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An Assessment of Investment Funds' Liquidity Management Tools

Ulf Lewrick, Jochen Schanz, Jean-François Carpentier and Shaneera Rasqué

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Abstract

Open-ended funds have to align the liquidity of their assets with that of their liabilities. Their structural vulnerabilities to liquidity mismatch are at the forefront of international discussions, especially for those funds investing in less liquid assets. For fund managers, liquidity risk management involves several measures, including notably (1) the active management of the portfolio, including cash and liquid assets, (2) passing costs of trading in securities due to redemptions and subscriptions to transacting investors, and (3) restricting investors' access to their capital under exceptional circumstances. We assess funds' related liquidity management tools based on several supervisory datasets of Luxembourg-domiciled open-ended funds (UCITS). For these funds, redemptions regularly exceed the funds' cash reserves, suggesting that the funds rely on the ability to sell assets at short notice to honour redemptions. Fund managers' assessment of their assets' liquidity under systemic stress scenarios appears somewhat optimistic. Funds frequently use swing pricing, which allows them to pass on the costs of trading to transacting investors. Swing pricing appears to dampen fund outflows except during systemic stress. In contrast, funds rarely suspend redemptions. Suspensions often precede the permanent closure and liquidation of the fund and occasionally coincide with higher outflows from related funds. Lower survival rates and adverse signalling effects may imply that funds wait too long before suspending redemptions. These findings suggest that funds' liquidity management tools work well in normal times, but could be made more effective during episodes of stress by improving their calibration, timing and operationalization. Providing related guidance would further enhance investor protection and strengthen the resilience of the fund sector.

JEL Classifications: G01, G23, G28, C72

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1. Introduction

Investment funds play an important role in the financial system. They provide a key source of funding for corporates and the public sector by investing in equity and fixed income securities. At the same time, funds offer institutional and retail investors investment opportunities with access to a diversified portfolio.

Liquidity risk management of funds aims at ensuring consistency between the funds' portfolio liquidity on the one side and their liabilities and redemption policy on the other side. Funds need to manage liquidity mismatches. These mismatches arise because funds invest in assets that are typically less liquid than cash, while usually granting investors the right to redeem their shares for cash daily. The main objective of funds' liquidity risk management is thus to ensure that the funds can honour their contractual obligations – i.e. meet redemption requests by investors within the agreed timeframe – based on a fair treatment of investors. The fund manager needs to strike a balance between exposing the fund to liquidity mismatches in order to generate returns, while ensuring the ability to pay out redeeming investors. In this context, the fund's liquidity risk management framework needs, for example, to determine and document appropriately for investors the fund's risk tolerance as well as the circumstances under which the fund can pass costs of trading due to capital activity (i.e. redemptions and subscriptions that result in net fund flows) to transacting investors (e.g. via swing pricing or anti-dilution levies), can partially restrict investors' ability to redeem (redemption gates), or can suspend temporarily the payment to redeeming investors (suspensions).²

From a macroprudential perspective, funds' liquidity risk management should also consider the negative externalities that can arise from funds having to sell assets at short notice (i.e. engaging in "forced sales") to meet redemptions, but also from the adverse spillover effects on financial markets, such as increasing system-wide uncertainties and volatility, that can result from funds restricting access to investor capital.

This paper studies the effectiveness of several core components of funds' liquidity risk management in handling large investor redemptions: first, the management of *liquidity buffers* (i.e. cash and liquid assets) to meet redemptions on an ongoing basis; second, the use of *swing pricing*, which passes the costs of trading due to capital activity in the fund to transacting investors in order to prevent dilution of remaining investors, while mitigating potential incentives for investors to redeem; and third, the *temporary suspension of redemptions* ("suspensions") that helps preserve the fund's value in situations such as stressed market conditions, instances of unusually high redemptions, or when an accurate pricing of the portfolio becomes unfeasible (e.g. due to temporarily closed markets). The selection of swing pricing and suspensions in this paper reflects their more widespread availability and use (in the case of swing pricing) relative to comparable instruments (e.g. anti-dilution levies, redemptions-in-kind, redemption gates) used by funds studied in this paper.

The assessment covers *Undertakings for Collective Investments in Transferable Securities* (UCITS) authorised in Luxembourg. The analysis focuses on actively managed UCITS (sub-)funds (henceforth "funds") and combines several CSSF supervisory datasets with vendor data.

² We use the terms *redemption* (*subscription*) and *outflow* (*inflow*) interchangeably. *Net redemptions* (or *net outflows*) refer to the difference of redemptions and subscriptions. We use "gross" redemption to distinguish redemption from "net" redemption in some cases to avoid ambiguity.

Our study is related to several strands of the literature. A number of recent papers study the financial fragility that can arise from investor redemptions, highlighting the potential for adverse spillovers across funds and to the underlying asset markets (Ma et al 2021, Falato et al 2021, Claessens and Lewrick 2021). Prior work has also emphasised vulnerabilities that can arise from investor behaviour (e.g. Chen et al 2010, Goldstein et al 2017) as well as from herding by fund managers (e.g. Feroli et al 2014). Research on funds' use of liquidity buffers and cash management includes, for example, Chernenko and Sunderam (2016), Morris et al (2017), Zeng (2017), Jiang et al (2020), and Schrimpf et al (2021).

A few papers study the effects of swing pricing, including, for example, Malik and Lindner (2017), Lewrick and Schanz (2017, 2022), Capponi et al (2020), and Jin et al (2022). These papers underscore the potential for swing pricing to support financial stability by reducing investors' incentives to redeem but reach different conclusions on whether swing pricing can fulfil this role during periods of market stress.

Research on the impact of suspensions includes Grill et al (2021) who show that suspensions can increase outflows after funds reopen and may result in spillovers on other funds. The model in Cipriani et al (2014), in turn, highlights the potential for suspensions to induce pre-emptive runs by investors.

Finally, our study is related to policy papers published by international institutions that recommend and assess the design of consistent redemption arrangements (IOSCO 2015, 2018), the wider availability of liquidity management tools (FSB 2017), a better guidance on the use of liquidity management tools (ESRB 2017) and the development of macroprudential tools designed for the non-bank financial intermediation sector (FSB 2021).

