057*** (4.25)	0.082*** (10.51)
I(Lagged Return<0)	-0.001*** (-3.06)	-0.001*** (-3.17)	-0.001* (-1.90)	-0.001*** (-4.45)
I(ESG) x I(Lagged Return<0)	0.000 (0.41)	-0.001 (-0.60)	-0.002 (-0.87)	0.001 (0.86)
Ln(age)	-0.011*** (-10.65)	-0.011*** (-7.53)	-0.006*** (-3.65)	-0.010*** (-11.61)
Ln(size)	-0.010*** (-22.66)	-0.008*** (-14.72)	-0.010*** (-15.99)	-0.009*** (-24.00)
Lagged Flows	0.176*** (37.61)	0.170*** (29.34)	0.162*** (24.43)	0.171*** (41.66)
Std Dev Ret	-0.003*** (-12.28)	-0.002*** (-8.46)	-0.003*** (-7.91)	-0.002*** (-11.73)
Constant	0.204*** (26.19)	0.170*** (17.38)	0.193*** (17.51)	0.191*** (27.64)
Share FE	Yes	Yes	Yes	Yes
Month x ESG FE	Yes	Yes	Yes	Yes
Cluster	Share	Share	Share	Share
H0: Ret Neg ESG = Ret Neg NESG	0.077*	0.148	0.254	0.029*
Adj. R <sup>2</sup>	0.2	0.2	0.19	0.19
Observations	172 244	104 314	71 428	231 078
Sample	Lipper classification, Excess returns			

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the flow-performance relationship for ESG and for non-ESG funds split by European or non-European clientele. A share is considered as having an European (non-European) clientele if at least 75% (less than 75%) of its assets are detained by European clients. We regress share's flows on share's past excess returns. An asymmetry in investor response is tested with respect to past negative and positive performance. Moreover, we also test an asymmetry in investor response to past returns with respect to a share being considered an ESG or a conventional fund share. The following control variables are introduced: Ln(age) indicates the past natural logarithm of share's age (expressed in years), Ln(size) indicates the past natural logarithm of share's size, share's lagged flows and the standard deviation of the past 12 monthly returns. The sample covers January 2016 - December 2020 and is at a monthly frequency. ESG/E-funds are defined according to the use of certain words in funds' names. The first 2 columns show the results split between European and non-European clientele, while in the last 2 columns we use the currency denomination of the share as a proxy for the geographical split by clientele. Share fixed effects and crossed month and ESG fixed effects are introduced.

Observations are clustered at a share level.

Table 2.11: The effect of European's clientele on the flow-performance relation of bond funds : ESG versus non-ESG peers  
Specification using name classification and excess returns

	Bond funds			
	(1)	(2)	(3)	(4)
	EA	Non-EA	USD	EUR/GBP
	All ESG		All ESG	
	Flows	Flows	Flows	Flows
Ret Pos ESG	0.128 (0.55)	-0.538** (-2.29)	-0.606 (-0.98)	0.050 (0.24)
Ret Pos NESG	0.056 (1.14)	-0.001 (-0.02)	-0.003 (-0.03)	0.117*** (2.83)
Ret Neg ESG	0.107 (0.42)	0.042 (0.27)	1.699** (2.39)	0.076 (0.30)
Ret Neg NESG	0.105** (2.50)	0.128*** (3.32)	0.238*** (3.76)	0.076* (1.76)
I(Lagged Return<0)	-0.002*** (-2.85)	-0.000 (-0.16)	-0.003 (-1.62)	-0.004*** (-5.04)
I(ESG) x I(Lagged Return<0)	0.001 (0.22)	0.003 (0.49)	0.017 (1.35)	0.001 (0.35)
Ln(age)	-0.009*** (-3.02)	-0.006 (-1.60)	-0.007 (-1.23)	-0.008*** (-3.26)
Ln(size)	-0.012*** (-9.33)	-0.017*** (-11.11)	-0.014*** (-8.13)	-0.014*** (-11.35)
Lagged Flows	0.153*** (16.78)	0.147*** (11.63)	0.140*** (8.20)	0.153*** (19.81)
Std Dev Ret	-0.003*** (-3.85)	-0.004*** (-5.04)	-0.005*** (-4.25)	-0.003*** (-3.78)
Constant	0.238*** (10.27)	0.313*** (11.70)	0.272*** (8.90)	0.263*** (12.27)
Share FE	Yes	Yes	Yes	Yes
Month x ESG FE	Yes	Yes	Yes	Yes
Cluster	Share	Share	Share	Share
H0: Ret Neg ESG = Ret Neg NESG	0.995	0.595	0.042**	0.998
Adj. R <sup>2</sup>	0.16	0.16	0.14	0.16
Observations	33 526	23 092	13 107	44 608
Sample	Lipper classification, Excess returns			

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the flow-performance relationship for ESG and for non-ESG funds split by European or non-European clientele. A share is considered as having an European (non-European) clientele if at least 75% (less than 75%) of its assets are detained by European clients. We regress share's flows on share's past excess returns. An asymmetry in investor response is tested with respect to past negative and positive performance. Moreover, we also test an asymmetry in investor response to past returns with respect to a share being considered an ESG or a conventional fund share. The following control variables are introduced: Ln(age) indicates the past natural logarithm of share's age (expressed in years), Ln(size) indicates the past natural logarithm of share's size, share's lagged flows and the standard deviation of the past 12 monthly returns. The sample covers January 2016 - December 2020 and is at a monthly frequency. ESG/E-funds are defined according to the use of certain words in funds' names. The first 2 columns show the results split between European and non-European clientele, while in the last 2 columns we use the currency denomination of the share as a proxy for the geographical split by clientele. Share fixed effects and crossed month and ESG fixed effects are introduced.

Observations are clustered at a share level.

## 2.9 Appendix 3

Table 2.12: The effect of share's clientele on the flow-performance relation of equity funds: ESG versus non-ESG peers  
Specification using Lipper classification and excess returns

	Equity funds			
	(1)	(2)	(3)	(4)
	Instit	Retail	Instit	Retail
	All ESG		Green ESG	
	Flows	Flows	Flows	Flows
Ret Pos ESG	0.054*	0.064***	0.092*	0.100***
	(1.80)	(2.98)	(1.91)	(3.24)
Ret Pos NESG	0.044***	0.054***	0.044***	0.054***
	(4.30)	(9.36)	(4.27)	(9.44)
Ret Neg ESG	0.036	0.004	0.033	0.067
	(0.72)	(0.14)	(0.44)	(1.58)
Ret Neg NESG	0.093***	0.059***	0.093***	0.059***
	(6.92)	(8.23)	(6.93)	(8.17)
I(Lagged Return<0)	-0.000	-0.001***	-0.000	-0.001***
	(-0.71)	(-5.26)	(-0.71)	(-5.23)
I(ESG) x I(Lagged Return<0)	0.001	-0.000	0.001	0.001
	(0.64)	(-0.05)	(0.59)	(1.07)
Ln(age)	-0.004***	-0.011***	-0.005***	-0.011***
	(-2.94)	(-12.96)	(-3.05)	(-12.46)
Ln(size)	-0.010***	-0.009***	-0.010***	-0.009***
	(-19.63)	(-22.73)	(-19.23)	(-22.23)
Lagged Flows	0.126***	0.194***	0.128***	0.195***
	(23.82)	(44.86)	(23.47)	(43.93)
Std Dev Ret	-0.002***	-0.002***	-0.002***	-0.003***
	(-6.61)	(-13.41)	(-6.41)	(-13.46)
Constant	0.203***	0.187***	0.202***	0.189***
	(20.85)	(26.92)	(20.31)	(26.32)
Share FE	Yes	Yes	Yes	Yes
Month x ESG FE	Yes	Yes	Yes	Yes
Cluster	Share	Share	Share	Share
H0: Ret Neg ESG = Ret Neg NESG	0.28	0.075*	0.43	0.857
Adj. R <sup>2</sup>	0.13	0.23	0.13	0.23
Observations	94 047	229 975	88 216	219 687
Sample	Lipper classification, Excess returns			

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the flow-performance relationship for ESG and for non-ESG funds split by clientele. A share is considered as institutional based on the Lipper classification. We regress share's flows on share's past excess returns. An asymmetry in investor response is tested with respect to past negative and positive performance. Moreover, we also test an asymmetry in investor response to past returns with respect to a share being considered an ESG or a conventional fund share. The following control variables are introduced: Ln(age) indicates the past natural logarithm of share's age (expressed in years), Ln(size) indicates the past natural logarithm of share's size, share's lagged flows and the standard deviation of the past 12 monthly returns. The sample covers January 2016 - December 2020 and is at a monthly frequency. ESG/E-funds are defined according to the use of certain words in funds' names. The first 2 columns show the results for all ESG funds (the Green ESG are considered instead of All ESG in the last 2 columns). Share fixed effects and crossed month and ESG fixed effects are introduced. Observations are clustered at a share level.

Table 2.13: The effect of share's clientele on the flow-performance relation of bond funds : ESG versus non-ESG peers  
Specification using Lipper classification and excess returns

	Bond funds			
	(1)	(2)	(3)	(4)
	Instit	Retail	Instit	Retail
	All ESG		Green ESG	
	Flows	Flows	Flows	Flows
Ret Pos ESG	-0.235 (-0.98)	-0.058 (-0.34)	0.060 (0.19)	-0.126 (-0.43)
Ret Pos NESG	0.020 (0.45)	0.025 (0.65)	0.018 (0.41)	0.025 (0.66)
Ret Neg ESG	-0.117 (-0.71)	0.480* (1.80)	-0.277 (-1.52)	0.288 (1.06)
Ret Neg NESG	0.061 (1.33)	0.093*** (3.02)	0.062 (1.35)	0.093*** (3.00)
I(Lagged Return<0)	-0.000 (-0.30)	-0.002** (-2.34)	-0.000 (-0.31)	-0.002** (-2.35)
I(ESG) x I(Lagged Return<0)	0.001 (0.16)	0.002 (0.63)	0.006 (0.70)	0.005 (1.37)
Ln(age)	-0.008** (-2.54)	-0.008*** (-2.69)	-0.009** (-2.54)	-0.007** (-2.28)
Ln(size)	-0.013*** (-9.29)	-0.014*** (-11.43)	-0.013*** (-8.70)	-0.014*** (-10.94)
Lagged Flows	0.126*** (13.06)	0.173*** (17.60)	0.123*** (12.31)	0.172*** (16.98)
Std Dev Ret	-0.002** (-2.15)	-0.005*** (-6.67)	-0.002** (-2.00)	-0.005*** (-6.72)
Constant	0.254*** (10.09)	0.274*** (12.25)	0.247*** (9.45)	0.268*** (11.67)
Share FE	Yes	Yes	Yes	Yes
Month x ESG FE	Yes	Yes	Yes	Yes
Cluster	Share	Share	Share	Share
H0: Ret Neg ESG = Ret Neg NESG	0.3	0.15	0.071*	0.475
Adj. R <sup>2</sup>	0.12	0.17	0.12	0.17
Observations	24 526	39 941	23 153	38 264
Sample	Lipper classification, Excess returns			

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the flow-performance relationship for ESG and for non-ESG funds split by clientele. A share is considered as institutional based on the Lipper classification. We regress share's flows on share's past excess returns. An asymmetry in investor response is tested with respect to past negative and positive performance. Moreover, we also test an asymmetry in investor response to past returns with respect to a share being considered an ESG or a conventional fund share. The following control variables are introduced: Ln(age) indicates the past natural logarithm of share's age (expressed in years), Ln(size) indicates the past natural logarithm of share's size, share's lagged flows and the standard deviation of the past 12 monthly returns. The sample covers January 2016 - December 2020 and is at a monthly frequency. ESG/E-funds are defined according to the use of certain words in funds' names. The first 2 columns show the results for all ESG funds (the Green ESG are considered instead of All ESG in the last 2 columns). Share fixed effects and crossed month and ESG fixed effects are introduced. Observations are clustered at a share level.



# Chapter 3

## Is the EU Money Market Fund Regulation fit for purpose? Lessons from the COVID-19 turmoil

### 3.1 Introduction

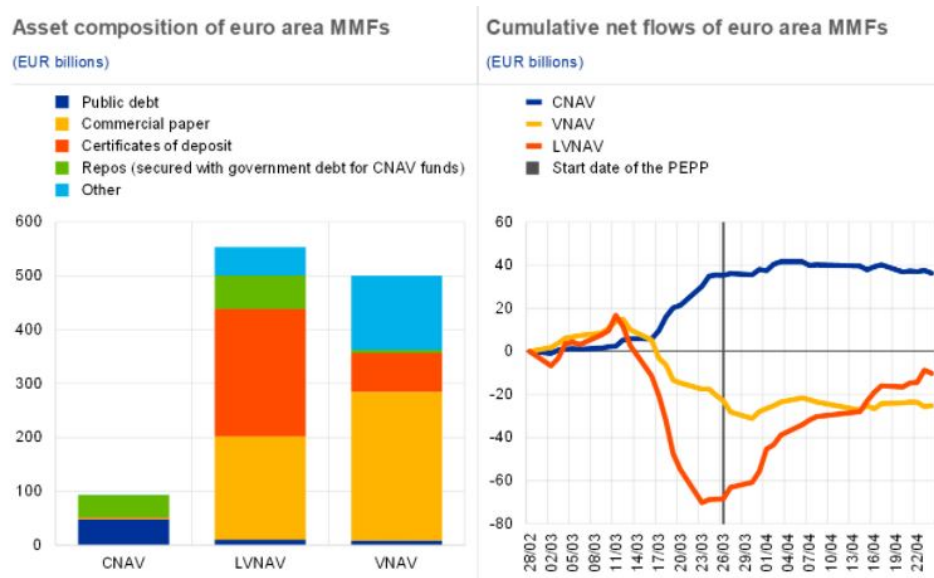
MMFs play a key role in the financial system. They provide short-term funding to issuers, in particular banks, and are used as cash management vehicles by investors. MMF shares display cash-like properties since they are redeemable on demand and typically provide a stable net asset value (NAV). Similarly, MMFs are generally expected to raise liquidity by allowing assets to mature, rather than selling them in secondary markets. However, even though MMFs are generally perceived as safe investments, they are subject to credit and liquidity risks, in particular when investing in less liquid instruments such as commercial paper and certificates of deposit (FSB (2020b), Bouveret (2021)).

The 2008 global financial crisis highlighted several key vulnerabilities through which MMFs can amplify risks in the financial system (IOSCO (2012)). When the Reserve Primary Fund's share price fell below its constant share price ('broke the buck'), other prime funds also suffered severe outflows and falling returns (McCabe (2010)). Since then, legislators in Europe and the US have adopted new rules to make the sector more resilient. In 2017, the EU adopted the MMF Regulation (MMFR henceforth).

Despite the new regulatory framework, the COVID-19 turmoil has been challenging for MMFs. Following the onset of the crisis in early 2020, private debt MMFs (meaning

variable NAV (VNAV) and LVNAV funds) experienced significant outflows, while public debt CNAV funds saw net inflows (Figure 1, RHS). At the same time, the liquidity of money market instruments on the asset side deteriorated. This was particularly the case for VNAV and LVNAV funds, which invest largely in commercial paper and certificates of deposit (Figure 1, LHS). While the level of stress stabilised following ECB interventions, this episode highlighted the need to make the sector more resilient. The COVID-19 turmoil raised questions about the EU MMF Regulation’s ability to ensure that private debt MMFs are capable of facing large and unexpected outflows, and hence to reduce the probability of spillovers from the MMF sector to the broader financial system.<sup>1</sup> This paper assesses the effectiveness of the EU MMF Regulation in safeguarding financial stability, with a particular focus on the COVID-19 turmoil.

Figure 3.1: Cumulative net flows and portfolio composition of European MMFs



Sources: Crane Data, Refinitiv Lipper and ECB calculations.

Notes: The left-hand panel shows the aggregate composition of different types of MMF on 28 February 2020. The total assets of each type of fund are based on data from Refinitiv Lipper, while the composition of those portfolios is based on information from Crane Data. The right-hand panel shows cumulative daily net flows between 28 February and 22 April 2020. The vertical line denotes 26 March 2020, which was the start date of the ECB’s pandemic emergency purchase programme (PEPP).

<sup>1</sup>For instance, ESMA (2021) and the FSB (2021b) initiated work streams to analyse potential regulatory reforms that could enhance the MMF sector’s resilience. In October 2021, the Financial Stability Board published its final report on policy proposals to increase money market fund stability (FSB (2021b)). The report makes several proposals: i) introducing swing pricing or capital buffers to alleviate first-mover advantages, ii) removing direct links between the breach of regulatory thresholds and the imposition of fees in order to reduce potential cliff effects, and iii) increasing mandatory holdings of safe and liquid assets for MMFs to mitigate liquidity transformation and enable funds to face outflows without selling illiquid assets under stressed market conditions.

We run multivariate panel regressions to study several hypotheses about the effects of the EU MMF Regulation from an investor and a fund manager perspective. First, we test whether investors redeem more strongly from funds with more illiquid portfolios during crisis periods. In response to large redemptions, private debt MMFs may be forced to sell assets at a discount to accommodate those redemptions. However, the secondary market liquidity for commercial papers and certificates of deposit usually depends on the willingness of the issuing banks to buy back their own paper. Investors may anticipate this and redeem more strongly from funds with more illiquid portfolios, as these assets are harder to sell. Second, LVNAV funds are required to switch from a stable to a variable NAV if they breach a certain valuation threshold. Since investors value MMFs for their stable NAV, we test whether LVNAVs face higher outflows if they approach their regulatory threshold for a stable NAV. Third, funds with liquidity buffers below a regulatory threshold are required to consider redemption gates or similar measures to improve their liquidity management<sup>2</sup>. Since this can restrict investor redemptions, we test whether funds with lower liquidity buffers (and higher risk of employing liquidity management tools) face stronger outflows in crisis times. Fourth, fund managers may anticipate this investor behaviour in response to their liquidity levels. Therefore, we study if funds with low liquidity levels are reluctant to use their liquidity buffers when facing redemptions in order to avoid further outflows.

Our empirical tests are based on a granular fund-level dataset from Crane with daily observations of EU MMFs between January 2019 and May 2020, covering around 70% of the EU money market fund sector. This allows us to run our regressions at a high frequency and take a detailed look at the fast-moving developments in the MMF sector around the COVID-19 shock. Our data also enables us to control for a wide array of potentially confounding factors such as past returns, past volatility of returns, fund age and size, fund currency, as well as portfolio illiquidity. In addition, all our regressions include fund and time fixed effects to capture additional factors which we cannot control for directly. Furthermore, we also cluster standard errors at a fund level in order to account for heteroskedasticity and autocorrelation across observations.

Our results identify three key vulnerabilities in the EU MMF sector. First, investment in private debt assets exposes MMFs to liquidity risk. We find that investors in MMFs

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<sup>2</sup>Redemption gates constitutes a limit on the amount of shares that can be redeemed during a specific time frame.



investing in less liquid assets redeem more strongly than other investors during crisis periods. Second, LVNAV funds are particularly vulnerable to liquidity shocks as they invest in non-public debt assets while offering a stable NAV. During crisis periods, outflows are around 1.8-2.4 percentage points larger for LVNAV funds that were close to the lower valuation threshold on the previous day, relative to other LVNAV funds. The prospect of breaching the regulatory NAV limit may have incentivised outflows among some LVNAV investors during the March 2020 turmoil. Third, although some LVNAV funds experienced large outflows, fund managers did not draw down on their weekly liquid assets to the same extent, suggesting low levels of buffer usability. According to the MMF Regulation (MMFR), falling below liquidity requirements can lead LVNAV and CNAV MMFs to consider applying extraordinary liquidity measures, which may encourage investors to redeem early. We find that investors redeem more strongly from MMFs with low liquidity buffers than from funds with large buffers. At the same time, we find that funds with lower levels of liquidity buffers use their buffers less than funds with higher buffers, suggesting a preference for those funds to sell illiquid assets, possibly to avoid getting too close or falling below the regulatory threshold. These findings suggest fragility in the EU MMF sector and call for a strengthened regulatory framework.

The remainder of this paper is structured as follows. Section 2 describes the institutional framework of MMFs. Section 3 reviews the existing literature on vulnerabilities in MMFs and the effectiveness of existing regulatory measures in improving financial stability. Section 4 develops several hypotheses which we test empirically. Section 5 describes our data set, while section 6 presents our empirical results. Section 7 concludes.

## 3.2 Institutional framework

The 2008 crisis proved that MMFs can be subject to first-mover advantages and can contribute to the transmission of risks to other financial system players. During the Great Financial Crisis a number of funds (both EU and US MMFs) showed their vulnerabilities in a context of low liquidity, price decreases, and high investor redemptions. If some funds were bailed out by their sponsors (Bengtsson (2013), McCabe (2010)), the Reserve Primary Fund 'broke the buck' due to its Lehman holdings and the unwillingness of its sponsors to intervene. Indeed, in the US, the Reserve Primary Fund lost its constant

NAV properties as the gap between its marked-to-market NAV and the 1\$ constant value widened to more than 50 bps due to portfolio devaluation. The Reserve Primary Fund case triggered massive redemptions from other prime funds (even from those not holding Lehman papers), pushing their sponsors to intervene in order to keep their MMFs afloat. In Europe, as explained by Bengtsson (2013), MMFs also suffered considerable stress: a number of them closed or suspended their redemptions, while others benefited from sponsor support.