The remainder of this paper is organised as follows. Section 2 presents the data and provides an overview of the liquidity management tools (LMTs) that are available to Luxembourg funds. Section 3 discusses funds' use of liquidity buffers, before turning to the assessment of swing pricing and suspensions in Sections 4 and 5, respectively. Section 6 concludes.

2. Liquidity management tools: data and availability to funds

The analysis builds on four datasets compiled by the CSSF. The first dataset comprises a subset of the UCITS risk reporting (URR) with semi-annual data from end-2015 to the first half of 2020 for Luxembourg funds with more than €500 million total net assets (TNA) or an average leverage utilization in terms of notional amount during the reference period above 250% of TNA.³ This dataset provides information about the main fund characteristics and the funds' usage of LMTs. At mid-2020, the sample comprised 1,915 funds with total TNA of about €2.9 trillion, representing 23% in terms of the total number of UCITS and about 77% of UCITS total TNA.

³ The first reporting period is from October 2015 to March 2016. As of the second half of 2016, the reporting periods comprise the first and second half of the calendar year, respectively.

The second dataset comprises a compilation of all suspensions by Luxembourg funds from 2007 to 2018. This dataset contains 454 suspensions, including multiple suspensions by individual funds, and provides basic information about the reason and the length of each suspension. The third dataset contains monthly redemptions and subscriptions in euro terms at the fund level from 2006 to 2020. The fourth dataset is based on a survey of 57 funds by the CSSF and covers the period from January to June 2020. It provides daily data on funds' liquidity buffers and swing pricing activity during the March 2020 market turmoil.

We merge the supervisory data with monthly data from Refinitiv Lipper and daily data from Bloomberg. Matches are identified at the share class level based on the ISIN. Share class data are then aggregated to the fund level.

Funds can rely on a variety of LMTs (Table 1). Indeed, international comparisons (e.g. ESMA 2020, IOSCO 2015) suggest that Luxembourg-domiciled funds have access to a broad set of LMTs if compared with funds from other jurisdictions. For the first half of 2020, URR data indicate that nearly all reporting funds can restrict investor access to capital under exceptional circumstances by suspending redemptions temporarily, whereas 90% can apply redemptions gates. About 65% of funds can apply swing pricing, whereas only 17% can apply anti-dilution levies (i.e. an alternative LMT to swing pricing). Redemptions in-kind are only available to 10% of the funds.

Table 1: Available liquidity management tools¹

Asset class	Temporary suspension	Redemption gates	Swing pricing	Anti-dilution levy	Redemption in kind	No of funds ³
Equity	96%	90%	71%	19%	9%	674
General Bonds	98%	90%	74%	21%	10%	357
High Yield Bonds	99%	95%	80%	16%	16%	88
Investment Grade Bonds	95%	88%	62%	17%	13%	232
Mixed Equity and Bonds	99%	92%	43%	10%	10%	249
Other ²	95%	89%	59%	17%	7%	315
All funds	97%	90%	65%	17%	10%	1,915

¹ As a percentage share of reporting funds per asset class. Data for the first half of 2020. ² This category comprises the following asset classes: ABS/MBS, commodities, convertible bonds, foreign exchange, mixed other, money market instruments, volatility, and funds with no asset class allocation. ³ Number of funds subject to the UCITS Risk Reporting. These figures do not cover all LMTs given the limited coverage of the UCITS Risk Reporting.

Sources: CSSF; authors' calculations.

LMTs are generally used infrequently, except for swing pricing (Table 2). Suspensions and redemption gates are, by design, only used under exceptional circumstances. Even for the period covering the March 2020 market turmoil, as evidenced in Table 2, when many funds exhibited elevated investor redemptions, only 7 funds suspended redemptions and no fund reported the use of gates.⁴ By contrast, 43% of the funds used swing pricing (4% applied anti-dilution levies), up from 36% (3%) in the preceding half-year. These statistics are based on the subset of funds subject to the URR, that is, limited to relatively large and/or leveraged funds. Another analysis focusing on large redemptions and based on a broader sample of 7,830 funds reports larger figures for 2020, especially for redemption gates (26 cases) and redemptions in kind (33 cases) (Carpantier 2021).

⁴ See Grill et al (2021) and ESMA (2020) for more detailed studies on suspensions during the COVID-19 crisis.

Table 2: Usage of liquidity management tools¹

Asset class	Temporary suspension	Redemption gates	Swing pricing	Anti-dilution levy	Redemption in kind	Number of funds ³
Equity	0%	0%	49%	4%	0%	674
General Bonds	1%	0%	56%	6%	0%	357
High Yield Bonds	0%	0%	69%	5%	0%	88
Investment Grade Bonds	0%	0%	44%	7%	0%	232
Mixed Equity and Bonds	0%	0%	21%	0%	0%	249
Other ²	1%	0%	23%	1%	0%	315
All funds	0%	0%	43%	4%	0%	1,915

¹ As a percentage share of reporting funds per asset class. Data for the first half of 2020. ² This category comprises the following asset classes: ABS/MBS, commodities, convertible bonds, foreign exchange, mixed other, money market instruments, volatility, and funds with no asset class allocation. ³ Number of funds subject to the UCITS Risk Reporting. These figures do not cover all LMTs given the limited coverage of the UCITS Risk Reporting.

Sources: CSSF; authors' calculations.

3. Liquidity buffers

Cash and other liquid assets represent funds' first line of defence against large redemptions. For the first half of 2020, the ratio of unencumbered cash to TNA ("cash ratio") and the ratio of liquid assets (i.e. assets that funds expect to be able to liquidate within a day or less, as based on a self-assessment by fund managers) to TNA ("liquid asset ratio") was 2.6% and 74.8% for the median fund, respectively, with considerable variation both within and across asset classes (see Table 3 for the cash ratio and Table 4 for the liquid asset ratio, respectively).

Table 3: Cash ratio¹

Asset class	25 th	Median	75 th	Mean	St.Dev	No of funds ³
Equity	0.38	1.43	4.21	22.33	8.59	674
General Bonds	1.10	3.09	6.83	14.52	6.98	352
High Yield Bonds	1.57	3.10	5.77	16.13	6.47	87
Investment Grade Bonds	0.30	0.99	3.57	14.46	4.93	231
Mixed Equity and Bonds	2.19	5.45	12.00	18.84	11.53	248
Other ²	2.50	6.00	14.16	19.08	13.14	314
All funds	0.71	2.59	7.46	19.10	8.88	1,906

¹ As a percentage share of reporting funds per asset class. Data for the first half of 2020, winsorized at 1% and 99% to account for the effect of outliers. ² This category comprises the following asset classes: ABS/MBS, commodities, convertible bonds, foreign exchange, mixed other, money market instruments, volatility, and funds with no asset class allocation. ³ Number of funds subject to the UCITS Risk Reporting. These figures are not fully representative given the limited coverage of the Reporting.

Sources: CSSF; authors' calculations.

Table 4: Liquid asset ratio¹

Asset class	25 th	Median	75 th	Mean	St.Dev	No of funds ³
Equity	38.45	74.83	95.29	33.58	64.68	674
General Bonds	24.57	57.60	88.22	33.24	55.58	357
High Yield Bonds	15.00	29.83	55.51	28.84	36.76	88
Investment Grade Bonds	34.31	72.59	97.78	34.98	63.48	232
Mixed Equity and Bonds	59.02	88.65	98.79	31.81	74.05	249
Other ²	48.50	90.17	99.87	32.67	72.69	315
All funds	34.04	74.80	96.23	34.16	64.09	1,915

¹ As a percentage share of funds per asset class. Data for the first half of 2020, winsorized at 1% and 99% to account for the effect of outliers. ² This category comprises the following asset classes: ABS/MBS, commodities, convertible bonds, foreign exchange, mixed other, money market instruments, volatility, and funds with no asset class allocation. ³ Number of funds subject to the UCITS Risk Reporting. These figures are not fully representative given the limited coverage of the Reporting.

Sources: CSSF; authors' calculations.

A more formal regression analysis suggests that active liquidity risk management by fund managers is integrated in the portfolio management decision process, while liabilities (e.g. investor specifics) are also considered (Table 5). Indeed, funds that are bigger in terms of their TNA or funds with a higher liquid asset ratio tend to hold less cash. By contrast, funds with a high concentration of holdings among only a few investors tend to hold more cash, while cash ratios also tend to increase if market volatility (as measured by the VIX) rises.

Table 5: Drivers of cash and liquid asset ratio

	Cash ratio			Liquid asset ratio		
TNA (log)	-1.11*** (-4.50)	-1.13*** (-4.52)	-1.15*** (-4.58)	-7.72*** (-9.20)	-7.42*** (-9.03)	-7.39*** (-8.94)
Years since launch (log)	-0.04 (-0.09)	0.10 (0.25)	0.06 (0.14)	-1.31 (-1.28)	-0.99 (-1.00)	-0.91 (-0.90)
Institutional investor share	0.01 (1.21)	0.02** (2.09)	0.02** (2.12)	-0.05** (-2.07)	-0.02 (-0.98)	-0.02 (-0.98)
Share of top-5 investors	0.03*** (2.69)	0.03*** (2.82)	0.03*** (2.82)	0.10*** (3.33)	0.07** (2.48)	0.07** (2.49)
Liquid asset ratio	-0.01 (-1.47)	-0.02* (-1.95)	-0.02* (-1.95)			
Cash ratio				-0.06 (-1.59)	-0.08** (-2.18)	-0.08** (-2.17)
VIX	0.06*** (2.80)	0.06*** (2.75)		0.05 (1.00)	0.03 (0.63)	
Number of observations	9,671	9,671	9,671	9,671	9,671	9,671
Adjusted R-squared	0.01	0.02	0.02	0.07	0.13	0.13
Fixed effects		Class	Class x time		Class	Class x time

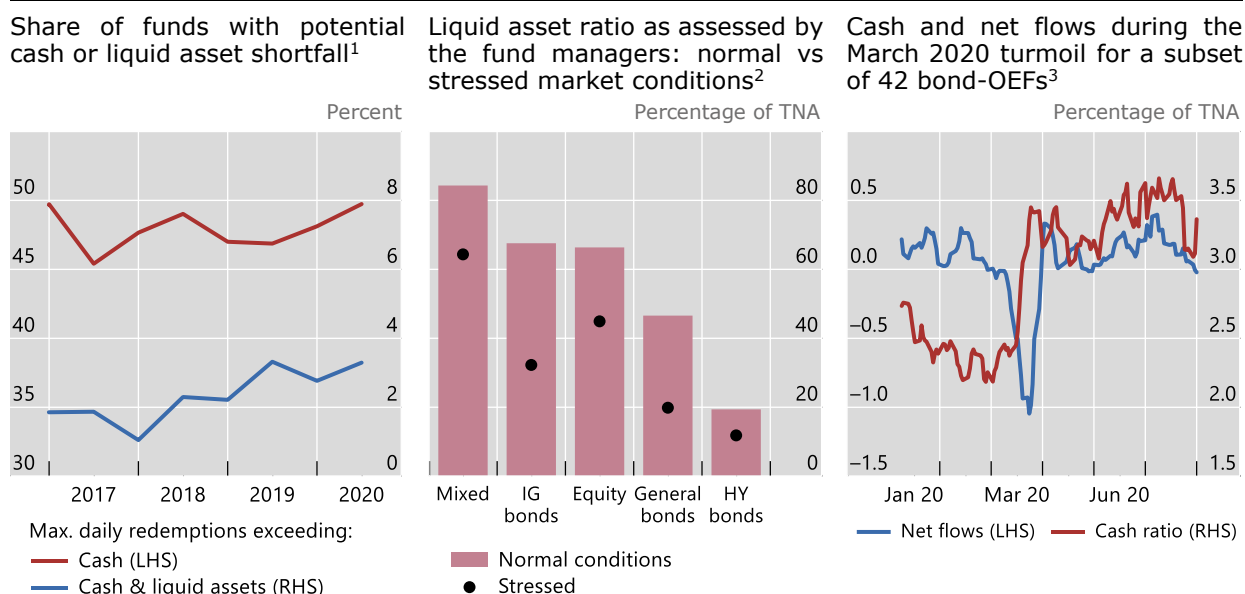
*/**/*** indicates statistical significance at the 10/5/1% level based on robust standard errors clustered by fund (t-values in parentheses). OLS regressions based on fund-half-year observations. All variables are winsorized at the 1% and 99% level to account for outliers.

Sources: CSSF; authors' calculations.