After the turmoil experienced by MMFs during the Great Financial Crisis, regulators adopted a series of reforms in order to increase the resilience of the sector. In the US for example, in 2010, the SEC introduced amendments in order to reduce the liquidity, credit and interest risk of the portfolio of MMFs. This regulation introduced lower limits of the WAL and of the WAM<sup>3</sup>, as well as daily and weekly liquidity and portfolio transparency requirements. In Europe, in the same year, the Committee of European Securities Regulators adopted guidelines to establish a minimum level playing field for MMFs (CESR (2010)). The CESR regulation introduced a common definition to short-term Money Market Funds and Money Market funds and among other measures it provided a limit to the WAL and WAM of these funds' portfolios. However, the CESR guideline was only applied by 12 Member States and following the policy recommendations published by the IOSCO (2012) the MMF Regulation was adopted by the EU in 2017.

According to the MMF Regulation, there are three regulatory types of MMFs in Europe: CNAV, LVNAV and VNAV<sup>4</sup>.

CNAV invest in public debt assets and transact at a stable NAV as long as the gap between the stable and marked-to-market NAV is lower than 50 bps. They are required to respect daily and weekly liquidity ratios. In case the fund does not respect the required weekly liquidity ratios, they may apply redemption gates and liquidity gates under certain conditions.

LVNAV are allowed to invest in riskier money market instruments (as commercial papers or certificates of deposit). Like CNAV, LVNAV also transact at a stable NAV, but the allowed gap between the constant and the marked-to-market NAV is set at 20

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<sup>3</sup>The WAL represents the Weighted Average Life and it captures the credit risk of a MMF portfolio, while the WAM or the Weighted Average Maturity "measures the sensitivity of an MMF to changing money market interest rates" (MMFR, p.13).

<sup>4</sup>In addition, the VNAV are split in two categories, standard VNAV and short-term VNAV respectively, which differentiate themselves by the maximum legal or residual maturity of the assets (namely, standard VNAV are allowed to hold assets with a longer maturity)

bps. The required daily and weekly liquidity ratios are set at the same values as for the CNAVs, and they can also apply liquidity fees and redemption gates under certain conditions in case they do not meet the weekly liquidity requirements.

VNAVs are also allowed to invest in riskier money market instruments. Contrary to CNAVs and LVNAVs, VNAVs transact at a variable NAV. They need to respect lower requirements in terms of daily and weekly liquidity ratios and they do not have to take corrective measures if the weekly liquidity requirements are not respected.<sup>5</sup>

### 3.3 Literature review

Our paper contributes to several strands of literature. From a more general point of view, our results contribute to a better understanding of vulnerabilities displayed by MMFs. Our paper results are in line with previous findings in the US space (as regulatory similarities exist between US and EU MMFs). However, to the best of our knowledge, our paper is the first one to also analyse redemptions' drivers of LVNAV funds, which is a specific feature of the European MMF framework.

First, our paper is related to the literature on runs in mutual funds, and MMFs in particular. During stress periods, MMFs can be subject to several risks that can motivate investor outflows. First, MMFs engage in maturity transformation (Ansidei et al. (2012)). Second, MMFs may engage in risk-taking behaviour since investors reward high returns by increasing their fund investments (Chernenko and Sunderam (2014), Kacperczyk and Schnabl (2013)). This exposes investments in prime MMFs to credit and liquidity risks, which can give rise to a first-mover advantage among MMF investors: late redeemers face the risk of a lower share value if the fund needs to sell assets at a discount to meet redemption requests (McCabe (2010)). Therefore, MMFs holding a larger share of risky assets experience higher outflows during crises periods than other MMFs (Baba et al. (2009), Jank and Wedow (2008), Strahan and Tanyeri (2015)).<sup>6</sup> If the previously mentioned articles studied US MMFs, the riskiness of the funds' assets may also play a role in incentivising outflows for EU MMFs. Indeed, Bouveret (2021) show empirically that private-debt MMFs display a large and concentrated exposure to private money market

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<sup>5</sup>The table in Appendix 1 provides a more detailed picture of the differences between the MMF regulatory types.

<sup>6</sup>Goldstein et al. (2017) and Chen et al. (2010) confirm these findings for bond and equity funds more generally.

instruments, which "are not very liquid even in normal times" (Bouveret (2021), p.65). We demonstrate that these mechanisms were also at play during the more recent COVID-19 turmoil. Indeed, to the best of our knowledge we are the first to demonstrate empirically that excess levels of liquidity transformation (proxied by the level of investment in illiquid assets) will lead to higher outflows for EU MMFs. More specifically, we contribute to these studies by demonstrating that investors redeem particularly strongly from funds with low liquidity buffers or high investment in illiquid assets<sup>7</sup>.

Second, our paper contributes to the literature on liquidity requirements and their effectiveness during crisis periods. Focusing on the COVID-19 turmoil, our paper is in line with recent papers (Li et al. (2021), Dunne and Raffaele (2021), Investment Company Institute (2020) among others), which demonstrate the role of low liquidity buffers as an amplifying mechanism of redemptions for both US and EU MMFs. However, it is important to note that the existence of this mechanism has been demonstrated before the COVID-19 turmoil, as Hanson et al. (2015) and Cipriani et al. (2014) show that runs are amplified through a regulatory mechanism allowing for the introduction of liquidity fees or gates once certain liquidity buffer levels are not met. As buffers approach the regulatory threshold, investors fear that liquidity fees or gates may be imposed and therefore react with higher outflows. The study of buffers' usability is therefore important especially during a stress period. Avalos and Xia (2021) study the use of liquidity buffers over time to investigate the selling behaviour of US MMFs. They demonstrate that during the March 2020 turmoil, US prime MMFs preferred to preserve their weekly liquid assets in response to contemporaneous flows, rather than dipping into their liquidity buffers to meet redemptions. Focusing on EU MMFs and the COVID-19 turmoil, our findings suggest that despite large outflows for some funds, fund managers did not draw down on their weekly liquid assets to the same extent, suggesting low levels of buffer usability for EU MMFs. We add to the results of Avalos and Xia (2021) by analysing EU private-debt MMFs and by proving that the use of liquid assets is influenced by the pre-crisis levels of liquidity buffers.

Third, in addition to the role played by the level of liquidity buffers in explaining the redemption pressures, we demonstrate that the specific pricing technique of LVNAV funds also acted as an amplifying mechanism of redemptions during the COVID-19 turmoil.

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<sup>7</sup>However, Darpeix (2021) demonstrate that the portfolio structure does not play a role in the redemptions experienced by French MMFs, which consist solely of VNAV funds.

More specifically, to the best of our knowledge, this paper is the first to demonstrate that a LVNAV MMF that is close to breaching its constant NAV properties will experience larger outflows. This finding adds more generally to the discussion on how to regulate MMFs and mitigate run risks related to a constant NAV structure. Following the global financial crisis, regulators considered that the constant NAV framework encourages pre-emptive redemptions (Lewis (2016)). The outflows during this period were larger for funds with a constant NAV than for funds with a floating NAV structure (Witmer (2016), Schmidt et al. (2016)). In this context, IOSCO (2012) recommended regulators to require MMFs to convert to a floating NAV if possible. Since 2016, the US Securities and Exchange Commission (SEC) requires institutional prime and municipal MMFs to migrate from a stable NAV to a floating NAV. The EU MMFR (2017) introduced the LVNAV structure, which offers a stable NAV as long as its NAV at amortised cost does not deviate from the corresponding market value by more than 20 basis points. If the fund breaches the valuation threshold, it is required to trade at a variable price.

However, even if first-mover advantages are stronger in constant NAV funds, they also exist among floating NAV MMFs. In floating NAV funds, the first-mover advantage among investors exists as direct and indirect costs related to a portfolio rebalancing in response to outflows are borne by the remaining investors in the fund (Chen et al. (2010), Witmer (2016) and Schmidt et al. (2016)). Therefore, investors are incentivised to redeem before others do. Moreover, a mandatory switch to a floating NAV structure increases the risk-taking behaviour of institutional prime MMFs in a bid to retain investors (Alnahedh and Bhagat (2017), Baghai et al. (2018)). Cipriani and La Spada (2021) and the Investment Company Institute (2020) demonstrate that investors value the money-likeness of MMFs and that the US regulation incentivised investors to withdraw from prime MMFs (which lost their constant NAV feature) and switch to government MMFs (which were not impacted by a mandatory move to a floating NAV). Our paper contributes to this literature by studying the financial stability implications of the LVNAV structure which was introduced with the MMFR. Focusing on the LVNAV regulatory framework more particularly, Baes et al. (2021) build a stylized model to demonstrate that under certain conditions for outflows and asset liquidity, it may be difficult for LVNAVs to simultaneously respect two crucial regulatory constraints: minimum liquidity buffers and a maximum deviation of 20 bps between the constant NAV and the marked-to-market NAV. Our paper complements

the work of Baes et al. (2021) by empirically analysing the drivers of investors' outflows during the COVID-19 turmoil and proving that approaching the regulatory thresholds related to the constraints mentioned by Baes et al. (2021) will incentivise outflows. Indeed, our findings suggest that the prospect of breaching the regulatory NAV limit may have amplified outflows among some LVNAV investors during the March 2020 turmoil, contributing to the large outflows among those funds relative to other funds.

Our paper adds to the analysis of redemptions' drivers during the COVID-19 turmoil by studying European MMFs. While the majority of papers so far has studied the stress experienced by US MMFs (Li et al. (2021), Cipriani and La Spada (2020), Avalos and Xia (2021), Investment Company Institute (2020) among others), EU MMFs also experienced high stress during the COVID-19 turmoil. Despite regulatory similarities between US and EU MMFs, the existence of the LVNAV feature in the European MMF framework adds a key difference in the analysis of EU MMFs. More generally, our analysis provide insights into the vulnerabilities displayed by EU MMFs, which is important in the context of the future MMFR review.

### **3.4 Hypotheses**

The purpose of the MMF Regulation was to guarantee that private debt MMFs can face strong and unexpected outflows, and therefore limit the likelihood that stress is spread from the MMF sector to the broader financial system. However, the COVID-19 market turmoil in March 2020 was challenging for MMFs and raised questions about the MMF Regulation's ability to tackle systemic risks effectively. Some elements of the MMF Regulation may have the potential to increase incentives among investors to redeem before others do, especially during crisis periods. One example is the requirement for LVNAV and CNAV funds to consider temporarily suspending or limiting redemptions or applying liquidity fees where weekly liquid assets fall below 30% of total assets and the fund experiences daily redemptions totalling more than 10% of total assets. In times of market stress, this can prompt investors to withdraw money from funds that are close to the 30% threshold. Anticipating this, fund managers may be reluctant to use their liquidity buffers (meaning the stock of liquid assets that MMFs hold on an ongoing basis to meet cash needs).

We construct our first four hypotheses to test whether certain elements of the EU MMF regulation exacerbate the strategic complementarities in MMFs. Strategic complementarities refer to certain fund characteristics that incentivise investors to withdraw before others do, i.e. contribute to the existence of a first-mover advantage.<sup>8</sup> The existence of strategic complementarities is well acknowledged in the mutual fund literature. Goldstein et al. (2017) argue that investors face stronger strategic complementarities in less liquid funds relative to liquid funds. The same should apply to MMFs, as some MMFs do not only invest in high quality short-term assets such as public debt, but also in higher-risk money market securities. This is the case for VNAV and LVNAV funds, which invest to a large extent in commercial paper and certificates of deposit. Therefore, in these private debt funds, the first-mover advantage is expected to be larger than in funds investing purely in public debt, resulting in higher outflows during crisis periods.

**Hypothesis 1: During crisis periods, investors redeem more strongly from more illiquid funds investing in private debt, relative to more liquid funds.**

While funds investing in illiquid assets may be more prone to runs in general, the newly introduced LVNAV fund structure may particularly amplify the first-mover advantage in investors' redemption decisions. Both VNAV and LVNAV funds are allowed to invest in riskier money market securities in addition to public debt, but only LVNAV funds can maintain a constant NAV. In contrast, VNAV funds have a floating NAV. The risk of breaching the valuation threshold may be a source of run risk in LVNAV funds (see also Hypothesis 3). Furthermore, LVNAV funds may impose liquidity fees on their redemptions or redemption gates if their liquidity buffers fall below a certain level. In contrast, VNAV funds are not under the same obligation to impose liquidity fees. Therefore, during crisis periods, investors may want to redeem from LVNAV funds before other investors in order to avoid liquidity fees or losses triggered by a move to a floating NAV. Outflows in LVNAVs would then be higher than in other types of MMFs during periods of stress.<sup>9</sup>

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<sup>8</sup>For example, imposing the cost of redeeming investors' liquidity to the remaining investors contribute to the presence of a first-mover advantage.

<sup>9</sup>Throughout the paper, we often use terms such as *periods of stress* or *crisis periods*. Since our sample only includes the recent COVID-19 turmoil, we use this market shock as a case study to draw conclusions from our findings about the behaviour of MMF managers and investors in crisis times more generally.

**Hypothesis 2: During crisis periods, LVNAV funds experience higher outflows than other types of MMFs.**

In LVNAV funds, the possibility of breaching the valuation threshold and switching to a floating NAV is one of the key risks that could incentivise investors to redeem before others. If the marked-to-market NAV falls by more than 20 basis points below the fixed NAV, a LVNAV fund loses its money-like properties and investors incur losses. The threshold for conversion from a constant to a variable NAV is considerably lower for LVNAV funds than for public debt CNAVs (20 basis points compared to 50 basis points) because LVNAV funds are allowed to invest in higher risk securities compared with public debt CNAVs. In March 2020, a number of LVNAV funds were close to breaching the valuation threshold, in which case these funds would have needed to trade at a variable price, resulting in mark-to-market losses for investors. This may have contributed to additional outflows and liquidity shortages in LVNAV funds.<sup>10</sup>

**Hypothesis 3: During crisis periods, LVNAV funds approaching the regulatory NAV threshold experience higher outflows than other types of MMFs.**

The EU MMFR introduced daily and weekly liquidity requirements with a view to strengthening MMFs' ability to handle redemptions and mitigate procyclical sales. The liquidity requirements are higher for public debt CNAV and LVNAV MMFs than for VNAV funds. If the liquidity requirements fall below a certain threshold, the board of the MMF can decide to introduce gates or liquidity fees<sup>11</sup>. The purpose of the liquidity requirements is to allow funds to deal with large-scale redemptions without having to sell less liquid assets under unfavourable market conditions. They may therefore provide a stabilising role during stress periods by allowing fund managers to use the liquid asset

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<sup>10</sup>Stronger outflows in LVNAV funds could also be due to higher investor risk aversion since risk-averse investors self-selected more into LVNAVs instead of VNAVs. To control for this feature, our regressions include fund fixed effects. To the extent that more risk-averse investors self-select into specific MMFs, fund fixed effects control for differences in flows due to these investor attributes.

<sup>11</sup>CNAV and LVNAV funds are required to hold at all times at least 10% of their portfolio invested in daily maturing assets and 30% of their portfolio in weekly maturing assets. If a fund falls below these regulatory thresholds, the board of the fund can take corrective measures which include the establishment of liquidity fees on redemptions, redemption gates or suspension of redemptions. For VNAV funds, the thresholds are 7.5% of their portfolio invested in daily maturing assets and 15% of their portfolio invested in weekly maturing assets respectively. However, in contrast to CNAV and LVNAV funds, VNAV funds are not required to take similar corrective parts in case they breach the regulatory thresholds.



buffers when facing large redemptions. However, if managers use their liquidity buffers to accommodate redemptions, liquidity buffers decrease and the risk of falling below the regulatory threshold increases. Investors may then be incentivised to redeem before the buffers drop below the threshold to avoid facing redemption gates or liquidity fees.

**Hypothesis 4: During crisis periods, funds with lower liquidity buffers face higher outflows than funds with higher buffers.**

Fund managers can respond to outflows in different ways. On the one hand, they can sell their liquid assets first, thus avoiding potential losses from selling illiquid assets at a discount during crisis periods. On the other hand, they can sell their illiquid assets first to preserve their liquidity buffers. During stress periods, investors may favour a fund with higher liquidity buffers compared with a fund that has lower buffers. This would suggest that funds with low liquidity buffers would prefer not to dip into their buffers and instead sell illiquid assets to accommodate outflows (Hypothesis 5).

**Hypothesis 5: During crisis periods, funds with low liquidity buffers are reluctant to use their buffers to accommodate redemptions.**

### 3.5 Data

We obtain daily data on European MMFs from Crane. Our sample is from 01/01/2019 until 28/05/2020 and contains information on fund returns, weekly liquid assets (WLA), NAV and marked-to-market NAV at a share level. A fund can be composed of multiple shares that cater to different types of investors and have different characteristics (such as fees and minimum initial investment). Since the assets under management (AuM) are not available at a share level, we pursue our analysis at a fund level. We average across the shares the values of the previously mentioned variables in order to aggregate them to the fund level. In addition, the dataset contains information on the regulatory type of the MMF (CNAV, LVNAV or VNAV), the inception date, the currency of the fund and its domicile. Furthermore, it also contains end of month data on the share of the portfolio invested in government securities, repos, commercial papers, certificates of deposit and other instruments. This allows us to construct an *Illiquidity* variable which represents

the share of the portfolio invested in commercial papers and certificates of deposit. The final sample comprises 63 funds<sup>12</sup> subject to the MMF Regulation between January 2019 and end of May 2020, with assets totalling €810 billion at the end of February 2020 (around 70% of the total assets of all euro area MMFs). It is worth noting, however, that VNAV funds are underrepresented in the Crane dataset<sup>13</sup>. In order to provide an accurate picture of the assets managed by VNAV funds and of their evolution we use Refinitiv Lipper to build Figure 3.1.<sup>14</sup>

Table 1 shows the summary statistics for our sample of European MMFs from January 2019 until end of May 2020. On average, there are small daily inflows into European MMFs (0.09%). However, during a few days over the COVID-19 turmoil, they experienced high outflows (the fifth percentile ranges between -5.4% and -3.33%). CNAV funds experience higher inflows compared to their other counterparts (for CNAV MMFs the 95<sup>th</sup> percentile is 6.19% compared to 4.26% and 3.42% for LVNAVs and VNAVs MMFs). The median performance of CNAV MMFs is higher (1.94% on an annualised basis) than the one displayed by LVNAVs (0.86%) or by VNAVs (-0.26%). This can be explained by the currency of denomination of these funds (USD-denominated assets display a higher return than EUR-denominated assets). CNAVs in our sample are mostly denominated in USD, while LVNAVs and VNAVs are largely denominated in EUR and GBP. If we restrict the analysis only to USD-denominated funds, LVNAVs and VNAVs display a larger median of returns than USD CNAVs (2.44 % and 2.59% respectively compared to 2.24%).

VNAVs and LVNAVs also hold lower weekly liquid assets on average (around 43% is invested in securities maturing in less than 5 days) than CNAV MMFs (which hold on average 73% weekly liquid assets). This finding reflects the fact that non-public debt MMFs invest in assets with a longer maturity in order to potentially increase their returns. LVNAV funds display a median age of around 17 years compared to approximately 11 years for VNAVs and CNAVs. LVNAV MMFs are also the largest: on average, these

<sup>12</sup>Of these 63 funds, 16 are CNAV funds, 41 are LVNAV funds and 6 are VNAV MMFs. At the end of February 2020, LVNAV funds manage most of the assets in our sample (€660 billion), CNAV funds manage €111 billion, while VNAV funds manage approximately €39 billion. In terms of currency decomposition, 13 funds are EUR-denominated, 16 funds are GBP-denominated and 29 funds are USD-denominated, while the rest of 5 funds are denominated in other currencies.

<sup>13</sup>For articles on VNAV funds and in particular those that are domiciled in France, see Darpeix and Mosson (2021) for a study on the portfolio shift during the COVID-19 crisis and Darpeix (2021) for an analysis of redemptions' drivers during the COVID-19 turmoil.

<sup>14</sup>While VNAV funds are better represented in the Refinitiv Lipper database, we do not use this dataset in our main empirical analysis as it does not provide data on the weekly liquid assets, which is one of the key variables in our analysis.

funds manage approximately €11 bn compared to €7 bn and €3 bn for CNAV and VNAV, respectively. On average, VNAV funds hold the largest share of the portfolio invested in commercial paper and certificates of deposit: 64% compared to 55% for LVNAV MMFs. As required by the regulation, CNAV funds do not hold any commercial papers or certificates of deposit.

Table 1 : Summary statistics

Panel A: All funds	Mean	Std dev	P5	P25	P50	P75	P95	N
Flows (in %)	0.09	2.77	-4.29	-1.05	0.02	1.19	4.61	19,633
Returns (in %)	1.18	1.21	-0.47	0.37	0.88	2.33	2.62	19,633
WLA (in %)	50.35	17.92	31.45	37.79	44.11	57.91	93.3	19,633
Ln(age)	2.67	0.62	1.54	2.4	2.92	3.06	3.29	19,633
Ln(TNA)	22.03	1.77	18.38	20.76	22.39	23.25	24.53	19,633
Illiquidity (in %)	57	21	0	52	62	71	85	1,649
Panel B: CNAV MMFs	Mean	Std dev	P5	P25	P50	P75	P95	N
Flows (in %)	0.15	3.33	-5.44	-1.14	0.03	1.33	6.19	4,770
Returns (in %)	1.56	0.98	-0.51	0.72	1.94	2.36	2.55	4,770
WLA (in %)	72.65	18.58	43.76	57.47	71.21	89.58	99.99	4,770
Ln(age)	2.32	0.76	0.44	2.35	2.41	2.49	3.33	4,770
Ln(TNA)	21.23	2.17	17.39	19.69	21.51	23.12	24.15	4,770
Illiquidity (in %)	0	0	0	0	0	0	0	340
Panel C: LVNAV MMFs	Mean	Std dev	P5	P25	P50	P75	P95	N
Flows (in %)	0.08	2.61	-4.09	-1.12	0.03	1.26	4.26	12,703
Returns (in %)	1.11	1.09	-0.45	0.35	0.86	2.15	2.64	12,703
WLA (in %)	43.12	9.59	30.97	36.78	41.12	47.62	61.58	12,703
Ln(age)	2.81	0.47	2.02	2.75	2.97	3.05	3.19	12,703
Ln(TNA)	22.44	1.58	19.73	21.66	22.63	23.44	24.59	12,703
Illiquidity (in %)	55	21	0	49	62	70	79	1,020
Panel D: VNAV MMFs	Mean	Std dev	P5	P25	P50	P75	P95	N
Flows (in %)	0.07	2.35	-3.33	-0.55	0	0.64	3.42	2,160
Returns (in %)	0.75	1.32	-0.48	-0.39	-0.26	2.53	2.62	2,160
WLA (in %)	43.63	12.85	30.02	34.86	38.92	49.49	72.65	2,160
Ln(age)	2.67	0.69	1.59	1.88	2.79	3.2	3.49	2,160
Ln(TNA)	21.42	0.89	20.39	20.67	21.34	21.77	23.14	2,160
Illiquidity (in %)	64	19	0	58	66	77	84	289

This table presents the summary statistics for our sample of Money Market Funds under the MMF Regulation between January 2019 and May 2020. We report the mean, standard deviation (Std.Dev.), the 5th percentile (P5), the 25th percentile (P25), etc. as well as the number of observations. Illiquidity is at a monthly level, while all the other variables are reported at a daily level.