Specifically, a 10 percentage points higher liquid asset ratio is associated with a 0.2 percentage points lower cash ratio, whereas a 10 percentage points higher share of top-5 investors’ holdings is associated with a 0.3 percentage point higher cash ratio. Similarly, the liquid asset ratios of larger funds and of funds with a higher cash ratio tend to be lower than for comparable funds. The size of funds and the share of top-5 investors in funds were similarly found to explain large redemptions (Carpantier 2021).

Peak daily redemptions regularly exceed funds’ holdings of cash, suggesting that funds rely on their ability to sell assets at short notice in order to meet redemptions. Indeed, for nearly half of the funds, the cash ratio at the end of the reporting periods was below the value of the largest daily redemption in the corresponding periods as depicted in Graph 1 (left-hand panel).

Graph 1: Funds’ liquidity risk management



¹ Number of funds as a percentage share of all reporting funds for which the reported maximum daily redemption over the 6-month reporting period exceeded the cash ratio (left axis) or the joint cash and liquid asset ratio (right axis) at the end of the corresponding 6-month reporting period. ² Median liquid asset ratios under normal (red bars) and stressed (black dots) market conditions based on funds’ own liquidity assessment; data as of mid-2020 and restricted to the subset of funds reporting liquid asset ratios under both normal and stressed scenarios. Mixed: Mixed equity and bond funds; IG: investment grade bond funds; HY: high-yield bond funds. ³ Five-day moving averages of total net assets (TNA)-weighted means of the cash ratio and net fund flows, respectively. Based on data from 42 open-ended bond funds for which daily data on cash and flows were available.

Sources: CSSF; authors’ calculations.

On the contrary, liquid assets are sufficient to cover the majority of outflows under normal market conditions. The liquidity ratio (defined as the sum of the cash and liquid asset ratio and as measured at the end of half-year periods) fell short of past maximum daily outflows in less than 4% of the observations in a given reporting period (Graph 1, left-hand panel).

Fund managers appear confident in the liquidity of their assets even under stressed liquidity conditions. A subset of funds in the URR report the fund managers' estimate of liquid assets under stressed liquidity conditions. For these funds, the reported median liquid asset ratio under normal market conditions ranges from more than 84% for mixed equity and bond funds to less than 20% for high-yield (HY) bond funds at mid-2020 (Graph 1, centre panel). Under the assumption of stressed market conditions, these ratios decline to 64% and 12%, respectively. Across all asset classes (636 reporting funds), this implies that fund managers collectively assumed that assets equivalent to about €455 billion (39% of TNA) were considered to be sufficiently liquid that they could be liquidated within one day or less even under stressed market conditions.

Although the fund managers' self-assessments of their asset's liquidity were not calibrated to reflect an immediate and concerted asset liquidation by all funds, this amount seems to be over-optimistic by not accounting sufficiently for the sale decisions of other funds. Moreover, we note that funds' assessment of the impact of stress on their portfolio differs markedly even within asset classes. Among high-yield bond funds, for example, one quarter of the funds expects that its liquid asset ratio would decline by less than 3 percentage points in a stress scenario, whereas another quarter expects a decline by more than 16 percentage points.

The market turmoil in March 2020 provides insights into how funds adjust their cash management during stressed market conditions. During this episode, European and U.S. funds exhibited elevated redemptions for several consecutive weeks (e.g. FSB 2020, Carpentier 2021, Breckenfelder et al 2021, Claessens and Lewrick 2021, Falato et al 2021). Detailed survey data highlights that funds, on average, raised their cash ratio during this episode, thereby selling more assets than needed to meet investor redemptions (Graph 1, right-hand panel). It is, however, difficult to assess to what extent this procyclicality is driven by a precautionary motive, with fund managers anticipating future redemptions, or by active portfolio adjustment to reduce exposure to prevalent market risks.

Strong reliance by funds on market liquidity has several implications for policy. First, for funds and particularly those investing in less liquid assets, net outflows imply a dilution of the fund value unless the fund passes the costs of trading to redeeming investors. This can potentially create a self-reinforcing incentive for investors to redeem in order to avoid dilution (so-called "first-mover advantage"). For less liquid funds, LMTs that mitigate such incentives, such as swing pricing for example, can thus help to strengthen fund resilience. But even funds that invest in seemingly liquid assets can be confronted with spikes in the costs of selling assets, as market liquidity tends to vanish during episodes of market stress. Thus, LMTs that pass on the costs of trading if and when they arise appear suitable for a broad range of funds. Furthermore, by reducing funds' asset sales, such LMTs can help to prevent a further decline in market liquidity.

Second, regular reliance on asset sales implies that all funds will not be able to meet unexpectedly large redemptions at reasonable costs under all circumstances. LMTs that temporarily suspend investor redemptions (or extend notice periods) can lower the cost of asset sales and thereby help to preserve the value of the fund. However, to the extent that investors anticipate that funds will be using LMTs that defer or limit investor pay-outs, such tools could also incentivise investors to front run on such actions by the funds.⁵ More generally, fund managers should be encouraged to take externalities into consideration comprehensively when dealing with stressed market situations: 1) the potential impact of market stress on asset liquidity should be assessed under conservative assumptions and 2) the impact on liquidity of concerted selling of assets by third parties (beyond own positions) should be taken into account.

4. Swing pricing

Swing pricing is a liquidity management tool that allows the fund to pass the costs of trading that arise from investor redemptions and subscriptions to the transacting investors. This reduces the dilution of the portfolio value. Swing pricing has a second property as, by reducing dilution, it could also help to mitigate investor first-mover advantages and thereby lower the risk of runs on the fund. Such first-mover advantages arise if investors anticipate that the costs associated with fund outflows will reduce the future net asset value per share (NAV) to an extent that it would be more profitable to redeem their shares as opposed to remaining invested.

The application of swing pricing follows rules based on a swing pricing policy determined by the fund. Swing pricing relies on adjusting the NAV at which the fund settles investor transactions if the fund faces net flows or if the fund's net flows exceed predefined thresholds. Specifically, the NAV is reduced by the swing factor if net outflows exceed the swing threshold. By analogy, the NAV is raised by the swing factor if net inflows are above a set threshold. The swing pricing policy is set and reviewed by the fund's governing body, including particularly in case of changing market conditions.