## 3.6 Empirical findings

### 3.6.1 Illiquid assets, LVNAV funds and flows

According to Hypothesis 1 and 2, more illiquid funds and especially LVNAV funds (due to their characteristics related to the constant NAV and minimum liquidity buffers) should have higher outflows during crisis periods than other funds. To test these hypotheses, we perform the following regression:

$$\begin{aligned} Flows_{i,t} = & \alpha + \beta_1 Crisis_t + \beta_2 LVNAV_i + \beta_3 IlliqFund_{i,t-1} + \beta_4 Crisis_t \times LVNAV_i + \\ & + \beta_5 Crisis_t \times IlliqFund_{i,t-1} + \gamma Controls_{i,t} + \delta_i + \lambda_t + \epsilon_{i,t}, \end{aligned} \quad (3.1)$$

where  $Flows_{i,t}$  represents the net flows experienced by fund  $i$  in day  $t$ .  $LVNAV_i$  is an indicator variable equal to one if the fund is classified as an LVNAV MMF and zero otherwise. We use the VIX as a proxy for stress in financial markets.  $Crisis_t$  represents an indicator variable equal to one if the VIX value is above its 90<sup>th</sup> percentile of its distribution over our sample period.  $\beta_4$  and  $\beta_5$  represent our coefficients of interest as they show whether investors react stronger to the illiquidity of the funds' portfolios during crisis periods and to a fund being classified as an LVNAV MMF. Controls include a series of lagged variables that could influence funds' flows: *Return* (fund's return in  $t-1$ ), *StdDev* (the standard deviation of the past 90 daily returns), *Log(age)* (the natural lagged logarithm of fund's age expressed in years), *Log(TNA)* (the lagged natural logarithm of fund's size measured as total net assets), *WLA* (the percentage of the fund's portfolio invested in weekly liquid assets in  $t-1$ ), *Illiquidity* (the percentage of the fund's portfolio invested in commercial papers and certificates of deposit), *IlliqFund* (is a dummy variable which has a value of 1 if the fund is in the highest decile of all funds in the sample in terms of the illiquidity of portfolios), *USD* (an indicator variable equal to one if the fund is denominated in USD and zero otherwise). To control for the aggregate flows into MMFs we include day fixed effects. Fund fixed effects are introduced in order to account for unobserved time-constant fund characteristics. Moreover, we cluster standard errors by fund to allow for intertemporal dependence of regression residuals. All tables include fund and day fixed effects and cluster standard errors by fund.

Table 3.1 shows the results. The columns differ in the fixed effects used. Under Hypothesis 1 and 2, we expect  $\beta_4$  and  $\beta_5$  to be negative and statistically significant. During crisis periods, MMFs seem to attract inflows (column 1 and 3). This result is explained by the inflows experienced by CNAV funds, which benefited from a flight-to-safety investor behaviour. In contrast, we find that LVNAV funds experience higher outflows during crisis periods (the term  $Crisis \times LVNAV$  being negative and statistically significant in all four columns). On average, during crisis periods, LVNAV funds suffer 0.8pp - 1.2pp higher outflows compared with other EU MMFs.<sup>15</sup> The result is also economically significant: if we aggregate this number over a month, LVNAV funds would experience 20 percentage points higher outflows (in terms of their total assets), relative to other MMFs. This also controls for the illiquidity of the assets held by LVNAVs. In this regard, and in line with Hypothesis 1, we find that illiquid funds experience 0.7pp-0.9pp higher outflows during crisis periods compared to funds with more liquid assets. However, the Crisis x LVNAV coefficients remains robust, suggesting that parts of the outflows experienced by LVNAVs can be explained by other mechanisms than the illiquidity of the underlying assets.

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<sup>15</sup>As a robustness check, we estimate the model using available data from Refinitiv Lipper. While Refinitiv Lipper does not provide data on weekly liquid assets or the composition of MMFs' portfolios, it has better coverage for VNAV funds. The coefficient derived from the Refinitiv Lipper dataset for the  $Crisis \times LVNAV$  interaction term remains robust, suggesting that LVNAV funds have indeed seen larger outflows than other MMFs during the recent crisis period when controlling for other available variables. Note that it is not possible to replicate the coefficient for the illiquidity variable, given that this variable is not available in the Refinitiv Lipper dataset.

Table 3.1: The effect of crisis periods on flows

	(1)	(2)	(3)	(4)
	flows	flows	flows	flows
Crisis	0.007*** (4.35)		0.010*** (4.46)	
LVNAV	0.001 (1.47)	0.001 (1.23)		
Crisis × LVNAV	-0.008*** (-4.20)	-0.008*** (-4.18)	-0.011*** (-4.15)	-0.012*** (-4.32)
IlliqFund	0.000 (0.23)	0.000 (0.26)	-0.000 (-0.19)	-0.001 (-0.66)
Crisis × IlliqFund	-0.007* (-1.85)	-0.007* (-1.81)	-0.009** (-2.12)	-0.009** (-2.12)
Return	0.004 (0.19)	0.017 (0.79)	0.017 (0.16)	0.108 (0.99)
Std Dev	0.061 (0.33)	-0.090 (-0.54)	0.533 (1.61)	-0.136 (-0.41)
Log(age)	0.000 (0.10)	-0.000 (-0.10)	0.012 (1.59)	-0.004 (-0.54)
Log(TNA)	-0.000 (-0.54)	-0.000 (-0.45)	-0.021*** (-9.33)	-0.022*** (-10.15)
WLA	-0.003 (-1.64)	-0.003* (-1.75)	-0.002 (-0.81)	-0.006** (-2.05)
Illiquidity	-0.002* (-1.82)	-0.002* (-1.79)	-0.002 (-0.48)	0.001 (0.32)
USD	0.000 (0.07)	-0.000 (-0.05)		
Constant	0.003 (1.54)	0.004* (1.94)	0.422*** (9.44)	0.508*** (9.95)
Day FE	No	Yes	No	Yes
Fund FE	No	No	Yes	Yes
Cluster	Fund	Fund	Fund	Fund
Adj. R <sup>2</sup>	0.003	0.03	0.01	0.04
Observations	19 518	19 518	19 518	19 518

*t* statistics in parentheses

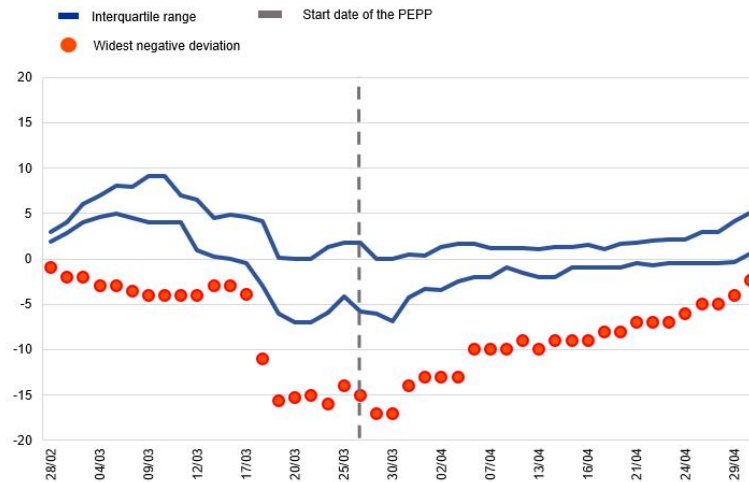
\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the relationship between the fund net flows and the illiquidity of the assets and the MMF regulatory type from January 2019 until May 2020. The dependent variable is normalised fund flows. Crisis equals one if the daily VIX is above the 90th percentile in our sample. IlliqFund is one if the fund is in the highest decile of all funds in the sample in terms of the illiquidity of portfolios. The analysis is pursued at a fund level. Columns differ in the choice of fixed effects (fund and daily level). We cluster standard errors by fund. Standard errors are in parenthesis.

### 3.6.2 Valuation cliff effects and flows

LVNAV funds are particularly vulnerable to liquidity shocks, given that they invest in non-public debt instruments while offering a stable share price. An LVNAV fund offers a stable NAV as long as its NAV at amortised cost does not deviate from the corresponding marked-to-market NAV (MNAV) by more than 20 basis points. If the fund breaches that valuation threshold, it is required to trade at a variable price. A breach on the downside generally leads to losses for investors and the investment loses its cash-like properties. In mid-March 2020, a number of LVNAV funds – particularly US dollar-denominated funds – were close to breaching the regulatory threshold on the downside (as figure 3.2 shows). This may have encouraged investors in some LVNAV funds to withdraw their money, contributing to the large outflows for that fund type relative to other funds.

Figure 3.2: Gap between the NAV and the MNAV for US dollar-denominated European LVNAVs



As described in Hypothesis 3, investors have an incentive to redeem if the moving NAV approaches the regulatory lower threshold. In order to test this hypothesis, we apply the following specification to LVNAV funds:

$$\begin{aligned}
 Flows_{i,t} = & \alpha + \beta_1 Crisis_t + \beta_2 NavLow_{i,t-1} + \beta_3 Crisis_t \times NavLow_{i,t-1} + \\
 & + \gamma Controls_{i,t} + \delta_i + \lambda_t + \epsilon_{i,t},
 \end{aligned}
 \tag{3.2}$$

where  $Flows_{i,t}$  represents the net flows experienced by fund  $i$  on day  $t$ .  $NavLow_{i,t}$  is an indicator variable equal to one if the gap between the constant NAV and the marked-to-market NAV is larger than 5 basis points in absolute terms and zero otherwise. Therefore,  $NavLow_{i,t}$  equals one if the fund is at a larger risk of breaching the valuation threshold. As above, we use the VIX as a proxy for stress in the financial system.  $Crisis_t$  takes a value of one if the VIX value is above its 90<sup>th</sup> percentile of its distribution and is zero otherwise.  $\beta_3$  represents our coefficient of interest as it shows whether investors react more sensitively to funds approaching the regulatory thresholds during crisis periods. Controls are defined as in section 5.1.

Table 3.2 shows the results. Under Hypothesis 3, we expect  $\beta_3$  to be negative and statistically significant. We find that during normal periods, funds approaching the lower NAV threshold by more than 5 basis points do not suffer higher outflows compared to other MMFs (the term  $NavLow$  is close to zero and statistically insignificant in all columns). However, investors are sensitive to a possible breach of the valuation threshold during crisis periods. Under adverse market conditions, LVNAVs displaying a high (above 5 basis points) deviation between the constant NAV and the moving NAV suffer 0.9pp-1.8pp more outflows on average. This effect is robust across the different specifications. However, investors may redeem more the wider the gap between the constant and the marked-to-market NAV gets. In order to test the presence of such a non-linearity in investors' response, we apply the same specification (2), where  $NavLow_{i,t}$  is an indicator variable equal to one if the gap between the constant NAV and the marked-to-market NAV is above 10 basis points and zero otherwise.<sup>16</sup> Table 3.3 shows the results for this specification. We find that during crisis periods, funds with a higher deviation suffer on average 1.5pp-2.4pp higher outflows than other MMFs.

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<sup>16</sup>In unreported results, we also run the same regression with  $NavLow$  defined as equal to one if the deviation between NAV and MNAV is larger than 15 basis points. The coefficient size increases further (in absolute terms), indicating the presence of non-linearities in outflows as the risk of breaching the valuation threshold increases. However, there is a too small number of observations with NAV deviations of this size, which is why it is not possible to estimate a sensible model.



Table 3.2: The effect of the valuation threshold on flows: above 5 bp deviation

	(1)	(2)	(3)	(4)
	flows	flows	flows	flows
Crisis	-0.002 (-1.60)		-0.002 (-1.64)	
NavLow	-0.001 (-0.44)	-0.001 (-0.60)	0.000 (0.09)	-0.000 (-0.01)
Crisis × NavLow	-0.009** (-2.11)	-0.013*** (-2.77)	-0.015*** (-3.87)	-0.018*** (-4.34)
Return	-0.008 (-0.35)	0.028 (1.02)	0.292** (2.45)	0.353*** (3.45)
Log(age)	-0.000 (-0.24)	-0.001 (-1.51)	0.039*** (3.37)	0.018*** (3.99)
Log(TNA)	-0.000 (-1.34)	-0.000 (-1.45)	-0.033*** (-9.02)	-0.032*** (-8.24)
WLA	-0.003 (-1.51)	-0.011*** (-3.91)	0.003 (0.42)	-0.012** (-2.26)
Std Dev	0.520** (2.61)	0.134 (0.63)	1.102** (2.33)	0.195 (0.50)
Illiquidity	-0.001 (-0.23)	-0.001 (-0.36)	0.004 (0.89)	0.008** (2.05)
Constant	0.008** (2.48)	0.014*** (3.38)	0.623*** (8.61)	0.654*** (7.32)
Day FE	No	Yes	No	Yes
Fund FE	No	No	Yes	Yes
Cluster	Fund	Fund	Fund	Fund
Adj. R <sup>2</sup>	0.002	0.05	0.02	0.07
Observations	9 701	9 701	9 701	9 701

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the relationship between the fund net flows and the proximity to the valuation threshold for LVNAV from January 2019 until May 2020. The dependent variable is normalised fund flows. Crisis equals one if the daily VIX is above the 90th percentile in our sample. NavLow equals one if the difference between the constant NAV and the marked-to-market NAV is larger than 5 basis points. The analysis is pursued at a fund level. Columns differ in the choice of fixed effects (fund and daily level). We cluster standard errors by fund. Standard errors are in parenthesis.

Table 3.3: The effect of the valuation threshold on flows: above 10 bp deviation

	(1)	(2)	(3)	(4)
	flows	flows	flows	flows
Crisis	-0.002*		-0.002*	
	(-1.76)		(-1.90)	
NavLow	0.000	0.000	0.001	0.002
	(0.06)	(0.06)	(0.29)	(0.48)
Crisis × NavLow	-0.015***	-0.020***	-0.019***	-0.024***
	(-3.50)	(-4.17)	(-4.77)	(-5.32)
Return	-0.005	0.034	0.338**	0.415***
	(-0.20)	(1.20)	(2.52)	(3.58)
Log(age)	-0.000	-0.001	0.040***	0.019***
	(-0.29)	(-1.60)	(3.38)	(4.18)
Log(TNA)	-0.000	-0.000	-0.032***	-0.030***
	(-1.40)	(-1.51)	(-8.45)	(-7.83)
WLA	-0.003	-0.010***	0.003	-0.012**
	(-1.28)	(-3.55)	(0.47)	(-2.22)
Std Dev	0.452**	0.022	1.109**	0.207
	(2.27)	(0.10)	(2.19)	(0.49)
Illiquidity	-0.000	-0.001	0.004	0.008**
	(-0.12)	(-0.23)	(0.87)	(2.03)
Constant	0.009**	0.014***	0.597***	0.625***
	(2.48)	(3.30)	(7.69)	(6.78)
Day FE	No	Yes	No	Yes
Fund FE	No	No	Yes	Yes
Cluster	Fund	Fund	Fund	Fund
Adj. R <sup>2</sup>	0.002	0.05	0.02	0.07
Observations	9 701	9 701	9 701	9 701

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the relationship between the fund net flows and the proximity to the valuation threshold for LVNAV from January 2019 until May 2020. The dependent variable is normalised fund flows. Crisis equals one if the daily VIX is above the 90th percentile in our sample. NavLow equals one if the difference between the constant NAV and the marked-to-market NAV is larger than 10 basis points. The analysis is pursued at a fund level. Columns differ in the choice of fixed effects (fund and daily level). We cluster standard errors by fund. Standard errors are in parenthesis.

### 3.6.3 Weekly liquid assets and flows

As described in Hypothesis 4, investors may redeem more in funds with lower levels of liquidity buffers. We apply the following specification to test this hypothesis to LVNAV and VNAV funds as they experienced important outflows during the COVID-19 crisis<sup>17</sup>:

$$\begin{aligned} Flows_{i,t} = & \alpha + \beta_1 Crisis_t + \beta_2 WLA_{i,t-1} + \beta_3 Crisis_t \times WLA_{i,t-1} + \\ & + \gamma Controls_{i,t} + \delta_i + \lambda_t + \epsilon_{i,t}, \end{aligned} \quad (3.3)$$

where  $Flows_{i,t}$  represents the net flows experienced by fund  $i$  on day  $t$ .  $WLA$  is the percentage of the fund's portfolio invested in weekly liquid assets in  $t-1$ . We use the VIX as a proxy for the economic conditions.  $Crisis_t$  represents an indicator variable equal to one if the VIX value is above the 90<sup>th</sup> percentile of its distribution.  $\beta_3$  represents our coefficient of interest as it shows whether investors behave more sensitively to past levels of weekly liquid assets during crisis periods. Controls are defined as in section 5.1.

Table 3.4 shows the results. Columns 1 and 3 show the effect during normal periods, while in columns 2 and 4, we interact the WLA with the crisis dummy. Under Hypothesis 4, we expect  $\beta_3$  to be positive and statistically significant. Looking at row 2, we find that a higher level of liquidity buffers does not have a significant effect on net flows (the estimated coefficient is statistically insignificant in all four columns). However, column 4 shows that during crisis periods, funds with higher levels of liquidity buffers suffer less outflows. An increase of the WLA by one percentage point is associated with 0.022 percentage points lower outflows. The rationale is that investors may try to avoid liquidity fees or redemptions gates introduced by funds that breach the regulatory thresholds of minimum liquid buffers. Therefore, they would redeem more from funds having less liquid assets and consequently a higher possibility to breach the levels of minimum buffers.<sup>18</sup>

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<sup>17</sup>The result does not significantly change when considering all regulatory types of MMFs.

<sup>18</sup>In Appendix 2 we explain LVNAV outflows by considering in the same regression all redemptions drivers that we have previously identified, namely the illiquidity fund dummy, a gap between the constant NAV and the marked-to-market NAV higher than 10 bps, and the level of past WLA. The results show that all determinants play a role in explaining the outflows, as all interaction terms are significant and have the relevant sign.

Table 3.4: The effect of the weekly liquid assets on flows

	(1)	(2)	(3)	(4)
	flows	flows	flows	flows
Crisis		-0.020*** (-4.44)		
WLA	0.007 (1.29)	0.000 (0.09)	-0.001 (-0.20)	-0.006 (-1.12)
Crisis × WLA		0.041*** (4.02)		0.028*** (2.77)
Return	0.460*** (3.20)	0.382*** (3.23)	0.447*** (3.77)	0.451*** (3.87)
Log(age)	0.038*** (3.36)	0.041*** (2.95)	0.022*** (2.94)	0.019** (2.62)
Log(TNA)	-0.028*** (-6.34)	-0.029*** (-6.33)	-0.027*** (-5.71)	-0.028*** (-5.97)
Std Dev	1.113* (2.00)	0.918** (2.03)	0.413 (0.86)	0.348 (0.75)
Nav Deviation	0.000* (1.80)	0.000** (2.10)	0.000** (2.12)	0.000** (2.10)
Illiquidity	-0.003 (-0.45)	-0.002 (-0.39)	0.000 (0.01)	-0.000 (-0.03)
Constant	0.513*** (5.90)	0.531*** (6.30)	0.541*** (5.50)	0.569*** (5.80)
Day FE	No	No	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes
Cluster	Fund	Fund	Fund	Fund
Adj. R <sup>2</sup>	0.01	0.02	0.05	0.05
Observations	11 777	11 777	11 777	11 777

*t* statistics in parentheses

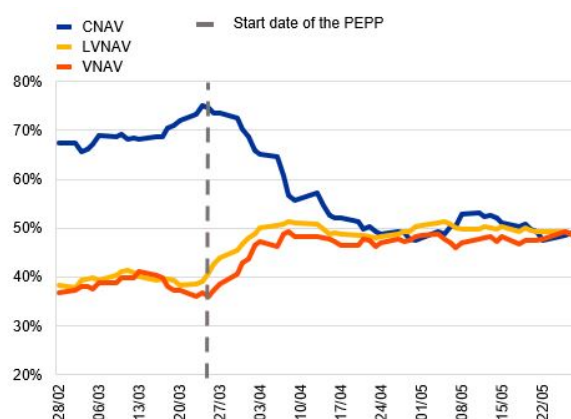
\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the relationship between the fund net flows and weekly liquid assets for LVNAV and VNAV funds from January 2019 until May 2020. The dependent variable is normalised fund flows. Crisis equals one if the daily VIX is above the 90th percentile in our sample. The analysis is pursued at a fund level. Columns differ in the choice of fixed effects (fund and daily level). We cluster standard errors by fund. Standard errors are in parenthesis.