Investor information about swing pricing is limited. Swing factors and thresholds applied in case of fund flows are typically not disclosed by the fund in order to keep investors from trying to game the swing policy (e.g. by splitting redemption orders). The regulatory framework in Luxembourg requires funds to disclose the maximum applicable swing factor in the fund prospectus. No distinction is usually made between normal and stressed market conditions, allowing the fund to adjust the swing factor up to the maximum in response to changes in market conditions (see CSSF 2021).

The effectiveness of swing pricing will be first assessed in terms of its ability to reduce fund dilution and then in its ability to mitigate investor first-mover advantages.

To the extent that swing pricing passes the related costs of trading to transacting investors, the returns of funds that apply swing pricing should be less sensitive to past fund flows than the returns of comparable funds which do not apply swing pricing. Furthermore, funds that apply swing pricing should be less susceptible to large outflows during episodes of market stress.

⁵ In practice, the extent to which front-running incentives represent a risk depends on the LMTs that the fund is prepared to use, on the fund's investor base, and on its investors' beliefs about how other investors are likely to behave. For example, if investors are equally fast in making decisions and anticipate each other's moves, then suspensions could eliminate front-running. The reason is that suspensions are imposed after the fund manager observes the order flow. Front-running would thereby simply lead to an earlier closure of the fund and not yield any benefits to those investors that decided to front run. If, on the other hand, investors believe that other investors are slow, such that each anticipates to be able to front run the others, the threat of suspensions could encourage front-running (e.g. Cipriani et al (2014)).

Table 6: How swing pricing affects the dependency of fund returns on outflows

Dependent variable: Monthly fund return relative to benchmark (annualised, in percent)				
Gross redemptions	-0.006*** (-3.77)	-0.007*** (-5.09)		
Gross redemptions × Swing	0.005*** (2.59)	0.006*** (3.22)		
Net fund outflows			-0.010*** (-6.43)	-0.006*** (-4.00)
Net fund outflows × Swing			0.003 (1.60)	0.003* (1.83)
Number of observations	36,539	36,539	36,539	36,539
Adjusted R-squared	0.032	0.111	0.034	0.111
Fixed effects		Fund		Fund

*/**/** indicates statistical significance at the 10/5/1% level based on robust standard errors clustered by fund (t-values in parentheses). OLS regressions based on monthly observations (November 2015 to June 2020) for 989 funds categorised as bond funds (general, IG, HY), equity funds, or mixed equity and bond funds. Time-varying controls comprise the first lag of log TNA, age (in log years), expense ratio, the share of institutional investors, and the VIX.

Sources: CSSF; authors' calculations.

Swing pricing can reduce the dilution associated with fund flows. The results in Jin et al (2022) and Lewrick and Schanz (2022) indicate that funds which apply swing pricing achieve higher returns than their peers if differences in the funds' flow and other characteristics are taken into account. Claessens and Lewrick (2021), in turn, show that swing pricing allowed funds to recoup roughly 0.06% of TNA on average from investors redeeming during the three weeks of elevated redemptions in March 2020. Estimates based on the URR data generally support these results. While redemptions or net outflows generally lower fund returns (relative to benchmark returns), this impact is reduced if the fund applies swing pricing (Table 6). More specifically, we find for funds not using swing pricing that a 10 percentage points increase of the monthly net fund outflows per TNA gives rise to a 0.06 percentage point decline in monthly fund return relative to its benchmark, while for funds using swing pricing, the impact is reduced by half (Table 6, column 4).

Table 7: Estimated effect of swing pricing on redemptions during elevated market volatility

Dependent variable: Monthly gross redemptions (percentage share of TNA)			
Stress × Swing	-0.23** (-2.26)	0.03 (0.28)	0.21 (0.89)
Stress	0.40*** (4.63)	0.51*** (5.84)	1.19*** (6.26)
Swing	0.25** (2.10)	0.24** (2.01)	0.35 (1.54)
Period of observation	2015–19	2015–20	2020
Number of observations	49,387	54,931	5,544
Adjusted R-squared	0.04	0.04	0.06
Fixed effects	Asset class	Asset class	Asset class

*/**/** indicates statistical significance at the 10/5/1% level based on robust standard errors clustered by fund (t-values in parentheses). OLS regressions based on monthly observations for 989 funds categorised as bond funds (general, IG, HY), equity funds, or mixed equity and bond funds. Time-varying controls comprise the first lag of log TNA, age (in log years), expense ratio, the share of institutional investors, and the VIX.

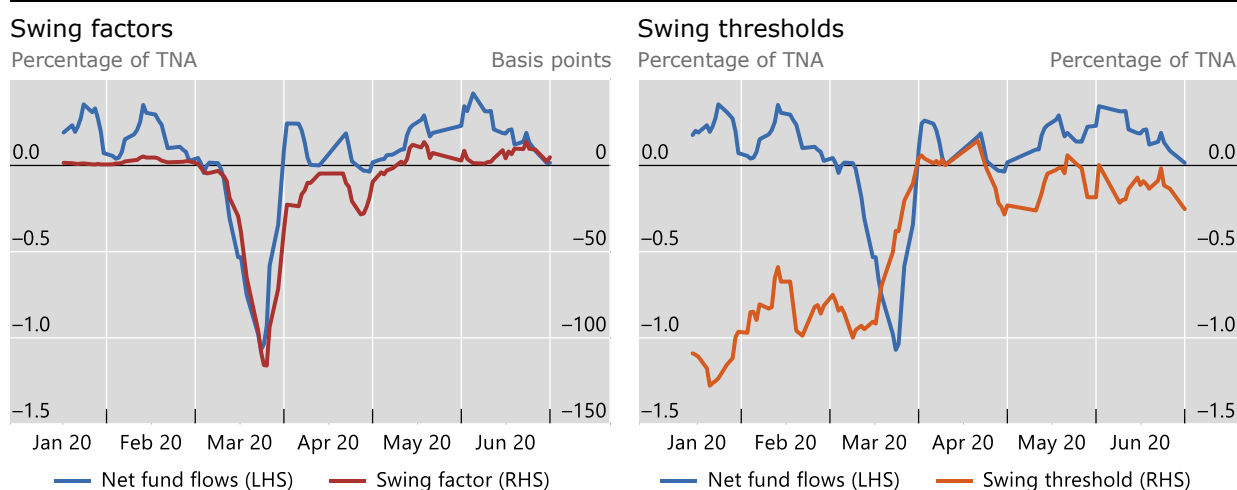
Sources: CSSF; authors' calculations.