### 3.6.4 Buffer usability in response to flows

Although large outflows were experienced by some funds, fund managers did not draw down on their weekly liquid assets to the same extent. As Figure 3.3 shows, between 11 and 25 March, LVNAV and VNAV funds reduced their holdings of weekly liquid assets only slightly – by 1 and 3 percentage points respectively on average. Given the large outflows for those funds in this period, that small reduction in liquid assets suggests that fund managers only used their buffers to a very limited extent. Moreover, although LVNAV funds experienced larger outflows than VNAV funds, they made less use of their liquid assets than VNAV funds. This suggests that VNAV funds may be more willing to use their weekly liquid assets than LVNAV funds, possibly because investors do not associate lower levels of liquid asset holdings with a higher risk of suspensions or liquidity fees.

Figure 3.3: Evolution of WLA of European MMFs



Sources: Crane Data and ECB calculations.

Notes: This chart shows the weighted mean of weekly liquid assets for each type of MMF. The vertical line denotes 26 March 2020, which was the start date of the PEPP.

The picture above does not fully reflect the possible heterogeneity in the use of liquidity buffers, in particular between funds with generally low and those with high levels of liquidity buffers. For instance, funds with low levels of liquidity buffers before the crisis might try to avoid using their buffers, for instance to prevent additional outflows.

Hypothesis 5 postulates that a fund's buffer usability is contingent upon its pre-crisis liquidity levels. In order to test this hypothesis, we apply the following specifications for

LVNAV and VNAV MMFs<sup>19</sup>:

$$\begin{aligned}\Delta WLA_{i,t} &= \alpha_i + \beta_1 Flows_{i,t-1} + \beta_2 Small_i + \beta_3 Small_i \times Flows_{i,t-1} + \\ &+ \gamma Controls_{i,t} + \lambda_t + \epsilon_{i,t},\end{aligned}\tag{3.4}$$

$$\begin{aligned}\Delta WLA_{i,t} &= \alpha_i + \beta_1 Inflows_{i,t-1} + \beta_2 Small_i + \beta_3 Small_i \times Inflows_{i,t-1} + \\ &+ \beta_4 Outflows_{i,t-1} + \beta_5 Small_i \times Outflows_{i,t-1} + \gamma Controls_{i,t} \\ &+ \lambda_t + \epsilon_{i,t},\end{aligned}\tag{3.5}$$

where  $\Delta WLA_{i,t}$  represents the difference between the weekly liquid assets on day  $t$  and  $t-1$ , respectively.  $Flows_{i,t-1}$  represents the net flows experienced by fund  $i$  at day  $t-1$ . In specification 5, flows are further divided into inflows (defined as positive flows) and outflows (defined as negative flows). The *Small* indicator shows whether a fund entered the COVID-19 turmoil with low levels of liquid assets. We construct this indicator variable in two steps. First, for one month before the start of the turmoil (between the 12<sup>th</sup> of February and the 12<sup>th</sup> of March), we calculate the cross-sectional median of the portfolio share invested in assets maturing in less than 5 days for LVNAV and for VNAV funds respectively. The median is approximately equal between the two regulatory types (39% for LVNAV MMFs and 40% for VNAVs respectively). Second,  $Small_i$  is an indicator variable equal to one if the fund was holding less than the aforementioned median in any of the seven days preceding the beginning of the crisis.  $\beta_3$  in equation (4) ( $\beta_5$  in equation (5) respectively) represent our coefficients of interest as they show whether fund managers use their liquid buffers differently in response to flows (outflows) in case their funds enter the crisis with low liquid buffers. Controls include a series of lagged variables that could influence funds' flows: *Return*, *Log(TNA)*, and *WLA*.

Table 3.5 shows the results. Under Hypothesis 5, during the COVID-19 turmoil, we expect  $\beta_1$  ( $\beta_4$  respectively) to be positive and statistically significant in equation 4 (equation 5 respectively). Also, we expect  $\beta_3$  ( $\beta_5$  respectively) to be negative and statistically

<sup>19</sup>The results of the regressions do not significantly change when considering all regulatory types of MMFs.

significant in equation 4 (equation 5 respectively). We are interested in analysing the response of fund managers to flows during different time periods. Accordingly, we split the sample in two parts and estimate equation (4) for each subsample. In order to test whether managers respond differently to inflows and outflows we apply specification (5). We consider the period from 12 March 2020 until 25 March (until the start of the PEPP by the ECB) as "run period", meaning the period where the MMF sector experienced the largest outflows during the turmoil. During this period, a decrease of one percentage point in the net flows is associated with a reduction in the first difference of WLA of 0.420 percentage points (column 1). This would suggest that fund managers use to a greater extent their liquidity buffers in response to higher outflows. A potential caveat of this analysis is that since we are working with first differences, the coefficient can mean either an increase in the use of liquidity buffers in response to past flows or an increase in illiquid asset holdings. However, in general, we would expect it to be more likely that MMFs use their liquid assets rather than buying additional illiquid assets, as a response to outflows during the COVID-19 turmoil.

Columns 1 and 2 indicate that the use of weekly liquid assets is contingent upon the pre-crisis levels. Funds having large liquidity buffers before the crisis respond to an increase in outflows by using more assets maturing in the next 5 days (the coefficient of the variable *Outflows* in column 2 is positive and highly significant). Funds having below median liquidity buffers will tend to keep unchanged the share of their portfolio invested in weekly liquid assets (indeed, column 2 indicates that the term  $Outflows + Small \times Outflows$  is positive and insignificant). It means that managers sell both liquid and illiquid assets on a pro rata basis. This finding suggests that under adverse market conditions, fund managers with low liquidity buffers are reluctant to use them in response to outflows, possibly also because they anticipate that investors may redeem more when the liquidity buffers approach the regulatory thresholds.

In order to demonstrate that the levels of liquidity buffers influence managers' behaviour mainly during crisis periods, we also run regressions (4) and (5) during a post-run period, which we define as starting on 26 March 2020 and lasting until 8 April 2020 (an identical period of 14 days is used as in the "run period" sample). Indeed, columns 3 and 4 show that the pre-crisis level of liquidity buffers does not influence managers' use of liquid buffers (the interaction terms  $Small \times Flows$  and  $Small \times Inflows$  or  $Small \times Outflows$

are not statistically different from 0).

Table 3.5: Buffer usability in response to flows

	(1)	(2)	(3)	(4)
	$\Delta WLA$	$\Delta WLA$	$\Delta WLA$	$\Delta WLA$
Flows	0.420*** (7.91)		0.140*** (4.16)	
Small $\times$ Flows	-0.262*** (-3.63)		0.059 (0.69)	
Inflows		0.504*** (5.62)		0.129* (1.86)
Small $\times$ Inflows		-0.153 (-1.07)		0.037 (0.29)
Outflows		0.341*** (4.33)		0.158* (1.75)
Small $\times$ Outflows		-0.324** (-2.65)		0.103 (0.59)
Return	1.084 (1.03)	0.994 (0.98)	-1.300 (-0.62)	-1.223 (-0.57)
Log(TNA)	0.031 (0.86)	0.039 (1.14)	-0.024 (-0.46)	-0.023 (-0.44)
WLA	-0.267*** (-3.71)	-0.273*** (-3.78)	-0.246*** (-5.00)	-0.249*** (-4.94)
Sample	Run	Run	Post Run	Post Run
Day FE	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes
Cluster	Fund	Fund	Fund	Fund
Adj. R2	0.28	0.29	0.17	0.17
Observations	450	450	459	459

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the relationship between the evolution of the WLA and past flows for LVNAV and VNAV funds. The dependent variable represents the difference between the weekly liquid assets on day  $t$  and  $t-1$ . Flows represents the net flows experienced by fund  $i$  at day  $t-1$ . In columns 2 and 4, flows are further divided into inflows (defined as positive flows) and outflows (defined as negative flows). Small equals one if the fund entered the COVID-19 crisis with low liquid buffers. As the sample spans only 14 days, we eliminated the past natural logarithm of age and illiquidity of the portfolio from the control variables due to their low variability. The analysis is pursued at a fund level. We include daily and fund fixed effects and cluster standard errors by fund. Standard errors are in parenthesis. While columns 1 and 2 analyse the "run" period, from 12 March 2020 until 25 March 2020, columns 3 and 4 show the results using the "post run" period, which spans from 26 March 2020 until 8 April 2020.



### 3.7 Conclusion

We assess the effectiveness of the EU Money Market Fund Regulation from a financial stability perspective. We use fund-level data on European money market funds to study the behaviour of MMF managers and investors during the recent COVID-19 market turmoil. We identify several key vulnerabilities in the MMF sector. First, less liquid MMFs are subject to increased outflows during crisis periods. Second, LVNAV funds invest in non-public debt assets while offering a constant NAV. These features expose them to liquidity shocks: we find that during the COVID-19 turmoil, some LVNAV funds were close to breaching the regulatory NAV limits, which might have incentivised investors to redeem more from these funds. Third, according to the MMFR, corrective liquidity measures can be applied by the board of the MMF if LVNAV and CNAV funds fall below their liquidity thresholds. We find that MMFs with low liquidity buffers experience stronger redemptions during crisis periods compared to funds with larger liquidity buffers. Finally, we find that in order to avoid approaching or falling below the regulatory liquidity thresholds, funds with lower levels of liquidity buffers use their buffers less than funds with higher buffers, suggesting a preference for those funds to sell illiquid assets.

These vulnerabilities call for a strengthened regulatory framework. Future work in this area should focus on addressing liquidity mismatches (for instance through the adjustment of the composition of MMFs' portfolios), alleviating vulnerabilities related to the LVNAV structure (for instance by removing regulatory threshold effects and improving their portfolio liquidity), and making liquidity buffers more usable.<sup>20</sup> By identifying a number of key vulnerabilities in the EU MMF sector and regulation, our findings may contribute to this work. For instance, the EU will review the EU MMF Regulation still in 2022. In addition, although we focus exclusively on EU MMFs, our results may also be relevant for policy discussions on strengthening the MMF sector in other markets. For example, our conclusions closely resemble those of the recent proposals by the SEC (2021) for US MMFs.

Importantly, any regulatory adjustment to address vulnerabilities in the MMF sector needs to be targeted and consider both benefits and costs. For instance, while higher liquidity requirements could allow funds to meet redemption requests more easily and

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<sup>20</sup>See also recent regulatory proposals to enhance the resilience of the MMF sector, which among other things aim to reduce liquidity transformation (FSB (2021b), ECB (2021b)).

reduce run risks during crisis periods, those requirements should be appropriately calibrated to not unduly reduce MMF returns or lead to funding problems for non-financial corporations.<sup>21</sup> In addition, a more resilient MMF sector could also limit possible moral hazard concerns from central bank interventions. The expectation of future extraordinary central bank interventions (similar to those parts seen during the recent market turmoil) may distort incentives of market participants in managing their liquidity and credit risk positions and lead them to take higher risk. Further research may address these issues to identify what an optimal regulation should achieve both in normal and in crisis times.

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<sup>21</sup>See, for instance, Grill et al. (2022) who study the possible impact of a mandatory public debt quota for EU private debt funds.

## 3.8 Appendix 1

### Key elements of EU MMF Regulation

	Short-term MMF			Standard MMF
Types of MMFs	Public Debt CNAV	VNAV	LVNAV	VNAV
NAV	Stable – Units in the fund are purchased or redeemed at a constant price so long as the value of the underlying assets does not deviate by more than 0.5% (50bps) from par (i.e. 1.00).	Floating	Stable – Units in the fund are purchased or redeemed at a constant price so long as the value of the underlying assets does not deviate by more than 0.2% (20bps) from par (i.e. 1.00).	Floating
Eligibility requirements	99.5% of portfolio to be invested in public debt securities, reverse repo secured with government securities, and cash	Money market, instruments, securitisations and ABCP, deposits, derivatives, repo, reverse repo, MMF		
Legal/residual maturity of the assets of the MMF	< 397 days	< 397 days	<397 days	< 2 years
WAM of the portfolio	< 60 days	< 60 days	< 60 days	< 6 months
WAL of the portfolio	< 120 days	< 120 days	< 120 days	< 12 months
Daily liquidity ratio (daily maturing assets, reverse repurchase agreements that may be terminated by a one day notice, cash)	10%	7.5%	10%	7.5%
Weekly liquidity ratio (weekly maturing assets, reverse repurchase agreements that may be terminated by a five days' notice, cash)	30% (includes up to 17.5% of government debt with a legal or residual maturity of up to 190 days)	15% (includes up to 7.5% of money market instruments or shares of other MMFs that may be redeemed and settled within five working days)	30% (includes up to 17.5% of government debt with a or residual legal maturity of up to 190 days)	15% (includes up to 7.5% of market instruments or shares of other MMFs that may be redeemed and settled within five working days)
Liquidity Fee/ Redemption Gate	Optional if WLA falls below 30% and redemption requests reach 10% of the total net assets on any day.  Mandatory if WLA falls below 10% as follows: (i) liquidity fees shall adequately reflect the cost to the MMF of achieving liquidity and ensure that investors who remain in the fund are not unfairly disadvantaged when other investors redeem their units or shares during the period;  (ii) suspension of redemption up to 15 working days	None, unless at the discretion of the Fund and/or its asset management company, fees and gates are described under the prospectus	As for PDCNAV	None, unless at the discretion of the Fund and/or its asset management company, fees and gates are described under the prospectus

## 3.9 Appendix 2

### Different determinants of LVNAV outflows

Table 3.6: Different determinants of outflows

	(1)	(2)
	flows	flows
NavLow	0.002 (0.48)	0.002 (0.48)
Crisis $\times$ NavLow	-0.023*** (-5.31)	-0.022*** (-5.18)
IlliqFund	0.001 (0.98)	0.001* (1.88)
Crisis $\times$ IlliqFund	-0.003 (-0.79)	-0.004** (-2.41)
WLA	-0.017*** (-3.08)	-0.018*** (-3.11)
Crisis $\times$ WLA	0.028** (2.07)	0.029** (2.23)
Return	0.39*** (3.35)	0.414*** (3.66)
Log(age)	0.015*** (2.99)	0.016*** (3.06)
Log(TNA)	-0.031*** (-7.36)	-0.031*** (-7.46)
Std Dev	0.13 (0.32)	0.127 (0.31)
Illiquidity	0.007* (1.68)	0.007* (1.79)
Constant	0.657*** (6.34)	0.660*** (6.39)
Day FE	Yes	Yes
Fund FE	Yes	Yes
Cluster	Fund	Fund
Adj. R <sup>2</sup>	0.07	0.07
Observations	9 701	9 701

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

This table shows the relationship between the LVNAV fund net flows and different fund characteristics from January 2019 until May 2020. The dependent variable is normalised fund flows. Crisis equals one if the daily VIX is above the 90th percentile in our sample. In column 1 (column 2), IlliqFund is one if the fund is in the highest decile (highest percentile) of all funds in the sample in terms of the illiquidity of portfolios. *WLA* is the percentage of the fund's portfolio invested in weekly liquid assets in t-1m while NavLow equals one if the difference between the constant NAV and the marked-to-market NAV is larger than 10 basis points. The analysis is pursued at a fund level. We include day and fund fixed effects. We cluster standard errors by fund. Standard errors are in parenthesis.



# General Conclusion

Following the 2008 Global Financial Crisis, regulators acknowledged the growing importance of mutual funds in the financial system. The crisis provided evidence that investment funds are subject to runs and that their distress can be transmitted to other financial actors. Even money market funds, which were seen as safe investments experienced massive outflows. Those events pushed regulators to adopt reforms aiming to enhance the sector's resilience and contributed to the development of a vast area of literature which analyses the risk drivers stemming from mutual funds' activities. However, the reforms adopted after the 2008 crisis proved to be insufficient in preserving the resilience of this sector, as it has been demonstrated by the stress experienced by mutual funds during the COVID-19 turmoil.

The existence of links between mutual funds and financial stability has been the subject of this doctoral thesis. A general result of our different studies is that funds can indeed be a source of risk, with the notable exception of ESG funds(although future research is needed regarding the resilience of these growing funds). The focus of this thesis has been the study of outflows' drivers, or more generally, the study of the existence of a run risk in the mutual fund industry. The different studies presented in this thesis aim to provide a better comprehension of vulnerabilities (as well as of potential strengths) that exist in the mutual fund sector.

The study of different types of funds that has been pursued in this doctoral thesis falls within a wide range of recent discussion topics among economists. First, bond funds, which have been the subject of the first chapter could be negatively impacted by a sudden monetary policy normalisation. A less accomodative monetary policy would be synonymous with lower bond prices, which would incentivise investors to redeem, which could, under certain conditions, lead to a run risk. Second, ESG funds which are studied in the second chapter have experienced an important growth in the recent years due to

increasing climate risk concerns. Regulators should also monitor and measure the risks inherent to ESG funds and compare their risks to conventional funds. This question also has financial stability consequences if ESG funds' investors take into account climate risks in their decisions, this might imply a higher potential future source of fragility for non-ESG counterparts, since assets are subject to transition and physical risks. Finally, with respect to MMF funds, which have been the subject of the third chapter, an important regulatory work is undergoing regarding the amendment of the MMF regulation, which should render these funds more resilient.

In Chapter 1 we analysed in more detail the flow-performance relationship of bond funds. We demonstrate that investors are sensitive to both longer-term and short-term performances and we further show the existence of a non-linearity in response to different levels of negative performances, i.e. investors redeem more strongly in response to very negative past short-term returns compared to negative, but closer to zero returns. A number of extensions may be considered in order to enrich this analysis.

First, one could also consider the illiquidity of the fund's portfolio. Indeed, as demonstrated by Goldstein et al. (2017), investors are incentivised to redeem more strongly following negative performances in more illiquid funds, as first-mover advantages are greater in illiquid funds. One possible extension is to analyse whether our results are driven by shares of more illiquid funds. If this result is proven, then more outflows could take place in response to very poor past performances, which could push managers of these funds to sell more illiquid funds, probably at a discount under stressed market conditions. Second, another interesting extension would be to analyse the behaviour of French fund managers and investors during the COVID-19 turmoil. Indeed, AMF (2021) shows that during the COVID-19 turmoil, French bond funds suffered from both a drop in valuation and high outflows. It would therefore be interesting to examine the presence of a flow-performance relationship during this turmoil episode. In addition, one could also analyse the managers' behaviour following the strong outflows experienced in March 2020. Most notably, did managers sell more illiquid assets (thus potentially contributing to a further loss in value) or did they use cash in order to reimburse redeeming investors? One can also consider an additional extension which could examine the presence of a potential procyclical sell-off or the presence of a herding behaviour during this period.

Chapter 1 results point to the fact that funds (and especially the most illiquid) can be

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subject to first-mover advantages and run risks ultimately. The general question here is what measures can be taken (and with which efficiency) in order to desincentivise investors to redeem, particularly under stressed market conditions. One possible answer is to give the possibility to asset managers to use liquidity management tools when necessary. Those liquidity management tools should be calibrated appropriately in order to allow for a transfer of the liquidity costs from the remaining investors towards redeeming investors. If the swing pricing has been examined by a number of studies (Capponi et al. (2020), Jin et al. (2022), Lewrick and Schanz (2017)), other mechanisms' efficiency still need to be studied (such as the imposition of liquidity fees, gates etc.). Another auxiliary question is whether the possibility of using such tools modifies the portfolio management of the fund. For example, are managers taking more risk (as they know that they could be "covered" by those liquidity management tools during crisis periods), or do they adopt a more conservative approach (as they may think that the implementation of such liquidity tools constitutes a bad signal in terms of the funds' reputation)? Those research questions still need to be analysed as the implementation of liquidity management tools may have financial stability implications on both investor and managers choices.

In Chapter 2 we further examine ESG funds' flow-performance relationship. We demonstrate that ESG investors are less sensitive to past negative performances. The result is robust when considering crisis periods but also when separating the sample between institutional and retail shares. In addition, when taking bond funds' illiquidity into account, we also show that ESG bond investors do not redeem following negative performances even in more illiquid shares. The results shown in chapter 2 call for a more general analysis about their specific drivers and their future robustness.

On the results' drivers more precisely, one may think that ESG investors are more resilient because of mandates. Indeed, an institutional fund investor need to comply with mandates (if a mandate is in place), which for example require him to invest in ESG funds or securities. In order to test this hypothesis, one should precisely distinguish between institutional investors with and without mandates and analyse whether the results differ amongst them. Another potential driver of our results could be the time horizon we have chosen for our performance measures. Indeed, a number of papers argue that ESG investors pursue longer-term strategies compared to traditional fund investors. Therefore, an interesting extension would be to test the investors' sensitivity to longer-term



performances (in contrast to the one-month performance which is used in the article). If investors in ESG funds prove to be sensitive to long-term performances in contrast to short-term returns, there might be consequences in terms of financial markets and pricing of green assets as this finding would lead to a higher available financing of the green transition.

On the future robustness of our results, it is important to mention that our results may not hold in the long term due to the sample considered in the study. This could arise for two reasons. The first reason would be a change in the investor base, for example if more performance sensitive investors were to direct their investments towards ESG funds. In turn, during a potential future turmoil, these investors would withdraw due to their sensitivity, which would imply a positive flow-performance relationship for these funds. The second reason refers to the available options from an investor perspective. Here one may think that currently there are not many alternatives (in terms of preferences) for an investor wishing to invest in an ESG fund. Therefore, even if a fund recorded a negative performance, investors would choose to not redeem as there is no viable alternative. However, other alternatives could become available in the future as more and more funds take in account ESG criteria. For these reasons it would be interesting to pursue our analysis over an increased sample which would allow us to cover more time periods and to benefit from the existence of a more competitive ESG fund market.