Funds that apply swing pricing are less exposed to redemption pressure during episodes of elevated market volatility, consistent with swing pricing mitigating first-mover advantages. For the pre-Covid-19 period (2015–19), redemptions in funds that do not apply swing pricing are estimated to increase by an additional 0.4 percentage points of TNA during periods of elevated market volatility, defined as the VIX exceeding its sample 75th percentile (Table 7, first column). However, for funds that apply swing pricing, these stress-related redemptions are reduced by more than half.

Yet during episodes of severe market volatility, such as the March 2020 market turmoil, the dampening impact of swing pricing appears to vanish. The average swing factor of the 42 bond funds participating in the CSSF survey increased by more than 100 basis points on average during March 2020 (the median and maximum swing factor were 60 and 350 basis points, respectively), whereas funds lowered their swing thresholds on average from net outflows of 1% of TNA before the turmoil to less than 0.5% (Graph 2). Notwithstanding these adjustments by funds, the inclusion of the market turmoil in the above estimations leads to the result that swing pricing funds did not exhibit fewer redemptions relative to their peers (Table 7, second and third column). This finding is consistent with the results in Claessens and Lewrick (2021), Bank of England (2021) and ESMA (2020) who also find no evidence of a dampening effect on net outflows for swing pricing funds during the turmoil.

Two complementary observations emerge. First, the relative importance of the first-mover advantage may have decreased during the turmoil, with other investment considerations related to the so-called “dash-for-cash” and to the reduction of market risk exposure possibly dominating investor decisions (FSB 2020). Second, the financial stability benefits of swing pricing might be modest, given the tool’s calibration in practice. Calibration could be improved to make it more reactive to market developments, especially during episodes of severe stress.

Graph 2: Swing pricing during the March 2020 market turmoil¹



¹ Five-day moving averages of the total net assets (TNA)-weighted mean swing factor and swing threshold across funds. Based on an unbalanced sample of 42 open-ended bond funds.

Sources: CSSF; authors’ calculations.

5. Temporary suspensions of redemptions

Suspensions intend to preserve the fund’s value in exceptional circumstances. This can include runs on the fund during times of market stress or situations in which the valuation of the fund’s assets is not feasible (e.g. if prices in the reference market are not available due to temporary closure, i.e. technical suspension). By delaying and preventing investors from redeeming their shares, suspensions give the fund an opportunity to restructure the portfolio in an orderly manner. This, in turn, can also mitigate any adverse impact of asset sales on the underlying asset markets (by spreading sales across time rather than selling in a condensed time period) thus avoiding stress to spread further. At the same time, suspensions could also be perceived by investors as an indication of stress, which could adversely affect affiliated funds (by the same fund manager) or those with a similar investment strategy.

Suspensions are relatively rare, and many relate to technical reasons. The suspension dataset records 454 suspensions for the years from 2007 to 2018, equivalent to merely 0.05% of the fund-month observations in the data. This tallies with the objective of using suspensions only in exceptional circumstances. About 60% of the suspensions occurred because of technical reasons, mostly because the fund’s reference market was temporarily closed such that the fund’s assets could not be priced (Table 8). The remaining suspensions were mostly related to crises (subprime in 2007, Icelandic banks in 2008, Greek crisis in 2015 and Chinese stock market crash in 2015), large redemptions, or the illiquidity of the fund’s assets or other idiosyncratic events. Most suspensions affected equity funds, followed by bond funds (Graph 3, left-hand panel).

Table 8: Temporary suspensions of redemptions (2007–18)

Reason for suspending	No of suspensions	Length (in days)		TNA (€ million) ¹	
		Mean	Median	Mean	Median
Temporary market closure	206	4	2	199	71
Redemptions and/or portfolio illiquidity	73	119	31	117	21
Portfolio valuation issues	58	44	1	49	31
Crisis-related	54	243	40	118	24
Fraud ²	10	253	381	172	19
Planned closure of fund ³	9	105	36	26	2
Other	44	56	2	178	33
All	454	67	2	151	39

¹ TNA of suspending fund at start of the suspension. ² Valuation of the fund portfolio affected by the Madoff investment scandal of 2008. ³ Suspension ahead of permanent closure of the fund.

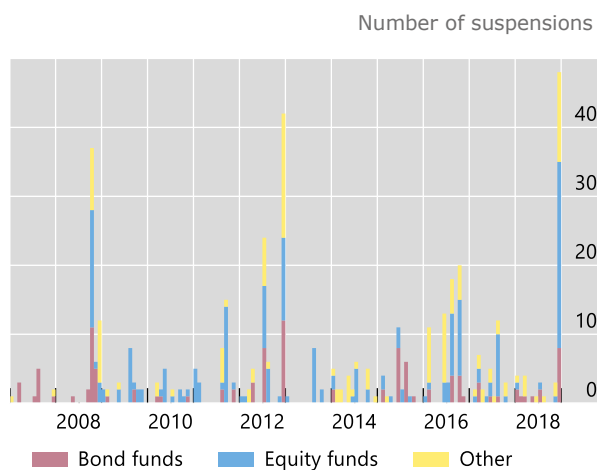
Sources: CSSF; authors’ calculations.

The duration of suspensions varies considerably. Suspensions due to technical reasons typically last only a few days, with only a few outliers reaching up to two months. Other suspensions typically last about a month, except for those due to the illiquidity of the fund portfolio or fraud, in which case the suspension can stretch to several years.

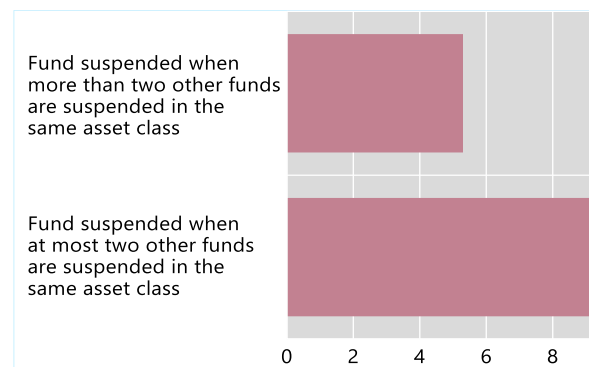
Suspensions often precede permanent closure and liquidation of the fund. Indeed, in 15% of the cases the fund did not reopen after suspending. This is typically the case when the fund manager expects its investors to resume redemptions upon re-opening. Conditional on suspending due to large redemption requests, 66% of the funds closed permanently.