In Chapter 3 we take a closer look at the drivers of the outflows experienced by Euro Area money market funds during the COVID-19 turmoil, when prime funds experienced massive redemptions. We demonstrate that the 2017 MMF Regulation has not improved the resilience of these funds under stressed market conditions. We find that LVNAV funds that are close to breaching their constant NAV properties suffer more withdrawals. In addition, lower levels of liquidity buffers encourage investor redemptions. Following this finding, we show that managers of funds displaying lower levels of liquidity buffers are not incentivised to use their buffers in response to outflows during a crisis as they wish to avoid additional outflows due to a breach of regulatory liquidity thresholds. This work could benefit from several extensions.

First, our dataset mainly comprise CNAV and LVNAV funds. However, VNAV funds (which are mainly domiciled in France) also merit to be studied as they have also faced important outflows during the COVID-19 turmoil (for papers studying French VNAV

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funds outflows see Darpeix (2021), Darpeix and Mosson (2021)). It would be interesting to analyse if the illiquidity of the assets for example also played a role in explaining the redemptions suffered by VNAVs<sup>22</sup>.

Second, another interesting extension would be the analysis of other drivers of fund outflows. ECB (2020) or Darpeix (2021) point to the importance of liquidity needs in explaining outflows. Indeed, investors may have redeemed from MMFs because they needed liquidity and not because they were worried about the resilience of these funds. For example, it would be useful to examine whether the redeemed liquidity served at paying different counterparties (for example as a response to margin calls) or it was simply stored in a bank account and re-invested in MMFs once the turmoil had passed. Fragilities in MMFs may therefore have either external (liquidity needs) or internal sources (possible losses for investors due to regulatory cliff effects), or a combination of both and merit further research.

Finally, our results also call for a more general study related the selling behaviour of MMFs in response to outflows. Indeed, fund managers could have played a role in the freezing of the commercial paper market if it is demonstrated that they sold an important number of commercial papers in response to outflows. Also, it could be interesting to analyse how and to what extent the ECB's announcements and actual implementations of asset purchases programmes (such as the PEPP) contributed or not to easing the stress experienced by prime MMFs. Although Central Bank monetary policy is not especially targeted towards non-banking financial intermediaries, MMFs could have indirectly benefited from its implementation via normalising conditions in the underlying securities markets.

In conclusion, our results contribute to the overall discussion of run risks. The stress experienced by several types of mutual funds during the COVID-19 turmoil and the increased sustainability risks call for the introduction of new regulatory rules and a truly macroprudential policy destined to contain vulnerabilities in the less liquid segments of mutual funds. Indeed, regulatory options that would allow for a reduction of risks and first-mover advantages exist and are subject to debate in terms of their efficiency. First,

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<sup>22</sup>Nevertheless, it is important to note that although VNAV funds also need to comply with the 2017 MMF Regulation, the rules that apply to them are different to a certain extent. These funds display a variable NAV, so they are not subject to a potential breach of their constant NAV properties (as is the case for CNAV and LVNAV funds). In addition, the breach of their regulatory liquidity thresholds do not entail potential corrective measures for investors, which may explain why investors in VNAV funds will not be incentivised to redeem if the liquidity buffers approach the regulatory thresholds.

the implementation of liquidity management tools might mitigate first-mover advantages which render bond funds particularly vulnerable. Second, all funds need to proceed to an assessment of sustainability risks of their portfolios as securities are increasingly exposed to transition and physical risks which can lead to a sudden repricing and high outflows ultimately. Finally, new rules related to the liquidity management or the elimination of thresholds effects can be adopted in the context of the upcoming MMF Regulation review by the European Commission. Eventually, the regulatory bodies are faced with the challenge of finding a subtle mix between a too binding regulation (which would reduce risks for the financial stability at a potential cost of investors choosing less regulated and hence riskier products) and a too permissive one (which would still keep investors but would leave the sector subject to future turmoils).

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# Résumé en Français

Le développement financier favorise la croissance. Telle est la conclusion d'une abondante littérature, bien que des questions relatives à la causalité de cette relation (Robinson (1952), Lucas (1988)), aux variables utilisées et à la méthodologie employée soient encore discutées par les économistes<sup>23</sup>. Le développement financier s'accompagne de l'émergence et de la croissance des intermédiaires financiers. La fonction première de ces acteurs est de servir d'intermédiaire entre les prêteurs et les emprunteurs et donc de diriger de manière optimale les fonds des premiers vers les seconds.

Les intermédiaires financiers peuvent être divisés en banques et intermédiaires financiers non bancaires (IFNB). Le secteur des IFNB est composé de plusieurs types d'institutions financières. Parmi celles-ci, les compagnies d'assurance, les fonds de pension et les fonds d'investissement représentent plus de 60% du secteur des IFNB (Conseil de stabilité financière (FSB) FSB (2021a)). La taille du secteur des IFNB a également augmenté : selon le FSB (2021a), en 2020, les IFNB gèrent près de 50% des actifs financiers mondiaux, contre 42% en 2008. Cependant, au cours des dernières années, les fonds d'investissement ont augmenté la part de leurs activités dans le total des activités non bancaires. Selon le FSB (2021a), dans la zone euro, les autres intermédiaires financiers (qui sont principalement composés de fonds d'investissement) géraient près de 40% des actifs non bancaires en 2020, contre 23% en 2008.

Les régulateurs et les académiques ont consacré un grand nombre d'études aux vulnérabilités potentielles des fonds communs de placement étant donné leur importance croissante dans le système financier et des tensions importantes qu'ils ont subies au cours de différentes périodes de turbulence.

Afin d'améliorer la résilience du système financier, il est donc important de mieux comprendre le fonctionnement des fonds communs de placement, les raisons de leur fort

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<sup>23</sup>Voir Levine (2005) pour une discussion de la littérature empirique relative à la relation entre finance et croissance.

développement ces dernières années et le rôle qu'ils jouent en période de stress. En outre, un sujet important lié au dernier point est l'identification et la compréhension des sources potentielles de risques découlant des activités de ces différents acteurs.

### **L'activité des fonds de placement**

Les fonds d'investissement sont des intermédiaires financiers qui investissent dans différents types de titres avec les ressources collectées par l'émission aux investisseurs un accès direct aux marchés financiers. Afin de calculer le prix des parts, le portefeuille est évalué dans la plupart des cas sur une base quotidienne (bien que certains fonds l'évaluent à une fréquence hebdomadaire ou inférieure). Si un investisseur souhaite racheter ses parts (ou investir dans un fonds), il recevra (paiera) la valeur de liquidation de la part. Dans le cas des fonds ouverts, le prix de ces parts est fixé à leur valeur liquidative (NAV) de fin de journée, qui est calculée en divisant la différence entre le total de l'actif et des dettes par le nombre total de parts. Un fonds commun de placement émet généralement différents types de parts, qui visent différents types d'investisseurs. Par exemple, les parts peuvent différer de par leurs distributions des gains (capitalisés ou distribués aux investisseurs), leurs frais de gestion, leurs montants d'investissement minimum requis, etc. L'objectif de l'émission de parts présentant des caractéristiques différentes est d'attirer différents types d'investisseurs. Par exemple, les investisseurs particuliers préféreront les parts dont l'investissement minimum est faible mais dont les frais sont plus élevés, tandis que les investisseurs institutionnels s'orienteront vers les parts dont les frais sont faibles mais dont l'investissement minimum est élevé.

Il existe une multitude de types de fonds communs de placement dans le système financier. Tout d'abord, nous pouvons différencier les fonds en fonction de leur structure : fonds ouverts, fonds fermés, etc. Dans la suite de l'introduction, nous ne décrirons que les fonds ouverts, car les différentes études présentées dans cette thèse de doctorat n'incluent que des fonds ayant cette structure.

Les fonds ouverts calculent généralement leur NAV à la fin de chaque journée et acceptent les rachats de manière quotidienne (les fonds rachètent les parts des investisseurs sortants à leur NAV). Ils créent également de nouvelles parts si de nouveaux investisseurs entrent dans le fonds ou si un investisseur existant souhaite élargir sa participation. Ces fonds sont les plus représentés dans l'espace des fonds d'investissement et leur croissance

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a été substantielle tant aux États-Unis que dans l'espace européen : selon le Investment Company Institute (2021), les actifs gérés par les fonds ouverts mondiaux sont passés de 28,4 billions de dollars fin 2011 à 63,1 billions de dollars fin 2020. La plupart des fonds sont domiciliés soit aux États-Unis, soit en Europe (selon le Investment Company Institute (2021), en décembre 2020, les fonds européens et américains gèrent 82% des actifs de cette catégorie).

Deuxièmement, en plus d'une différenciation en fonction de leur structure, les fonds peuvent également être différenciés en fonction des titres dans lesquels ils investissent :

- Les fonds monétaires (MMF) investissent généralement dans des instruments du marché monétaire. Comme ces fonds visent à préserver la valeur des investissements tout en générant un faible rendement, ils investiront dans des instruments à court terme présentant une qualité de crédit élevée. La réglementation de ces fonds est plus contraignante, par rapport à celle à laquelle doivent se conformer les autres types de fonds. En particulier, contrairement aux autres fonds, les OPC monétaires doivent respecter des règles spécifiques concernant les titres dans lesquels ils peuvent investir, et ils sont également soumis à des exigences de liquidité et de maturité qui dépendent de leur type selon la réglementation. Il existe également des règles spécifiques concernant la fixation du prix de leurs parts (certains fonds sont autorisés à conserver une NAV constante, tandis que d'autres MMFs affichent une NAV variable).
- Fonds actions investissent dans des actions ordinaires. Ces fonds peuvent également être différenciés en fonction du pays d'origine des actions, des secteurs d'émission des actions, des actions de revenu ou de croissance, etc.
- Les fonds obligataires investissent principalement dans des titres de créance. Comme les fonds d'actions, les fonds obligataires peuvent être différenciés en fonction du pays d'émission des obligations, de leur qualité de crédit, de leur échéance, etc.
- Les fonds hybrides sont autorisés à investir à la fois dans des obligations et des actions.
- D'autres fonds comme les hedge funds, les fonds immobiliers etc.



## **Les avantages des fonds de placement**

Les fonds d'investissement ont commencé à se développer fortement dans les années '80 et '90 en raison des nombreux avantages qu'ils offrent aux investisseurs. Tout d'abord, ils offrent la possibilité de bénéficier, même pour les petits épargnants, d'un portefeuille diversifié et de réduire les coûts de transaction. À cet égard, ils offrent la possibilité à tous les investisseurs d'accéder directement aux marchés financiers. Deuxièmement, ils permettent aux investisseurs de bénéficier de services de liquidité. Un investisseur d'un fonds peut ainsi effectuer des rachats dans le fonds généralement à la fin de chaque journée, sans avoir besoin de vendre son portefeuille s'il devait lui-même investir dans un panier de titres. Troisièmement, les investisseurs bénéficieront de l'expérience d'un gestionnaire de fonds professionnel qui est censé être capable de maximiser les rendements futurs tout en minimisant les risques. Cependant, l'information n'est pas parfaite entre les investisseurs et les gestionnaires de fonds. En effet, les gestionnaires de fonds peuvent ne pas agir dans le meilleur intérêt des investisseurs et leur cacher des informations. Par conséquent, un contrat d'agence (que nous verrons plus en détail dans la deuxième section de l'introduction) existe entre les investisseurs et les gestionnaires de fonds, dans le but d'inciter les gestionnaires de fonds à agir dans l'intérêt des investisseurs. En pratique, la rémunération des gestionnaires de fonds dépend du niveau des actifs sous gestion. Des primes peuvent être accordées en cas de surperformance du fonds.

Outre les avantages susmentionnés qu'ils offrent aux investisseurs, l'activité des fonds communs de placement présente également des avantages pour le système financier. Premièrement, les marchés financiers (dans lesquels les fonds communs de placement jouent un rôle important) offrent une source de financement supplémentaire pour l'économie réelle, qui complète celle fournie par les banques. Les fonds communs de placement peuvent donc faire office de "roue de secours" lorsque les banques sont soumises à des tensions (Fischer (2015), IMF (2015)). En effet, les entreprises peuvent se financer en émettant des actions ou des obligations qui sont achetées par des fonds (au lieu d'obtenir un prêt auprès d'une banque). Cependant, il est important de noter que toutes les entreprises n'ont pas la capacité d'émettre des actions ou des obligations (en général, les petites et moyennes entreprises se financent en grande partie par des prêts bancaires). Deuxièmement, la présence et l'importance des fonds communs de placement encouragent également les acteurs financiers à émettre des titres. Dans le cas des obligations, Zhu (2021) montre

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par exemple que les flux de fonds encouragent l'émission de nouvelles obligations pour les entreprises dans lesquelles les fonds obligataires détiennent une grande partie des obligations émises. En outre, ces entreprises bénéficient également de rendements demandés plus faibles sur leurs obligations. Troisièmement, par leurs échanges, ils contribuent également à la liquidité sous-jacente, en particulier dans des conditions de marché normales (selon le Investment Company Institute (2021), le taux de rotation moyen des fonds d'actions américains entre 1985 et 2020 est de 54% ).<sup>24</sup>

### **Les fonds de placement pendant les crises**

Si l'intermédiation financière encourage l'investissement et, in fine, la croissance économique, ses acteurs peuvent subir des sorties importantes dans des conditions de marché tendues, et ils peuvent, par leurs actions, contribuer à la transmission des chocs entre les acteurs du système financier. Par exemple, les fonds communs de placement ont été soumis à des tensions importantes lors de la crise de 2008 (GFC) et, plus récemment, lors de la crise de la COVID-19. Par exemple, pendant la crise de 2008, dans le segment des fonds monétaires (MMF), les MMF plus risqués (autorisés à investir dans des titres plus risqués, tels que les billets de trésorerie et les certificats de dépôt) ont subi des sorties importantes, dans un contexte de flight-to-quality. Un certain nombre d'OPC monétaires ont dû fermer ou suspendre les rachats, tandis que d'autres ont bénéficié du soutien des sponsors (Bengtsson (2013), Baba et al. (2009)). Les flux de sortie élevés des OPC monétaires non-gouvernementaux ont entraîné une diminution des liquidités disponibles pour les banques, ainsi que pour d'autres entreprises émettant des titres de créance (IMF (2008)). D'autres fonds communs de placement, tels que les fonds spéculatifs exposés aux titres adossés à des créances hypothécaires, ainsi que les fonds d'actions investissant principalement dans des sociétés financières ont également été exposés à des sorties importantes (IMF (2008)). Les stratégies de vente de ces fonds ont joué un rôle important pendant la crise<sup>25</sup>, car la vente en urgence d'actifs illiquides pouvait faire baisser davantage leur prix et avoir un impact sur les autres participants par le biais d'expositions

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<sup>24</sup>Cependant, en période de crise, il est important de noter que tous les fonds ne fournissent pas de liquidité au marché. En effet, comme le démontre Wang et al. (2020), les fonds disposant de moins de liquidités, d'obligations d'entreprises moins liquides et d'une relation flux-performance plus marquée (ce qui est synonyme de besoins de liquidité plus élevés) achètent dans une moindre mesure des obligations vendues en urgence par les compagnies d'assurance.

<sup>25</sup>En effet, comme le montre Manconi et al. (2012), les fonds communs de placement exposés aux obligations titrisées ont vendu des obligations corporate. Ce comportement a contribué à une transmission du stress du segment titrisé du marché obligataire vers le segment corporate.

communes par exemple.

Après la crise financière mondiale, il est devenu évident qu'une meilleure compréhension des risques liés aux activités des fonds communs de placement était nécessaire. En outre, la crise de 2008 a révélé la nécessité de mieux évaluer et traiter l'interaction des sources de fragilités entre les banques et les fonds communs de placement. En réponse à la gravité de la crise de 2008, les régulateurs ont pris des mesures afin de mettre en place un cadre plus adapté pour une réglementation mondiale. Par exemple, dans l'espace non bancaire, les régulateurs ont adopté des réformes concernant les fonds monétaires (MMF) ainsi que d'autres entités que les MMFs parmi d'autres réformes (US Securities and Exchange Commission SEC (2010), ou le règlement MMF (UE) 2017/1131 en Europe). Toutefois, comme l'indique le rapport annuel du FSB (2021c), "la mise en œuvre des réformes des IFNB se poursuit, mais elle est à un stade plus précoce que d'autres réformes" (FSB (2021c), p.2).

L'importance croissante des fonds d'investissement dans le secteur financier et leur contribution à l'amplification des déséquilibres, notamment en période de stress, sont sous les feux de la rampe depuis le GFC et la crise de la COVID-19 et les appels à la mise en place d'une politique macroprudentielle ciblée sur les intermédiaires non bancaires se sont multipliés (ESRB (2016), Schnabel (2021), de Guindos (2021)). Plus récemment, pendant la crise de la COVID-19, les fonds communs de placement ont de nouveau été mis à rude épreuve, les fonds d'obligations corporate plus risqués et les MMFs de dette privée connaissant des sorties de fonds importantes. Cela a contribué à la baisse des prix et à une liquidité limitée pour les billets de trésorerie ou les obligations des entreprises, par exemple (FSB (2020a)). Une meilleure compréhension de leur fonctionnement et des risques inhérents à leur activité, ainsi que des mécanismes par lesquels ces risques peuvent être transmis à l'ensemble du système est donc cruciale pour mieux réglementer le secteur.

Dans la suite de l'introduction, nous nous concentrerons plus particulièrement sur les vulnérabilités présentées par les fonds ouverts et leurs conséquences potentielles sur la stabilité du système financier. Dans la première section, nous expliquons qu'en raison du conflit d'agence qui existe entre les gestionnaires et les investisseurs, ces derniers vont fournir des incitations aux premiers en évaluant les fonds en fonction de leurs performances. Une relation convexe flux-performance émerge ainsi pour les fonds d'actions, où les bonnes performances sont récompensées par des flux entrants, tandis que les mau-

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vaises performances ne sont pas punies par des flux sortants. La forme convexe de cette relation créera à son tour des incitations dangereuses pour les gestionnaires de fonds, qui prendront plus de risques et adopteront un comportement grégaire. Dans la deuxième section, nous expliquons que, dans un contexte de faibles taux d'intérêt après la crise de 2008 et la crise de la dette, l'intérêt des régulateurs et des académiques s'est tourné des fonds actions vers les fonds obligataires. Les fonds obligataires sont moins liquides que les fonds d'actions, ce qui contribue à l'émergence d'une prime au premier sortant (first-mover advantage) et de risques de run. La relation flux-performance n'est plus convexe, mais les investisseurs se retirent également à la suite de mauvaises performances. La politique monétaire accommodante a également contribué à ce que les gestionnaires investissent une part plus importante de leur portefeuille dans des titres plus risqués, ce qui contribue à accroître la prime au premier sortant. En cas de conditions de marché tendues, le stress que connaissent les fonds communs de placement pourraient également s'étendre à d'autres acteurs financiers.

## **1 Les fonds de placement et les décisions d'investissement sous-optimales**

Comme décrit précédemment, les décisions d'investissement peuvent être prises par l'investisseur lui-même ou être déléguées à un gestionnaire de portefeuille. Les premiers travaux sur les fonds communs de placement se sont concentrés sur l'analyse de l'efficacité de la gestion déléguée du portefeuille et sur les conséquences de la gestion intermédiée du portefeuille sur les prix. En d'autres termes, l'épargne des investisseurs est-elle allouée de manière optimale et dans leur meilleur intérêt ? Deux thèmes sous-jacents sont liés à cette question de recherche, qui traitent tous les deux du conflit d'agence qui existe entre les investisseurs et les gestionnaires. Dans la première sous-section, nous analyserons le conflit d'agence (c'est-à-dire avant que l'investisseur ne choisisse le fonds). Nous examinerons comment les investisseurs incitent les gestionnaires à respecter leurs intérêts. Nous discuterons également les caractéristiques des fonds que les investisseurs prennent en compte lors du choix des fonds. Dans la deuxième sous-section, nous montrons que les incitations données par les investisseurs peuvent avoir des effets néfastes du point de vue

de la stabilité financière.

## 1.1 Le contrat d'agence entre les investisseurs et les managers

La relation entre les investisseurs et les gestionnaires de fonds est caractérisée par une asymétrie d'information. Plus particulièrement, les investisseurs ne peuvent pas évaluer les capacités des gestionnaires. Ils ne peuvent pas non plus connaître à chaque instant la composition du portefeuille. Ce conflit d'agence doit être limité, sinon un investisseur choisira un fonds qui ne lui convient pas en termes de profil de risque. Ainsi, un contrat principal-agent doit être établi pour que le gestionnaire (ou l'agent) agisse en fonction des intérêts de l'investisseur (ou le principal). Les gestionnaires seront donc incités par les investisseurs à agir dans l'intérêt de ces derniers.

Ainsi, selon Rajan (2006) et Ma et al. (2019), les investisseurs fourniront des incitations basées sur la performance aux gestionnaires de fonds en liant la rémunération du gestionnaire à la performance du fonds. Les investisseurs peuvent également fournir des incitations aux gestionnaires en dirigeant leur argent vers les plus performants (IMF (2015)). Comme l'affirme IMF (2015), ces deux manières de fournir des incitations sont liées si "la rémunération augmente avec les actifs sous gestion" (IMF (2015), p.100). En revanche, lorsqu'un fonds affiche de mauvaises performances, les investisseurs rachètent leurs parts "avec une inertie importante" (Rajan (2006), p.316). La performance des fonds est donc un élément clé que les investisseurs peuvent utiliser pour évaluer les fonds. En effet, plusieurs articles démontrent que les investisseurs interprètent les rendements passés comme un indicateur de la performance d'un gestionnaire, ce qui explique pourquoi ils se dirigent vers les bons rendements passés et se détournent des mauvais rendements passés (Ippolito (1992), Berk and Green (2004)).<sup>26 27</sup>

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<sup>26</sup>Ce résultat s'étend à la question plus générale de savoir si les performances passées sont un indicateur des performances futures, c'est-à-dire si la performance d'un fonds commun de placement présente une persistance. Alors que Grinblatt and Titman (1992), Hendricks et al. (1993), Brown and Goetzmann (1995) trouvent des preuves de la persistance de la performance, Carhart (1997) montre que "des facteurs communs dans les rendements des parts et les dépenses d'investissement expliquent presque complètement la persistance du rendement moyen et du rendement ajusté du risque". (Carhart (1997), p. 57) et Wermers (1997) prouvent que la persistance des performances est due aux stratégies de type momentum.