Graph 3: Temporary suspensions of redemptions

Suspensions over time

Impact of suspensions on survival rates¹

Multiples of the baseline likelihood of the fund's permanent closure



¹ Estimates based on Cox survival regressions. The number of simultaneous suspensions is captured by monthly fund-specific dummy variables, of which the coefficients are reported in the graph and to be interpreted as decimal increases in the probability of closure relative to a fund for which all other covariates are the same.

Sources: CSSF; Bloomberg; Refinitiv Lipper; authors' calculations.

Reputational effects may also affect funds' survival rates. Whether a suspended fund re-opens also appears to depend on how widespread suspensions were at the time the fund suspended. The increase in the likelihood of permanent closure is estimated to be nine times higher when no or few other funds in the same asset class are suspended as well, but only five times higher when suspensions in that asset class are more common (Graph 3, right-hand panel). Investors thus appear to attribute suspensions of individual funds to failures in the fund's (liquidity) risk management, damaging the fund manager's reputation, whereas more widespread suspensions are associated with common adverse shocks, such as e.g. the sub-prime/ABS crisis during the global financial crisis (2007–2009).

Funds that re-open following a suspension typically experience moderate net outflows of, on average, between 4% and 5% of their pre-suspension NAV. However, these outflows do not appear to increase the likelihood of the fund's closure. One possible explanation is that fund managers consult with their investors before re-opening and use the suspension period to liquidate enough assets to accommodate net outflows.

Suspensions could create positive or negative externalities. Positive externalities could result from the fact that suspensions reduce the pressure to (1) liquidate assets or (2), in the extreme, conduct fire sales to meet redemption requests or (3) enable orderly portfolio restructuring to strengthen the fund before re-opening. Negative externalities, or adverse spillovers, could follow from the negative signalling effects of suspensions for the fund manager, but also for funds invested in the same, or similar asset classes or following similar investment strategies.

Suspensions due to large redemptions can be associated with higher outflows from related funds. Regression estimates (Table 9) suggest that such suspensions are positively correlated with additional outflows from funds investing in similar assets, particularly if these suspensions are due to crisis events as opposed to other reasons (e.g. suspension prior to fund closure, valuation issues). Suspensions by funds affiliated with the same management company are also associated with higher outflows, although the effect is statistically insignificant if the impact of suspensions by funds with similar assets is considered. More specifically, we find that monthly gross redemptions per TNA increase by 0.37 percentage points in case of suspensions in funds with similar portfolios, and by 1.04 percentage points if the suspension of the similar funds is due to a crisis.

Table 9: Spillovers associated with temporary suspensions of redemptions

Dependent variable: Monthly gross redemptions (percentage share of TNA)					
Suspension by funds: with <i>similar</i> portfolio	0.37*** (5.37)	0.37*** (5.42)			0.37*** (5.41)
due to <i>crisis</i> and with <i>similar</i> portfolio			1.04*** (5.51)		
due to <i>other reason</i> and with <i>similar</i> portfolio				0.17 (1.63)	
managed by the <i>same management company</i>					0.29 (0.85)
Significant redemptions from funds with similar portfolio (dummy variable)		2.10*** (4.63)	2.11*** (4.66)	2.10*** (4.62)	2.10*** (4.63)
Number of observations	178,889	178,889	178,889	178,889	178,889
Adjusted R-squared	0.42	0.42	0.42	0.42	0.42
Fixed effects	Fund	Fund	Fund	Fund	Fund

*/**/** indicates statistical significance at the 10/5/1% level based on robust standard errors clustered by fund (t-values in parentheses). OLS regressions based on monthly observations (January 2007 to March 2019) for 1,945 funds. Unreported time-varying controls comprise lagged net outflows, lagged TNA (logs), age (in log years), returns over the previous 12 months, and the VIX.

Sources: CSSF; Refinitiv Lipper; authors' calculations.

Limited survival rates and adverse spillovers may imply that funds refrain from suspending for too long. Failure to reopen is not necessarily bad for investors. Funds that suspend and then close might still have been able to ride out market turbulences or might have waited for illiquid assets to mature, or might have recovered larger NAV-losses across time during suspension. In these cases, immediate liquidation and closure might well have been more costly for investors than the implicit cost of suspensions. However, limited survival rates after suspensions may imply that fund managers seek to delay suspensions (other than for technical reasons) to avoid reputational damage. Similarly, though not found significant in our empirical exercise, adverse spillovers to affiliated funds could incentivise funds to liquidate assets at considerable discounts in order to meet redemptions and avoid suspensions, which could be to the detriment of remaining investors.

CASE STUDY: Suspensions during the US subprime crisis**Box A****Objective**

In this case study, we zoom in on the suspensions of some Luxembourg-domiciled UCITS that were exposed to the ABS/MBS market during the US subprime crisis. We analyse the behaviour of the suspending funds, with a focus on a specific fund ("Fund A"). We compare these funds with their non-suspending peers to shed the light on (1) the effectiveness of the suspensions in preserving the funds' value and the impact on the survival of the fund and (2) the externalities induced by the suspension on the ABS asset class, documenting both negative and positive effects.

Sample

The exposure of Luxembourg UCITS funds to the ABS market at the beginning of the subprime crisis was significant, with exposures representing around 4.1% of the total TNA of Luxembourg funds (€84 billion). By comparison, the exposure to the US subprime segment was relatively moderate, representing only about 0.14% of the total Luxembourg funds' TNA (€2.8 billion).

The sample used in this case study comprises 59 Luxembourg-domiciled UCITS following an ABS/MBS strategy. Six of these funds suspended redemptions during the subprime crisis, though not concomitantly. The 53 other funds did not suspend redemptions ("non-suspending funds") during this episode.

At the beginning of the subprime crisis, in June 2007, all suspending funds were heavily exposed to the ABS market (>80% of their TNA), whereas their exposure to the US ABS market was equivalent to about 15% of TNA (one suspending fund had no US exposure).⁶ For Fund A, the corresponding exposures exceeded 50% and 32%, respectively. The proportion of investments rated AA or higher stood, on average, at 13% of TNA for suspending funds, while amounting to 63% of TNA for Fund A. The relatively larger exposure to the US market and higher proportion of highly rated investments, together with the high coverage of the suspension in the media, can be considered to be distinctive characteristics of this fund compared to its peers.