<sup>27</sup>Plus généralement, diverses études ont analysé si les investisseurs sont suffisamment "intelligents" pour détecter les performances futures, sur la base du rendement passé affiché par un fonds. Si cela est démontré, l'existence d'un "smart-money effect" est prouvée, ce qui permettrait aux fonds enregistrant de fortes entrées d'afficher des performances futures élevées. Certains articles démontrent que c'est effectivement le cas (Gruber (1996), Zheng (1999), Keswani and Stolin (2008)). Cependant, des publi-

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Il existe un grand nombre d'études qui examinent la relation entre les flux et les rendements passés. Dans le cas des fonds d'actions, plusieurs articles ont démontré que cette relation est convexe, ce qui signifie qu'un fonds enregistrera des flux entrants s'il a eu une bonne performance passée, mais que les flux sortants sont expliqués dans une moindre mesure par une faible performance passée (Sirri and Tufano (1998), Chevalier and Ellison (1997), Del Guercio and Tkak (2002), Chen et al. (2010), Bellando and Tran-Dieu (2011), Del Guercio and Reuter (2014), Goldstein et al. (2017) entre autres)<sup>2829</sup> De nombreux articles ont tenté de fournir différentes explications sur la forme de cette relation.

### **Les explications de la convexité de la relation flux-performances**

Premièrement, la recherche de bonnes performances passées n'est pas un indicateur de décisions rationnelles. Bailey et al. (2011), par exemple, démontrent que les investisseurs biaisés fondent dans une plus large mesure leurs décisions sur les performances passées. Cependant, Lynch and Musto (2003) affirment que les mauvaises performances passées ne donnent aucun signal sur les rendements futurs, car les fonds abandonnent les stratégies qui les ont conduits à la sous-performance. Cela pourrait expliquer la forme convexe de la relation flux-performance car les investisseurs ne rachèteront pas leurs parts à la suite d'une mauvaise performance étant donné que le fonds changera de stratégie.

Deuxièmement, plusieurs articles (Sirri and Tufano (1998), Huang et al. (2007), Fu et al. (2012)) expliquent le rôle des coûts (frais de fonds, coûts de transaction liés aux retraits et coûts d'entrée, coûts de participation) sur la relation flux-performance des fonds. En effet, il est coûteux de sortir d'un fonds et de chercher une meilleure alternative (Huang et al. (2007) parlent de "coûts de participation"). Comme l'explique Huang et al.

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cations plus récentes soutiennent que leurs résultats s'expliquent par une hypothèse de "persistance des flux", et qu'une fois que l'on contrôle pour cette explication, les bonnes performances passées ne seront certainement pas les performances futures (Wermers (2003), Lou (2012), Jiang and Yuksel (2017)).

<sup>28</sup>Il n'y a pas de consensus dans la littérature concernant la mesure de performance la plus appropriée à utiliser. Premièrement, les académiques se demandent si les investisseurs fondent leurs décisions sur des rendements bruts ou ajustés au risque (tels que le ratio de Sharpe ou les alphas estimés selon différents modèles factoriels afin de contrôler la sophistication des investisseurs). Deuxièmement, les articles varient quant à l'utilisation d'une mesure absolue ou relative de la performance. En effet, on peut considérer que les investisseurs classent les fonds entre eux, ce qui expliquerait pourquoi une mesure relative de la performance devrait être utilisée. Troisièmement, l'horizon d'investissement que les investisseurs utilisent est également incertain (réagissent-ils aux rendements mensuels passés ou à des rendements à plus long terme?). Indépendamment de la mesure de performance utilisée, la littérature s'accorde sur la forme du flux-performance pour les fonds d'actions.

<sup>29</sup>La plupart des articles susmentionnés analysent le marché américain. Ferreira et al. (2012) examine la convexité de la relation flux-performance dans un panel de pays présentant différents niveaux de développement. Ils constatent que la relation flux-performance présente un degré de convexité d'autant plus faible que le pays est développé.

(2007), "étant donné les barrières de participation au niveau du fonds, davantage de nouveaux investisseurs sont en mesure de surmonter leurs coûts de participation pour investir dans un fonds uniquement lorsque sa performance s'améliore" (Huang et al. (2007), p. 1305). Sirri and Tufano (1998) montrent également que les fonds ayant des coûts de recherche plus faibles (en raison d'un marketing plus important par exemple) afficheront une relation flux-performance plus prononcée.

Enfin, l'économie comportementale a également tenté d'expliquer pourquoi les investisseurs ne se retirent pas des fonds peu performants. Goetzmann and Peles (1997) expliquent ce résultat par la présence d'une dissonance cognitive, c'est-à-dire que les investisseurs dans des fonds peu performants ont tendance à surestimer leur performance.

Dans cette sous-section, nous avons démontré que les investisseurs prennent en compte les rendements des fonds lorsqu'ils les évaluent. Ce constat conduit à la question de recherche suivante : quelle est la relation entre les flux et les rendements passés ? Dans le cas des fonds actions, il a été démontré que la relation flux-performance est convexe. Cependant, la prochaine sous-section montrera que cette forme de la relation flux-performance peut conduire à un choix sous-optimal des titres par le gestionnaire.

## 1.2 La relation flux-performance et ses incitations

Un conflit d'agence ex-post existe entre les gestionnaires de fonds et les investisseurs. Plus particulièrement, une fois que l'investisseur a sélectionné le fonds sur la base de ses performances passées, il ne peut pas contrôler le choix du portefeuille du gestionnaire. Dans cette section, nous démontrerons que récompenser les fonds le plus performants par des entrées (sans punir les perdants par des sorties) fournira des incitations dangereuses aux gestionnaires, ce qui peut avoir des effets néfastes sur les prix des titres et la stabilité financière.

La relation positive entre les flux et les performances peut conduire à des **incitations de prise de risque**. (Morris and Shin (2014)). En effet, les gestionnaires pourraient être incités à investir dans des portefeuilles plus risqués dans le but d'augmenter leurs performances futures et de maximiser leur rémunération. La littérature sur les tournois est riche et fournit des indications utiles sur la présence d'incitations à la prise de risque. Brown et al. (1996) trouvent que dans une tentative d'augmenter leur performance relative, les

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perdants au milieu d'année afficheront un portefeuille ayant une plus forte volatilité par rapport aux gagnants au milieu d'année. Basak et al. (2007) démontrent également qu'un fonds ayant une performance supérieure ou identique à celle d'un indice aura tendance à imiter l'indice afin de sécuriser ses gains, tandis qu'un fonds ayant une sous-performance par rapport à un indice augmentera le risque de son portefeuille sous certaines conditions. Gorjaev et al. (2001) et Palomino (2005) considèrent le cas de deux fonds ayant des objectifs de classement relatif. Ils trouvent qu'un perdant au milieu de l'année prendra plus de risques dans la deuxième partie de l'année.

Cependant, les résultats de certains articles ne sont pas en accord avec ceux mentionnés précédemment. Busse (2001) constate que les résultats rapportés dans Brown et al. (1996) sont confirmés lorsqu'on utilise des données mensuelles, mais qu'ils disparaissent complètement lorsqu'on utilise des données quotidiennes. Ils affirment que ce résultat "provient du biais dans les estimations de l'écart-type mensuel de la déviation" (Busse (2001), p.54). Carhart et al. (2002) montrent que les fonds gagnants appliquent une stratégie de "portfolio pumping", qui leur permet d'afficher une forte performance à la fin du trimestre. Plus précisément, ils manipulent les prix des actions à la fin du trimestre en achetant des positions existantes, ce qui fait monter leurs prix, avec un retournement ultérieur le premier jour du trimestre suivant. Taylor (2003) montre qu'un fonds gagnant au milieu d'année sera incité à prendre plus de risques car il anticipe que le fonds perdant fera de même. Cette incitation sera d'autant plus forte que les rendements attendus des actions sont élevés dans la seconde partie de l'année. Jans and Otten (2002) démontrent empiriquement que l'existence d'un comportement de tournoi dépend de la période d'étude : entre 1989 et 1996, un comportement de tournoi existe, mais entre 1997 et 2003, les gestionnaires gagnants seront plus susceptibles d'augmenter les risques, comme dans le modèle théorique de Taylor (2003).

Ce sujet est également traité dans la littérature plus récente. Ferreira et al. (2012) par exemple montrent que les gestionnaires sont incités à prendre plus de risque plus la relation flux-performance est convexe. Basak and Makarov (2012) constatent que les fonds gagnants en milieu d'année visent un portefeuille plus volatil que les fonds perdants en milieu d'année et ils affirment que leurs résultats sont en fait "cohérents avec un modèle de tournoi rationnel" (Basak and Makarov (2012), p.379).

Comme les investisseurs récompensent les fonds ayant des performances élevées, les



gestionnaires peuvent être incités à investir dans les mêmes actifs, c'est-à-dire à adopter un comportement grégaire. Un grand nombre d'études se concentrent sur les modèles de "herding". Pour une revue complète de la littérature, voir Cai et al. (2019) qui distingue les modèles dans lesquels les agents ignorent leurs informations privées et les modèles dans lesquels les décisions des investisseurs sont guidées par les fondamentaux. Pour les fonds communs de placement américains, Wermers (1999) constate que les fonds d'investissement adoptent un comportement grégaire autour des actions des entreprises à faible capitalisation, tandis que Brown et al. (2014) montre que les fonds communs de placement font du "herding" en fonction des recommandations des analystes. Le comportement grégaire des OPCVM a également été étudié dans le cas français. En effet, Arouri et al. (2013) démontre que les fonds d'actions français adoptent un comportement grégaire, et qu'ils ont tendance à se regrouper à un degré plus élevé dans les entreprises à faible capitalisation.

En résumé, avant la crise, différentes études se sont intéressées à la question de savoir si la gestion de portefeuille déléguée représentait un choix optimal pour les investisseurs. La question de savoir quel contrat entre investisseurs et gestionnaires d'actifs était optimal a également été analysée. En pratique, comme le montrent Rajan (2006), Ma et al. (2019), les investisseurs incitent les gestionnaires à agir dans leur intérêt en liant la rémunération du gestionnaire aux rendements du fonds. Les fonds qui obtiennent de bons résultats recevront des flux, les investisseurs étant relativement inertes face aux mauvais résultats (Rajan (2006)). Cette relation convexe flux-performance conduit à des incitations à la prise de risque et à un comportement grégaire parmi les gestionnaires de fonds, comme décrit précédemment par différentes études.

Si les académiques et les régulateurs étaient conscients de ces différentes vulnérabilités avant la crise de 2008, ils n'ont pas anticipé les risques de run auxquels sont soumis les fonds communs de placement et les risques de contagion qui ont été révélés par la crise financière mondiale.

## **2 Les fonds de placement et le risque de run**

La crise de 2008 a changé la façon dont les régulateurs et le monde académique perçoivent les risques présentés par les fonds communs de placement. Si la crise financière

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mondiale n'a pas été provoquée par les fonds communs de placement, elle a révélé que ces acteurs font face à une prime au premier sortant et sont capables de transmettre des chocs aux autres acteurs du système financier. Dans cette section, nous proposerons une nouvelle interprétation de la relation flux-performance, nous décrirons également le rôle joué par les politiques monétaires accommodantes sur les risques pris par les gestionnaires de fonds et nous terminerons par une analyse des risques de contagion qui existent entre les fonds et les autres acteurs financiers.

## 2.1 Une nouvelle interprétation de la relation flux-performance

Comme décrit dans la section précédente, la littérature pré-existante a analysé la relation flux-performance dans le contexte d'un tournoi entre fonds qui se font concurrence pour attirer les flux entrants. La convexité de la relation incite les gestionnaires à investir dans des titres plus risqués et à adopter un comportement grégaire, car les investisseurs des fonds ne puniront pas les mauvais résultats par des rachats importants. Cependant, pendant la crise financière de 2008, certains fonds communs de placement ont fait l'objet de rachats importants, les investisseurs se cherchant la liquidité et la sécurité des titres moins risqués. Par conséquent, les régulateurs et les académiques ont porté leur attention sur l'existence d'un risque de run dans les fonds communs de placement et sur les conditions dans lesquelles ce risque peut être amplifié. Il existe un consensus dans la littérature sur le fait que dans les fonds plus risqués, le mode de fonctionnement du fonds créera des complémentarités stratégiques<sup>30</sup> ce qui conduira les fonds peu performants à connaître des rachats. Par conséquent, dans les fonds plus risqués, la question de stabilité financière liée à la relation flux-performance sera la présence d'un risque de ruée et les conditions dans lesquelles ce risque sera amplifié.

### **Le mécanisme du risque de run**

L'origine du risque de run se trouve dans le mode de fonctionnement du fonds et dans les règles de fixation du prix de la part. Un investisseur qui souhaite racheter sa part notifie sa décision au fonds et reçoit le prix de l'action (ou la NAV) calculé à la fin du jour en question. Afin de rembourser les investisseurs qui se retirent, le fonds devra procéder

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<sup>30</sup>Par complémentarités stratégiques nous entendons que les investisseurs qui sortent d'un fonds imposent un coût aux investisseurs restants, incitant ainsi ces derniers à également racheter leurs parts.

à un changement de portefeuille, une activité qui s'accompagne de coûts de transaction et qui pourrait potentiellement être effectuée avec une décote ou avoir un impact sur le prix du reste du portefeuille du fonds, surtout dans des conditions de marché tendues. Le jour suivant, le portefeuille sera réévalué sur la base d'une évaluation au prix du marché et les pertes potentielles sur les évaluations des titres seront enregistrées, ce qui pourrait entraîner une baisse de la NAV pour les investisseurs restant dans le fonds. Ainsi, un investisseur sera incité à se retirer avant les autres afin d'éviter de subir des pertes sur son investissement. Cette complémentarité stratégique aura des conséquences plus graves en cas de sorties importantes (en réponse desquelles les fonds devront vendre plus d'actifs, éventuellement avec une décote) et dans le cas d'un portefeuille moins liquide (il sera plus difficile de vendre des actifs illiquides sans accepter une perte potentielle, surtout en période de stress).

### **L'effet des rentabilités sur les flux: preuves empiriques**

Comme décrit ci-dessus, plus le fonds est illiquide, plus les complémentarités stratégiques seront importantes. En effet, il est plus coûteux de vendre des actifs illiquides (surtout en période de crise), ce qui entraînera un coût de liquidité plus élevé imposé aux investisseurs restants. Par conséquent, du point de vue de la stabilité financière, nous nous inquiétons d'un risque de ruée si les investisseurs rachètent leurs parts suite à de mauvaises performances dans des fonds plus illiquides et plus risqués. Les obligations étant généralement plus illiquides que les actions, le risque de ruée a été largement étudié dans le cas des fonds obligataires.

Contrairement aux fonds actions, plusieurs articles ont prouvé que les investisseurs réagiront en réponse aux mauvaises performances passées, c'est-à-dire que la relation entre les flux et les rendements passés n'est pas convexe (Goldstein et al. (2017), Chen and Qin (2017), IMF (2015), Wang (2015) entre autres articles). Cependant, la mesure dans laquelle les investisseurs réagissent aux faibles performances passées dépend des différentes caractéristiques des fonds et des conditions financières.

Tout d'abord, la prime au premier sortant étant plus importante dans les fonds obligataires plus illiquides, les flux afficheront une plus grande sensibilité aux rendements passés dans les fonds disposant de moins de liquidités ou dans les fonds qui détiennent une plus grande proportion de leur portefeuille investi en actifs illiquides (Goldstein et al.

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(2017), Wang (2015)). Falato et al. (2021a), Ma et al. (2020) montrent également que le degré d'illiquidité du portefeuille joue un rôle dans l'explication des sorties de fonds obligataires, les fonds les plus illiquides subissant davantage de sorties par rapport à leurs pairs liquides pendant la crise de la COVID-19. En outre, Falato et al. (2021a) montrent que des sorties plus importantes sont subies par les fonds les plus vulnérables, c'est-à-dire ceux avec plus de titres en commun avec d'autres fonds et dont les titres sont plus probablement impactés dans leurs prix. Dans le domaine des fonds monétaires, Li et al. (2021), Cipriani and La Spada (2020), ECB (2020) montrent notamment que les OPCVM monétaires autorisés d'investir dans des instruments du marché monétaire plus risqués (tant en Europe qu'aux États-Unis) ont également subi des sorties importantes, les investisseurs se tournant dans une large mesure vers les OPCVM monétaires de dette publique (comportement de fuite vers la sécurité ou "flight-to-safety").

Deuxièmement, les conditions financières jouent un rôle dans la décision des investisseurs de fonds obligataires de se retirer suite à de mauvaises performances. Par exemple, Falato et al. (2021a) montre que l'épisode COVID-19 a été extraordinaire pour les fonds d'obligations corporate, les sorties atteignant des niveaux plus élevés que lors de l'épisode Taper Tantrum de 2013<sup>31</sup>. En effet, les coûts de liquidité imposés par les investisseurs sortants aux investisseurs passifs seront plus élevés pendant les périodes illiquides, car les actifs illiquides seraient vendus avec une décote plus importante. Dans le même ordre d'idées, Goldstein et al. (2017) prouvent que les investisseurs réagissent plus fortement aux mauvaises performances passées pendant les périodes illiquides.

Troisièmement, la relation flux-performance est également conditionnée par le type d'investisseurs des fonds. Goldstein et al. (2017) démontrent que les investisseurs institutionnels sont plus sensibles à la performance et ils expliquent ce résultat par une plus grande sophistication de ces investisseurs, qui disposent de capacités plus élevées pour surveiller les gestionnaires de fonds. Cependant, les investisseurs institutionnels sont moins sensibles aux mauvaises performances des fonds plus illiquides que leurs homologues particuliers. Les auteurs expliquent ce résultat intéressant par le fait que les investisseurs institutionnels sont plus sophistiqués et plus conscients des conséquences de leurs décisions s'ils étaient amenés à racheter leurs parts des fonds illiquides : "Ils servent

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<sup>31</sup>L'épisode Taper Tantrum fait référence à une forte hausse des rendements obligataires suite à l'annonce d'une réduction future des achats d'actifs faite par le président de la Réserve Fédérale Ben Bernanke en mai 2013.

donc à réduire les problèmes de coordination qui conduisent à des ruées sur les fonds" (Goldstein et al. (2017), p. 608). Néanmoins, il convient de noter qu'il n'y a pas de consensus dans la littérature concernant ces résultats, puisque Wang (2015) trouve des résultats opposés.

Il existe donc un consensus dans la littérature selon lequel les investisseurs en fonds obligataires réagiront plus fortement aux mauvaises performances passées (par rapport aux investisseurs en fonds d'actions) étant donné les complémentarités stratégiques plus importantes auxquelles les investisseurs sont confrontés dans les fonds obligataires. Cependant, il est important de noter que l'existence d'une prime au premier sortant dépend également de l'influence des flux actuels sur les rendements futurs des fonds et des titres.

### **L'effet des flux sur les rentabilités: les preuves empiriques**

L'effet des flux sur les rendements des titres a été démontré par plusieurs articles.<sup>32</sup> Feroi et al. (2014) démontrent l'existence d'une boucle entre les flux et les prix des actifs, notamment dans les fonds obligataires. Coval and Stafford (2007) soutiennent qu'une pression temporaire sur les prix sera exercée en réponse aux flux sortants. Ben-Rephael et al. (2011) trouvent également que les flux conduisent à une pression temporaire sur les prix. Dans le cas des obligations corporate françaises, Coudert and Salakhova (2020) montrent que les flux de fonds influencent les rendements des obligations d'entreprises et que les rendements des obligations sont plus affectés par les flux sortants que par les flux entrants.

De plus, pendant la crise de la COVID-19, les sorties extrêmes subies par les fonds communs de placement ont exercé une pression sur les prix des titres et, in fine, sur le bon fonctionnement de l'économie. Jiang et al. (2022) construisent une mesure de fragilité des obligations, basée sur l'illiquidité moyenne du portefeuille des fonds obligataires et la taille relative d'un fonds dans une obligation donnée, par rapport aux autres fonds. Les résultats

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<sup>32</sup>Plusieurs articles aboutissent au résultat inverse, à savoir que les flux ne font pas baisser les prix des titres en dessous de leur valeur fondamentale. Choi et al. (2020), par exemple, trouvent peu de preuves d'une pression sur les prix exercée par des ventes en urgence suite à des sorties de fonds obligataires. Ils avancent qu'une explication potentielle est liée aux coussins de liquidité que les fonds maintiennent et utilisent afin de rembourser les investisseurs qui sortent des fonds. Hoseinzade (2016) trouve ce résultat pour les fonds d'obligations corporate et il soutient que ce résultat est dû aux gestionnaires de fonds qui ne vendent pas massivement les obligations illiquides et agissent donc par précaution. Czech et al. (2021) constate également que les flux de fonds communs de placement entraînent également, au cours du mois ou des deux mois suivants, des rendements positifs des obligations d'état ("gilts") britanniques. En outre, un résultat différent par rapport aux recherches précédentes est que l'effet sur les rendements des titres n'est pas temporaire

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plus récents de Jiang et al. (2022) font également écho aux résultats précédents, c'est-à-dire que les auteurs constatent que pour les obligations plus fragiles, une baisse de prix suivie d'un retournement se produit en réponse aux flux sortants. En outre, ces obligations semblent afficher une plus grande volatilité de leurs rendements, en particulier dans des conditions de marché tendues. Les auteurs affirment que ces résultats peuvent s'expliquer par les pressions de vente des investisseurs sous-jacents, à savoir qu'une obligation plus fragile souffrira d'une plus grande pression de vente. Haddad et al. (2021) démontrent également que les obligations davantage soumises à la pression de liquidation des fonds obligataires ont connu une baisse plus importante de leurs prix.

Une boucle entre les flux et les rendements des titres peut être renforcée plus les fonds communs de placement ont de participations en commun. En effet, Falato et al. (2021b) démontrent que les ventes en urgence peuvent avoir des effets néfastes sur les fonds obligataires qui détiennent les mêmes actifs et qu'elles contribuent à une baisse des rendements et à des sorties élevées des fonds homologues, ce qui encourage à son tour des ventes supplémentaires. Les résultats de Falato et al. (2021b) sont liés à deux questions de recherche sous-jacentes qui sont interconnectées, à savoir si les fonds communs de placement vendent des actifs qui ont mal performé (comportement procyclique) et si les fonds communs de placement investissent dans les mêmes titres (comportement grégaire). Ces questions de recherche sont interconnectées car les ventes en urgence des fonds qui ont un impact sur les prix auront un impact sur les fonds qui détiennent les mêmes actifs. À leur tour, les fonds pairs seront également incités à vendre des actifs peu performants puisqu'ils détiennent les mêmes actifs sous-performants.

En ce qui concerne la première question de recherche, Timmer (2018) démontre effectivement que les fonds communs de placement affichent un comportement procyclique. De plus, l'auteur montre que ce comportement procyclique augmente avec les sorties du fonds. Dans le même ordre d'idées, Raddatz and Schmukler (2012) démontrent que tant les gestionnaires de fonds que les investisseurs de fonds se retirent des pays qui connaissent des conditions de marché difficiles. Czech et al. (2021) montrent également que lors du Taper Tantrum de 2013, les fonds vendaient des obligations corporate suite à une augmentation de leurs rendements. Ce comportement procyclique se nourrit d'un comportement grégaire, qui peut contribuer à pousser les prix au-delà de leurs valeurs fondamentales. Cai et al. (2019) démontrent qu'un comportement grégaire est présent

dans les fonds communs de placement et que le comportement grégaire à la vente est plus fort que le comportement grégaire à l'achat. Les auteurs montrent également que le comportement de vente groupée est particulièrement présent dans les petites obligations illiquides après une baisse des prix. En outre, ce comportement grégaire contribue à des distorsions de prix : Wermers (2003) constate que les parts qui sont achetées de manière persistante surperforment celles qui sont vendues de manière persistante et qu'il n'y a pas de retournement de prix. Au contraire, Dasgupta et al. (2011), Brown et al. (2014), Cai et al. (2019) montre qu'il y a un renversement de prix sur le long terme.

Comme détaillé précédemment, plusieurs études fournissent des preuves que les flux de fonds ont un effet sur les rendements futurs des titres. Cependant, il est également important d'analyser si les flux de fonds influencent également les rendements futurs des fonds, contribuant ainsi à l'émergence de complémentarités stratégiques. Un certain nombre d'études se sont concentrées sur les conditions préalables susceptibles d'amplifier la prime au premier sortant.<sup>33</sup> <sup>34</sup> En effet, le prix futur de la part peut diminuer dans une plus large mesure si les gestionnaires de fonds répondent aux sorties actuelles en vendant plus d'actifs illiquides, ou si le fonds dispose de moins de liquidités ou d'actifs liquides, ce qui inciterait le fonds à utiliser ses actifs illiquides en premier. Dans un cadre empirique, Goldstein et al. (2017) et Wang (2015) pour les fonds obligataires et Chen et al. (2010) pour les fonds actions fournissent des preuves que les sorties diminuent les rendements des fonds et que cet effet est plus important dans les fonds avec plus d'actifs illiquides. En outre, Goldstein et al. (2017) souligne également l'importance des conditions financières, car ils constatent que dans les fonds obligataires, les sorties de fonds auront un impact plus important sur la future NAV pendant les périodes moins liquides. Zeng (2017) montre théoriquement que la vente d'actifs illiquides afin de reconstituer les réserves de liquidités

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<sup>33</sup>Les régulateurs et les académiques se sont efforcés d'identifier les mécanismes stabilisateurs qui pourraient permettre de réduire la prime au premier sortant. Une règle de swing pricing pour le calcul de la NAV a été proposée comme solution potentielle. Selon cette règle de tarification, les investisseurs désireux de vendre leurs parts supporteront les coûts de liquidité associés à leurs rachats. Plusieurs articles ont étudié l'efficacité d'une telle mesure : Jin et al. (2022) prouvent empiriquement que l'adoption du swing pricing réduit les sorties de fonds dans des conditions de marché sous pression et élimine la prime au premier sortant. Dans un cadre théorique, Capponi et al. (2020) montrent qu'une règle de swing pricing permet de transférer efficacement les coûts des investisseurs restants vers les investisseurs qui rachètent, permettant ainsi une réduction des complémentarités stratégiques. Lewrick et Schanz (2017) trouvent également que le swing pricing rend les sorties moins sensibles aux performances passées, mais que cet effet est limité dans un marché en stress.

<sup>34</sup>D'autres articles analysent les implications des règles de tarification de certains fonds qui se négocient à des prix obsolètes. Greene and Hodges (2002), Chalmers et al. (2001), Goetzmann et al. (2001) trouvent que les investisseurs sortants qui exploitent l'existence de prix obsolètes bénéficieront d'un rendement plus élevé et imposeront un coût aux investisseurs passifs qui choisissent de rester dans le fonds.

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aura une incidence négative sur la valeur liquidative future du fonds.

Les stratégies de vente des gestionnaires de fonds jouent donc un rôle important dans l'existence d'une relation entre les flux actuels et les rendements futurs.

### **L'impact des stratégies de vente sur la prime au premier sortant**

En réponse aux flux sortants, un gestionnaire de fonds doit faire un compromis entre la conservation de la liquidité de son portefeuille (au prix d'un rendement futur plus faible et au risque de vendre des actifs illiquides à une décote) et l'offre d'un rendement plus élevé à ses investisseurs (au prix d'une liquidité future plus faible du portefeuille). En effet, s'il est démontré que les fonds vendent d'abord les actifs les plus illiquides, en particulier dans des conditions de stress, leur comportement pourrait influencer dans une plus large mesure le prix des actifs et, in fine, les rendements futurs des fonds, contribuant ainsi à l'émergence d'une prime au premier sortant. Les actifs que les fonds communs de placement vendent en premier ont fait l'objet de plusieurs études. Notamment, les fonds peuvent répondre aux sorties de fonds de manière horizontale (en utilisant d'abord les liquidités ou en vendant d'abord les actifs les plus liquides) ou verticale (en vendant tous les types d'actifs, indépendamment de leur liquidité, au prorata). Chernenko and Sunderam (2016) constatent que les fonds d'actions et d'obligations corporate utilisent leurs liquidités pour faire face aux rachats. En outre, ils utilisent encore plus de liquidités pendant les périodes de faible liquidité du marché et détiennent des réserves de liquidités plus importantes si le fonds opère une plus grande transformation de liquidités. Toutefois, ces conclusions sont remises en question par des articles plus récents. Morris et al. (2017) montrent que les fonds obligataires vendent plus de titres et ont tendance à accumuler des liquidités en réponse aux rachats. Jiang et al. (2021) trouvent que les fonds d'obligations corporate répondent aux sorties de fonds en utilisant des liquidités ou en vendant les premiers actifs liquides (tels que les obligations d'État), ce qui est synonyme d'une "coupe horizontale" de leurs portefeuilles, mais ils passent à une "coupe verticale" en période d'incertitude élevée. Huang (2020), Girardi et al. (2017) constatent que les gestionnaires de fonds obligataires augmentent les liquidités et diminuent l'illiquidité de leur portefeuille par le biais des ventes (déduites des détentions trimestrielles) pendant les périodes où la volatilité attendue augmente. Ben-Rephael (2017) prouve également qu'en période de crise, les fonds communs de placement ont réduit leurs participations globales dans les



actions illiquides. En outre, la pression de vente peut être particulièrement importante, comme le montre Shek et al. (2018), dans le cas des fonds obligataires Emerging Market Economies (ou EME), les ventes discrétionnaires renforcent les ventes d'obligations dues aux rachats des investisseurs. Cette gestion dynamique du portefeuille peut avoir des conséquences néfastes. En effet, Zeng (2017) montre que la prime au premier sortant apparaît lorsque les fonds vendent des actifs illiquides afin de reconstituer leurs réserves de liquidités.

Toutefois, dans le contexte plus récent de la crise COVID-19, Ma et al. (2020) montrent que les fonds obligataires ont répondu aux sorties en vendant d'abord des obligations corporate et des bons du Trésor plus liquides, ce qui a contribué à une baisse de leurs rendements. O'Hara and Zhou (2021) constatent également que "lorsque la liquidité du marché commence à s'évaporer, les échanges se déplacent vers les obligations qui étaient plus liquides en temps normal" (O'Hara and Zhou (2021), p.47).

En résumé, les preuves sont mitigées quant à savoir si les gestionnaires de fonds communs de placement vendent d'abord des titres liquides ou illiquides en réponse aux sorties de fonds. Comme le démontrent un certain nombre d'articles, si les gestionnaires choisissent de vendre d'abord les actifs illiquides, cela pourrait augmenter les complémentarités stratégiques auxquelles les investisseurs sont soumis et, in fine, le risque de run du fonds. Toutefois, il convient de noter que ces dernières années, un nombre croissant de fonds ont investi une part plus importante de leur portefeuille dans des actifs plus risqués. À mesure que les portefeuilles deviennent plus risqués, les gestionnaires n'auront d'autre choix que de vendre des actifs illiquides. Il est donc crucial, du point de vue de la stabilité financière, de comprendre pourquoi les gestionnaires accumulent des avoirs illiquides.

Comme expliqué plus haut, l'une des raisons qui expliquent le choix du gestionnaire d'investir dans des titres illiquides est le modèle de tournoi : la rémunération du gestionnaire étant basée sur le montant des actifs sous gestion, les fonds sont en concurrence les uns avec les autres afin d'attirer les flux les plus élevés. Ils sont donc incités à prendre plus de risques, étant donné que les investisseurs préfèrent les fonds le plus performants. Toutefois, les incitations à la prise de risque ne proviennent pas seulement du modèle de tournoi auquel les fonds sont soumis, mais aussi de l'orientation de la politique monétaire en vigueur jusqu'à la crise de 2008 et au-delà.

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## 2.2 L'impact de la politique monétaire sur le portefeuille des fonds

Plus récemment, les régulateurs et les académiques se sont inquiétés de la poursuite générale d'un comportement de recherche de rendement, dans un contexte de taux d'intérêt bas à long terme et de politique monétaire non conventionnelle (UMP) appliquée par les banques centrales.

À mesure que les taux directeurs et les rendements à long terme de divers actifs diminuent, les investisseurs peuvent être poussés à rechercher des investissements alternatifs qui présentent un rendement plus élevé. Rajan (2006) et Borio and Zhu (2012), entre autres, soutiennent que dans un environnement de taux d'intérêt bas, les investisseurs peuvent être incités à rechercher un rendement supérieur. Ce phénomène est connu comme le canal de prise de risque de la politique monétaire. Le comportement de recherche de rentabilité affiché par les fonds communs de placement a attiré l'attention des régulateurs. ECB (2019) indique que "les problèmes de rentabilité ont encouragé les non-banques à accroître leur exposition à des titres plus risqués et moins liquides" (ECB (2019), p.84). Ce comportement s'est également poursuivi après la crise de 2020. Selon la ECB (2021c), 22% des portefeuilles des fonds obligataires sont investis dans des actifs à haut rendement (soit une augmentation de 3% depuis fin 2019). En outre, les fonds communs de placement ont pris davantage de risque de durée, c'est-à-dire qu'ils ont investi dans des titres de créance à plus long terme, ce qui a rendu leurs portefeuilles plus sensibles à une éventuelle hausse des taux d'intérêt. Si cela peut être bénéfique d'un point de vue économique (car l'UMP vise à pousser les investisseurs vers d'autres types d'actifs, donc à assouplir les conditions de financement et à fournir des liquidités), ce comportement peut être à l'origine d'un risque de liquidité plus important pris par les gestionnaires de fonds. En effet, si les conditions financières devaient se durcir et que davantage d'investisseurs souhaitaient se retirer, il pourrait être plus difficile de vendre des actifs moins liquides sans subir de perte. Tant les investisseurs finaux que les gestionnaires de fonds peuvent être à l'origine de ce comportement de prise de risque.

### **La prise des risques des investisseurs**

Plusieurs articles ont analysé le comportement des investisseurs de fonds en réponse

aux changements de la politique monétaire. Banegas et al. (2016) par exemple trouvent qu'en réponse à la baisse des taux du marché, les investisseurs prennent de plus en plus de risques et s'orientent vers des fonds plus risqués (comme les fonds d'obligations à haut rendement). Fratzscher et al. (2018) montrent que les politiques monétaires non conventionnelles adoptées par le Federal Reserve System (Fed) après 2010 ont contribué à une diminution des actifs des fonds obligataires mondiaux et à une augmentation des flux de fonds vers les EME. Kroencke et al. (2015) constatent qu'en réponse à l'assouplissement de la politique monétaire de la Fed, les investisseurs américains orientent leur épargne vers les actifs internationaux. En outre, ils montrent que les investisseurs institutionnels réorientent leur portefeuille vers des obligations à haut rendement ou plus risquées, un résultat qui est conforme à un comportement de recherche de rendement affiché par ces investisseurs. Giuzio et al. (2021) prouvent que les flux de collecte augmentent dans les fonds plus risqués de la zone Euro (fonds à haut rendement, fonds d'obligations corporate par exemple) suite à un choc de politique monétaire expansionniste. Daniel et al. (2021) démontrent que, sur la base d'un comportement de "recherche de revenus" (ou "reaching for income"), les investisseurs déplacent leur portefeuille vers des actifs à revenu plus élevé à la suite d'une baisse des taux d'intérêt. En outre, Hau and Lai (2016) trouvent des preuves d'un rééquilibrage des portefeuilles des investisseurs des fonds monétaires vers les fonds d'actions suite à une baisse des taux d'intérêt réels.

### **La prise des risques des managers**

D'autres articles ont analysé les décisions d'allocation de portefeuille des gestionnaires de fonds dans un contexte de taux d'intérêt bas. Choi and Kronlund (2018) montrent que les fonds d'obligations corporate vont chercher un rendement plus élevé dans un contexte de faible niveau et de faible pente de la courbe des taux. Kaufmann (2020) montre qu'après un assouplissement de la politique monétaire américaine, les gestionnaires de fonds déplacent de plus en plus leurs avoirs vers des obligations corporate ou à haut rendement. Czech and Roberts-Sklar (2019) trouve également des preuves d'un comportement de recherche de rendement en montrant que les gestionnaires d'actifs achètent des obligations à haut rendement. Di Maggio and Kacperczyk (2017) étudient les fonds monétaires et montrent que les gestionnaires de ces fonds investiront dans des titres plus risqués en réponse à de faibles niveaux de taux d'intérêt. Bien que lié aux articles men-

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tionnés précédemment, un autre volet de la littérature s'est concentré sur l'analyse du comportement de prise de risque des gestionnaires de fonds en réponse aux annonces et opérations de politique monétaire non conventionnelle. Cenedese and Elard (2021) par exemple constatent que les fonds d'actions et d'obligations déplacent leurs portefeuilles du pays développé dont la banque centrale effectue ces achats vers d'autres pays développés. Toutefois, un rééquilibrage potentiel vers les économies émergentes n'est pas clairement mis en évidence.

L'analyse des conséquences d'un comportement de prise de risque est importante du point de vue de la stabilité financière. En effet, si ce comportement de recherche de rendement est remplacé par un comportement de fuite vers la sécurité dans des conditions d'un marché sous stress, alors la vente d'actifs illiquides s'avérera très préjudiciable pour leurs prix et pourra potentiellement affecter d'autres institutions financières en raison de leurs détentions communes. Les risques de contagion des fonds communs de placement aux autres acteurs financiers seront le sujet de la section suivante.

## **2.3 Les risques de contagion vers d'autres institutions financières**

Les vulnérabilités affichées par les fonds communs de placement peuvent également avoir un impact sur d'autres acteurs du système financier. En effet, les régulateurs surveillent de près les différents liens et une potentielle transmission des risques entre les acteurs IFNB et les banques (Sydow et al. (2021), Aikman et al. (2019), Mirza et al. (2020), le Haut Conseil de Stabilité Financière HCSF (2020) entre autres). Ces liens peuvent porter soit sur les bilans de ces institutions (par exemple par la présence de titres communs, la détention de parts de fonds, les prêts accordés par les banques aux fonds etc.) qui peuvent être facilement quantifiés. L'intégration du secteur des fonds d'investissement dans un stress test classique complète les résultats des stress tests existants fondés sur les banques et informe mieux le régulateur sur les interactions possibles entre ces secteurs. Dans un document de travail de la BCE, Sydow et al. (2021) utilisent des données granulaires et prouvent que les fonds d'investissement de la zone euro contribuent et ajoutent au stress global en procédant à des ventes en urgence en réponse aux rachats des investisseurs. En outre, les auteurs affirment que la présence de fonds "augmente d'un point de pourcentage la baisse moyenne du capital des banques" (Sydow et al. (2021), p.2). Calimani

et al. (2019) prouvent que les fonds communs de placement peuvent amplifier les ventes en urgence même si seules les banques étaient touchées par les chocs. Aikman et al. (2019) construisent également un scénario de simulation de crise comprenant des banques, des fonds d'investissement, des fonds spéculatifs, des compagnies d'assurance et des fonds de pension et constatent que dans ce scénario, si les chocs sont suffisamment importants, une boucle entre les prix des actifs et les contraintes de solvabilité ou de liquidité apparaît. Mirza et al. (2020) examinent le portefeuille commun dans un système financier à deux acteurs (composé de banques et de fonds d'investissement) et trouvent également des preuves de l'importance systémique croissante des fonds d'investissement de la zone euro. Dans le cas plus spécifique de la France, HCSF (2020) a modélisé un système financier composé de banques, de fonds d'investissement et de compagnies d'assurance. L'étude souligne l'importance de la transmission du stress par le canal des positions communes et le canal des pertes de prix sur les titres des institutions qui sont détenues par d'autres acteurs du système financier.

Comme décrit dans le paragraphe précédent, une littérature croissante analyse le risque de contagion dans un système comprenant des fonds d'investissement. Dans les articles mentionnés ci-dessus, le risque de transmission est modélisé en considérant la structure du bilan, ainsi que d'autres canaux (prêts interbancaires, marchés repo, etc.) et certains articles utilisent des données granulaires afin d'estimer l'impact de la transmission d'un choc initial. Cependant, un autre canal de contagion, plus difficile à quantifier, existe. Comme le montre la Banque d'Angleterre (BoE), les banques pourraient en effet être incitées à intervenir afin de protéger leur réputation si des liens directs existent entre elles et leurs activités non bancaires (BoE (2019)). En effet, comme souligné par la ECB (2020), les banques et les compagnies d'assurance contrôlent souvent les sociétés de gestion d'actifs, ce qui permet aux premières de bénéficier de revenus supplémentaires et d'une diversification des risques (Ferreira et al. (2018) note qu'en décembre 2010 "environ 40% des fonds communs de placement sont gérés par des divisions de gestion d'actifs de groupes dont l'activité principale est la banque commerciale" (Ferreira et al. (2018), p.1)). Ce risque (step-in risk) est très important, surtout en période de crise, car il peut entraîner un risque de contagion<sup>35</sup>. En effet, il a été prouvé, en particulier pendant la crise financière mondiale de 2008, qu'un certain nombre de banques ont accordé des lignes de

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<sup>35</sup>La directive 2002/87/CE et la directive 2011/89/UE "FICOD1" du Parlement européen et du Conseil visent à atténuer les risques de contagion dans un conglomérat financier.

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crédit, acheté des actifs en difficulté ou émis des garanties en faveur d'OPC monétaires en difficulté afin que ceux-ci n'enregistrent pas de pertes (Bengtsson (2013), McCabe (2010)). Plus récemment, des preuves anecdotiques suggèrent qu'un certain nombre de banques européennes ont racheté des billets de trésorerie à des OPC monétaires en difficulté afin de leur fournir une source de financement (ECB (2020)).

En résumé, nous avons décrit comment le modèle principal-agent qui existe entre les gestionnaires de fonds et les investisseurs conduit ces derniers à rechercher la performance. Ainsi, une relation flux-performance apparaît avec des conséquences potentielles sur la stabilité financière. Si la littérature pré-existante soulignait les incitations à la prise de risque liées à la convexité de cette relation, la littérature plus récente a également mis l'accent sur les risques de run auxquels les fonds sont confrontés en raison de la forte sensibilité des investisseurs aux mauvaises performances et de la présence d'une prime au premier sortant. De plus, dans un contexte de politiques monétaires accommodantes adoptées après la crise de 2008, les risques de run sont potentiellement plus importants car les fonds investissent davantage dans des titres plus risqués. Il est donc important d'analyser les différentes fragilités (ou les forces) dont font preuve les fonds et leurs facteurs clé. En outre, d'un point de vue réglementaire, il est crucial de comprendre si la réglementation actuelle contribue à réduire ou à accumuler des vulnérabilités.

## **La contribution de la thèse**

Avec cette thèse de doctorat, nous tentons d'étudier comment les activités des fonds d'investissement peuvent avoir un impact sur la stabilité financière. Nous souhaitons ainsi contribuer à l'identification et au suivi des fragilités de ce secteur en pleine expansion. Nous contribuons également à une meilleure compréhension du comportement des investisseurs. Cette thèse se compose de trois articles empiriques présentés sous forme de chapitres qui se complètent dans l'analyse de différents types de fonds d'investissement : le premier chapitre étudie les fonds obligataires, le deuxième chapitre étudie les fonds ESG et conventionnels d'actions et obligations, tandis que le dernier chapitre examine les fonds monétaires.

Premièrement, nous contribuons à la littérature sur la relation flux-performance des

fonds obligataires. Le premier chapitre, qui a été publié dans *Finance*<sup>36</sup>, démontre que les investisseurs des fonds obligataires français sont sensibles aux mesures de performance à la fois à court et à long terme et que les investisseurs se retirent plus fortement des fonds affichant des performances très négatives par rapport aux fonds affichant de faibles performances négatives. Ce résultat met en lumière une non-linéarité dans la réponse des investisseurs suite à des niveaux de performances négatives passés. L'étude a également des implications en matière de stabilité financière puisque les fonds obligataires sont sensibles à une hausse des taux d'intérêt, un sujet qui est de plus en plus discuté dans un contexte de niveaux élevés d'inflation après la crise de la COVID-19 et la guerre Russie-Ukraine.

Deuxièmement, nous analysons le sous-secteur croissant des fonds ESG et nous contribuons à la littérature en examinant si ce type de fonds peut être à l'origine et propager le stress par l'existence d'une relation flux-performance positive. Le deuxième chapitre<sup>37</sup> analyse la relation flux-performance des fonds ESG et plus particulièrement si ces fonds sont plus résilients du point de vue de la stabilité financière. Nous constatons que les investisseurs dans les fonds ESG obligataires et actions sont moins sensibles aux rendements négatifs passés par rapport à leurs homologues traditionnels. De plus, ce résultat est robuste après avoir contrôlé pour les conditions de marché, la composition de la clientèle et la liquidité des actifs des portefeuilles. Cette analyse revêt également une importance pour la stabilité financière, car des investisseurs plus résilients réduiraient l'ampleur de la prime au premier sortant qui existe dans les fonds traditionnels. Plus généralement, des fonds ESG plus résilients s'avéreront être une source de financement stable pour la transition verte.

Enfin, nous étudions plus en détail le stress subi par les fonds monétaires pendant la crise de la COVID-19 et nous contribuons au débat en cours sur le renforcement de la stabilité de ce secteur en améliorant sa réglementation. Dans le troisième et dernier chapitre<sup>38</sup> nous analysons les sorties enregistrées par les fonds monétaires pendant la crise de la COVID-19 et nous constatons que les fonds plus risqués, mais aussi les fonds à valeur liquidative à faible volatilité (LVNAV) ont subi des sorties plus importantes.

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<sup>36</sup>Article co-écrit avec Raphaëlle Bellando et Sébastien Galanti (Bellando et al. (2021)).

<sup>37</sup>Article co-écrit avec Margherita Giuzio, Sujit Kapadia et Dilyara Salakhova

<sup>38</sup>Article co-écrit avec Michael Grill, Luis Molestina Vivar, Niklas Schmitz et Christian Weistroffer. Une version préliminaire de ce travail a été publiée dans le Bulletin Macroprudentiel de la BCE (Capota et al. (2021)).

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En outre, nous constatons que les fonds LVNAV, qui risquent davantage d'enfreindre les conditions réglementaires concernant la NAV constante, ont également subi des sorties plus importantes. En outre, les fonds affichant des niveaux plus faibles de liquidités sont soumis à des retraits plus importants. Ces résultats confirment le comportement plus général de fuite vers la qualité qui a eu lieu pendant la crise de la COVID-19. Notre étude a des implications en matière de stabilité financière puisqu'elle contribue à analyser dans quelle mesure la réglementation actuelle a joué un rôle dans l'explication des niveaux élevés de sorties de fonds enregistrés par certains OPC monétaires

Chaque chapitre est décrit d'une manière plus exhaustive ci-dessous.

## **Chapitre 1: Fragilités des Fonds Obligataires: la Réaction des Flux à des Chocs de Rentabilités très Négatives**

Les actifs gérés par les fonds obligataires ont augmenté rapidement ces dernières années dans un contexte de taux d'intérêt bas. Selon le Statistical Data Warehouse de la BCE, les actifs gérés par les fonds obligataires de la zone euro sont passés de 1,4 billion d'euros fin 2008 à 4,2 billion d'euros en novembre 2021 (soit une croissance de 300%). Les fonds obligataires constituent un sujet de recherche important compte tenu de leur importance dans le secteur de la gestion d'actifs, mais aussi en raison d'un contexte plus récent de forte inflation. En effet, une normalisation de la politique monétaire peut avoir des effets néfastes sur le rendement des fonds obligataires. Ces développements ont suscité des inquiétudes étant donné les liens qui existent entre leur activité et la stabilité financière. Plus particulièrement, une vaste littérature a étudié les risques de run auxquels les fonds obligataires peuvent être soumis et la présence d'une prime au premier sortant. En raison de leurs avoirs plus illiquides (par rapport aux fonds actions), plusieurs études ont démontré que les investisseurs dans les fonds obligataires étaient très sensibles aux mauvaises performances passées, la présence de cette sensibilité constituant la première étape dans la démonstration de l'existence d'une boucle flux-performance.

Nous contribuons à cette littérature en étudiant plus en détail la relation flux-performance des fonds obligataires français. Afin d'étudier cette relation, nous utilisons un ensemble de données mensuelles sur les fonds obligataires français, couvrant la période entre janvier 2005 et décembre 2017. La littérature passée a prouvé la présence d'une non-linéarité



dans la réponse des investisseurs suite à des performances passées positives et négatives (Goldstein et al. (2017), Chen and Qin (2017)). De plus, les auteurs considèrent que les investisseurs sont sensibles soit aux rendements à court terme, soit aux rendements à long terme.

Nous complétons cette littérature en démontrant que les décisions des investisseurs s'expliquent à la fois par les rendements à court et à long terme. En outre, nous montrons qu'une relation non linéaire existe également dans le segment des performances négatives, c'est-à-dire que les investisseurs se retirent davantage suite à des performances très négatives (définies comme étant dans le premier quintile des performances négatives sur notre échantillon). Nos résultats sont robustes à travers plusieurs spécifications, notamment après avoir contrôlé pour les périodes de stress (plus de retraits se produisent dans des conditions de marché néfastes) ou après avoir considéré la clientèle (l'analyse des parts retail et institutionnelles séparément donne des résultats similaires). Il est intéressant de noter que dans l'espace des parts institutionnelles, nous constatons que les investisseurs sont plus sensibles au niveau des performances négatives passées, car nous démontrons que la non-linéarité de l'effet des performances négatives passées est observée sur une plus grande plage de mauvaises performances. Par conséquent, par rapport aux fonds obligataires retail, les fonds obligataires institutionnels pourraient faire l'objet de sorties de capitaux plus importantes en cas de mauvaises performances.

Nos résultats sont importants pour la stabilité financière car ils montrent que non seulement les investisseurs réagissent différemment aux performances positives et négatives des fonds obligataires, mais aussi qu'ils se retirent davantage lorsque le fonds enregistre des performances négatives particulièrement importantes. Une performance forte et négative ne diminue pas seulement le rendement relatif à long terme du fonds, mais constitue également un choc à court terme. Par conséquent, une performance très négative peut entraîner des retraits plus importants résultant à la fois d'une diminution du rendement relatif à long terme et d'un faible rendement à court terme. L'étude de la relation flux-performance, notamment pour les fonds obligataires, est particulièrement importante dans le contexte actuel, où de plus en plus de banques centrales signalent leur volonté de relever les taux d'intérêt dans un avenir proche. Si ce changement d'orientation de la politique monétaire survient brusquement et que les marchés ne l'anticipent pas correctement, les rendements des titres de créance et des fonds obligataires in fine peuvent être

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rapidement affectés.

## Chapitre 2: Les Fonds Ethiques et Verts sont-ils Plus Résilients?

Les fonds ESG mondiaux ont enregistré une forte croissance au cours des six dernières années : leurs actifs sous gestion (AuM) ont rapidement augmenté, passant de 0,5 billion d'euros en 2015 à 1,3 billion d'euros en juin 2021. De plus, cette augmentation devrait se poursuivre dans les années à venir : une enquête réalisée en 2020 par BlackRock (2020) mentionne que "les répondants prévoient de doubler leurs actifs durables sous gestion dans les cinq prochaines années" (BlackRock (2020), p.3). Les fonds ESG constituent donc un sujet de recherche essentiel étant donné leur empreinte croissante sur le marché dans le secteur de la gestion d'actifs.

Les fonds ESG constituent aujourd'hui une source importante de financement vert et les études en cours tentent d'analyser si ces nouveaux fonds présentent les mêmes risques que leurs homologues traditionnels. Comme l'expliquent IMF (2021) et ECB (2021a), les actifs des fonds traditionnels sont soumis à des risques de transition et à des risques physiques qui pourraient conduire à une réévaluation soudaine des titres. Une réévaluation soudaine peut contribuer à un risque de run sur les fonds, qui trouve son origine dans la boucle flux-performance. En effet, diverses études ont montré que dans le cas des fonds d'actions et d'obligations, les investisseurs rachètent leurs parts à la suite de performances négatives, ce qui constitue le point de départ d'une prime au premier sortant. Cependant, certains articles montrent que les investisseurs sont moins sensibles aux performances passées dans les fonds ESG, ce qui implique que la prime au premier sortant est moindre dans ce type de fonds. En effet, il a été démontré que la relation flux-performance est plus faible dans les fonds ESG que dans les fonds traditionnels (voir Renneboog et al. (2011), El Ghoul and Karoui (2017), Benson and Humphrey (2008), Bollen (2007)). Les raisons de ces résultats peuvent être trouvées dans la littérature émergente.

Tout d'abord, un certain nombre d'études mettent en avant le fait que les investisseurs ESG sont moins influencés par les performances car ils tiennent compte davantage de la durabilité que des performances (Dottling and Kim (2020), Hartzmark and Sussman (2019), Pastor et al. (2021), Bauer et al. (2021)). Deuxièmement, les investisseurs ESG sont prêts à ne pas prendre compte d'une mauvaise performance à court terme, car ils

affichent un horizon à plus long terme (voir Riedl and Smeets (2017), Dottling and Kim (2020)), Enfin, sur la base des résultats d'une enquête, Krueger et al. (2020) démontre que des considérations morales ou éthiques, ou des obligations légales/fiduciaires, ainsi que la volonté de protéger leur réputation poussent les investisseurs institutionnels à inclure des critères de risques climatiques dans leurs décisions d'investissement.

Cet article examine si la relation flux-performance des fonds de placement obligataires et actions axés sur l'ESG et l'environnement (E) est différente de celle des fonds traditionnels. Plus particulièrement, nous souhaitons analyser si les investisseurs des fonds axés sur l'ESG/E sont moins sensibles aux mauvaises performances passées.

Nous contribuons à la littérature existante sur les fonds ESG en analysant le comportement des investisseurs ESG sur une longue période, couvrant la crise de la COVID-19, et considérant à la fois les fonds obligataires et les fonds d'actions, ainsi que les parts retail par rapport aux parts institutionnelles. Nous utilisons un ensemble de données uniques couvrant les observations mensuelles des parts de fonds obligataires et actions de janvier 2016 à décembre 2020. Nous identifions les fonds axés sur l'ESG/E en recherchant certains mots dans le nom des fonds (par exemple, "ESG", "durable", "vert", etc.). Nous faisons valoir que les investisseurs ne vérifient pas nécessairement les prospectus des fonds et que, par conséquent, l'utilisation de certains mots dans le nom du fonds constitue un premier signal indiquant qu'un fonds utilise des critères ESG/E-focalisés dans ses décisions d'investissement.

Nos résultats ont plusieurs implications politiques. Premièrement, une relation flux-performance différente pourrait avoir des conséquences sur la stabilité financière des fonds obligataires : les investisseurs insensibles aux mauvaises performances passées atténueraient la prime au premier sortant qui existe dans les fonds plus illiquides, réduisant ainsi la probabilité que les gestionnaires de fonds vendent leurs actifs pour faire face aux rachats. Deuxièmement, une plus grande résilience des décisions d'investissement aux faibles rendements pourrait être bénéfique pour la transition verte, car elle prouverait que les fonds axés sur l'ESG/E constituent une source de financement stable.

Nous constatons que, tant pour les fonds obligataires que pour les fonds actions, les investisseurs des fonds axés sur l'ESG/E sont moins sensibles aux rendements négatifs passés. Ce résultat est robuste lorsqu'on considère séparément les parts retail et institutionnelles et il reste également inchangé en période normale et en période de crise. En

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outre, pour l'échantillon de fonds obligataires, nous démontrons que les investisseurs des fonds ESG/E ne se retirent pas à la suite de mauvaises performances, même dans les fonds moins liquides. Par ailleurs, on peut avancer que nos résultats sont influencés par le choix de notre échantillon, qui se compose de fonds domiciliés dans la zone euro. En effet, on peut penser que les investisseurs européens ont des préoccupations environnementales plus fortes, ce qui les rendrait insensibles aux mauvaises performances. En revanche, les investisseurs non-européens rachèteraient quand même leurs parts suite à de mauvaises performances des fonds ESG. Cependant, nous observons que nos résultats restent robustes lorsque nous divisons l'échantillon entre les fonds détenus par les investisseurs européens et les fonds détenus par les autres investisseurs.

### **Chapitre 3: Le Règlement Européen sur les Fonds Monétaires est-il Adapté? Leçons de la Crise de la COVID-19**

La crise financière mondiale de 2007-2008 a démontré que les fonds monétaires sont également soumis à des risques de run malgré leur détention d'instruments à court terme et généralement qualitatifs. En effet, le secteur a connu un mouvement de fuite vers la sécurité lorsque les investisseurs ont racheté massivement leurs parts des MMF non-gouvernementaux au profit des MMF de dette publique. Cette ruée a eu pour origine le fait que le Reserve Primary Fund a perdu ses propriétés de NAV constante<sup>39</sup> en raison de ses titres Lehman Brothers et s'est rapidement propagée à d'autres fonds risqués, obligeant leurs sponsors à intervenir (McCabe (2010), Bengtsson (2013)). À la suite de la GFC, les législateurs européens ont introduit de nouvelles règles sur les fonds monétaires (MMF), notamment par l'adoption du règlement européen sur les MMF en 2017. La crise de la COVID-19 en mars 2020 a mis à l'épreuve la résilience du secteur des MMF, les MMF de dette privée ayant été confrontés à d'importantes sorties d'investisseurs. Nous nous concentrons sur les événements de mars 2020 pour évaluer l'efficacité du règlement de l'UE sur les MMF du point de vue de la stabilité financière.

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<sup>39</sup>Certains fonds monétaires ne font pas varier le prix de leurs parts, c'est-à-dire qu'ils ont une NAV constante. La NAV constante est obtenue en évaluant leurs actifs à un coût amorti (au lieu d'un prix de marché) et en utilisant des techniques d'arrondi. Un fonds est autorisé à afficher une NAV constante tant que l'écart entre la NAV constante et la NAV évaluée au prix du marché ne dépasse pas 50 points de base. Le fonds "break the buck" lorsque cet écart n'est plus respecté, ce qui oblige le fonds à convertir la NAV constante en une NAV évaluée au prix du marché.

Notre article contribue à la littérature sur les risques de run dans les OPC monétaires et sur l'impact de la réglementation sur les incitations des investisseurs et des gestionnaires d'OPC monétaires. En utilisant des données quotidiennes granulaires couvrant les MMF de la zone euro, nous évaluons les aspects clés du règlement européen sur les MMF, en nous concentrant particulièrement sur les fonds LVNAV et les exigences de liquidité quotidiennes et hebdomadaires. En étudiant le comportement des investisseurs et des gestionnaires de fonds pendant la crise de la COVID-19 en mars 2020, nous apportons de nouvelles preuves de la fragilité du secteur des MMF européens et appelons à un renforcement du cadre réglementaire, en particulier pour les MMF de dette privée. Cela aborde directement les questions discutées dans le débat politique en cours sur la réforme réglementaire visant à renforcer la stabilité du secteur des MMF.

Nos résultats mettent en évidence trois grandes vulnérabilités dans le secteur des OPC monétaires européen. Premièrement, l'investissement dans des actifs de dette privée expose les OPC monétaires au risque de liquidité. Nous constatons que les investisseurs des MMF investissant dans des actifs moins liquides se retirent plus fortement que les autres investisseurs en période de crise. Deuxièmement, les fonds LVNAV sont particulièrement vulnérables aux chocs de liquidité, car ils investissent dans des actifs de dette privée tout en offrant une valeur liquidative stable. La perspective de dépasser la limite réglementaire concernant la NAV peut avoir incité certains investisseurs de fonds LVNAV à sortir du marché pendant la crise de mars 2020. Troisièmement, bien que certains fonds LVNAV aient connu d'importantes sorties de fonds, les gestionnaires de fonds n'ont pas puisé dans leurs liquidités hebdomadaires dans la même mesure, ce qui suggère un faible niveau d'utilisation des réserves. Selon le Règlement sur les OPC monétaires, le fait de passer sous les exigences de liquidité peut amener les OPC monétaires LVNAV et CNAV à envisager d'appliquer des mesures de liquidité extraordinaires, ce qui peut inciter les investisseurs à effectuer des rachats anticipés. Nous constatons que les investisseurs se retirent plus fortement des MMF dont le coussin de liquidité est faible que ceux dont le coussin de liquidité est important. Dans le même temps, nous constatons que les fonds avec des faibles niveaux de liquidité utilisent moins leur coussin de titres liquides que ceux dont le coussin est élevé, ce qui suggère que ces fonds préfèrent vendre des actifs illiquides, peut-être pour éviter de s'approcher trop près du seuil réglementaire ou de passer sous ce seuil.





## Fonds de Placement et Stabilité Financière

### Résumé :

Si l'intermédiation financière apporte une multitude d'avantages aux investisseurs et favorise la croissance économique, ses acteurs peuvent subir d'importantes sorties de fonds dans des conditions de marché tendues et ils peuvent, par leurs actions, contribuer à la transmission des chocs entre les acteurs du système financier. Après la crise de 2008, il est devenu évident qu'une meilleure compréhension de leur fonctionnement et des risques inhérents à leur activité est cruciale pour mieux réguler le secteur. Avec cette thèse de doctorat, nous tentons d'étudier comment les activités des fonds d'investissement peuvent avoir un impact sur la stabilité financière. Dans le premier chapitre, nous montrons que les investisseurs des fonds obligataires sont sensibles aux performances négatives des fonds. Leur comportement pourrait être source d'instabilité financière car des retraits massifs pourraient mener à un phénomène de run, et de ventes en urgence, et conduire in fine à un assèchement de la liquidité sur les marchés. A contrario, dans le deuxième chapitre, nous montrons que tant pour les fonds d'obligations que pour les fonds d'actions, les investisseurs des fonds ESG sont moins sensibles aux rendements négatifs passés. Ce résultat impliquerait que les managers des fonds ne doivent pas vendre des actifs pour faire face aux rachats, ce qui serait en faveur de la stabilité financière. Dans le dernier chapitre nous étudions le comportement des investisseurs et des gestionnaires de fonds monétaires pendant la crise du COVID-19 et nous constatons que la réglementation des fonds monétaires pourrait avoir joué un rôle en incitant les investisseurs à céder leurs parts. Nos résultats contribuent à la discussion générale sur les risques de run. Le stress subi par plusieurs types de fonds communs de placement pendant la crise du COVID-19 et les risques accrus de durabilité appellent à l'introduction de nouvelles réglementations et d'une véritable politique macroprudentielle destinée à contenir les vulnérabilités dans les segments moins liquides des fonds communs de placement.

Mots clés : Fonds de placement, Risque de run, Fragilité financière

## Mutual Funds and Financial Stability

### Abstract :

While financial intermediation brings a multitude of benefits for investors and fosters economic growth, its actors can suffer significant outflows under stressed market conditions, and they can, by their actions, contribute to the transmission of shocks across the financial system's participants. Following the 2008 crisis, it became clear that a better understanding of their functioning and the risks inherent to their activity is crucial for better regulating the sector. With this doctoral thesis we attempt to study how the investment funds' activities can have an impact on the financial stability. In the first chapter, we show that bond fund investors are sensitive to negative fund performances. Their behaviour could be a source of financial instability because massive withdrawals could lead to a run phenomenon and emergency sales, which could ultimately lead to a drying up of liquidity in the markets. In contrast, in the second chapter, we show that for both bond and equity funds, investors in ESG funds are less sensitive to past negative returns. This result would imply that fund managers do not have to sell assets to cope with redemptions, which would be in favour of financial stability. In the final chapter we study the behaviour of money market fund investors and managers during the COVID-19 crisis and find that the money market fund regulation may have played a role in encouraging investors to redeem their shares. Our results contribute to the general discussion of run risks. The stress experienced by several types of mutual funds during the COVID-19 crisis and the increased sustainability risks call for the introduction of new regulations and a genuine macroprudential policy designed to contain vulnerabilities in the less liquid segments of mutual funds.

Keywords: Mutual funds, Run risk, Financial fragility