Fund A's suspension

In August 2007, Fund A's decision to suspend fuelled investor concerns that the subprime crisis would affect the EU economy. The main reason communicated on the suspension was the inability to assess the value of the portfolio due to illiquidity of certain segments of the US securitization market, although the fund had also experienced large redemptions (see below). The intention of the suspension was to protect investors' interests by preserving fund value. The fund reopened a few weeks later, once a new methodology for valuing the assets – based on a mapping to market indices and factoring in illiquidity adjustments – had been established.

Effects

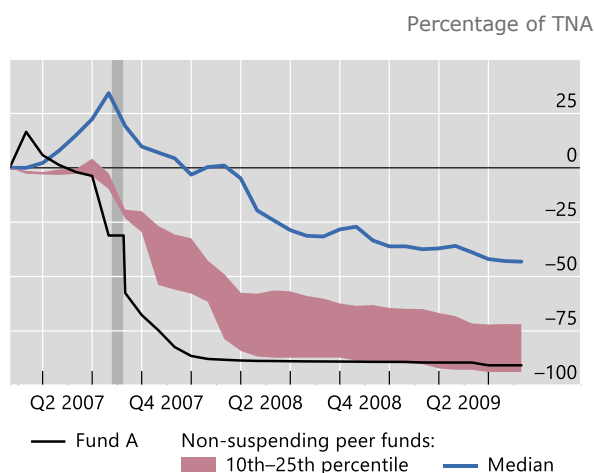
During the month preceding the suspension, the Fund A experienced large redemptions, much larger than those observed at non-suspending peers (Graph A, left-hand panel). After its reopening, the fund's outflows mimic those of its non-suspending peers, with outflows bottoming out towards the end of 2007.

⁶ This paragraph relates to the 4 suspending funds for which portfolio data was available.

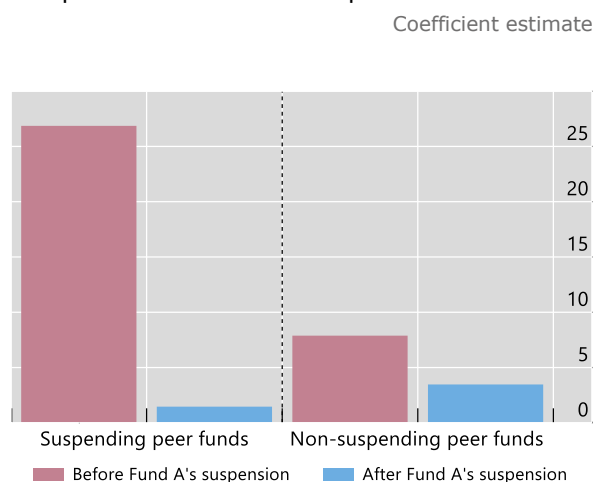
The relatively short suspension period of the analysed fund, lasting less than four weeks, was the exception. Other suspending peers had much longer suspension periods, in a range from several months to 7 years. In addition, contrary to the fund in focus, none of the suspending peers reopened as all were eventually liquidated. While the suspensions likely contributed to the liquidations, given that investors often shy away from funds that have suspended, it is important to note that more than half of the non-suspending peers were also liquidated within five years following the subprime crisis. This suggests that the liquidation of the funds also reflects a more general shift of investors out of the ABS segment.

Graph A: Funds during the US subprime crisis

Cumulative net inflows¹



Flow-performance relationship²



¹ Cumulative net inflows relative to the respective fund's NAV in January 2007. The black line depicts the cumulative flows for Fund A. The blue line shows the median and the red area shows the 10th to 25th percentiles, respectively, for non-suspending peer funds. The grey area represents the period of Fund A's suspension. ² Slope coefficients of subsample regressions of monthly net fund inflows as a percentage share of NAV on the funds' lagged monthly excess performance relative to its Lipper Global benchmark (including fund fixed effects). The subsamples comprise suspending peers (left two bars) and non-suspending peers (right two bars) for the period covering the 12 months preceding Fund A's suspension (red bars) and the 24 months following the suspension (blue bars), respectively.

Sources: CSSF; Refinitiv Lipper; authors' calculations.

Externalities

The suspension of Fund A was covered broadly in the media, suggesting scope for adverse externalities. That said, the suspension of this fund was not followed by a wave of suspensions. Three peers were already suspended at the time the specific fund was suspended and only two funds suspended redemptions a few months later. In addition, Fund A's cumulative net flows follow a trajectory similar to those observed for its non-suspending peers as from the suspension date of Fund A up to mid-2008 (Graph A, left-hand panel).

We further analyse whether Fund A's suspension altered the flow-to-performance relationship, i.e. the reaction of fund flows to past performance, of peers at that time. We observe that ahead of the suspension, flows responded strongly to excess performance; a 1 basis point month-on-month excess performance relative to the fund's benchmark returns led to a more than 25 basis point increase in net flows for the fund's peers. After the suspension, flows became essentially unresponsive to performance, which might well capture the flight of investors out of the ABS segment as from summer 2008 (Graph A, right-hand panel).

We cannot isolate the specific signalling effect on the ABS market of Fund A's suspension from the general increase in the market volatility or from the global repricing of risks in the US ABS market at the time. If any, the signalling effect of the suspension might well be viewed as positive to the extent to which it prevented fire sales and helped the ABS market to be priced according to fundamentals. From a supervisory point of view, the right timing of a suspension takes micro- and macroprudential objectives into account. From a microprudential perspective, a suspension needs to balance the interests of investors that wish to redeem their shares (e.g. because of liquidity needs) with those of investors willing to wait for longer. A macroprudential perspective would also take into account the external effects of suspensions on other funds and on prices in the asset market. These externalities can be both positive or negative, depending on the circumstances. A topic that deserves more analysis.

6. Conclusion

Open-ended funds' liquidity risk management seeks to align consistently and dynamically the liquidity of the funds' assets with that of their liabilities and redemption policy. General discussions on funds' liquidity risk have been ongoing for years, with recent events, such as the March 2020 turmoil, bringing it back again at the forefront of the international policy agenda (e.g. FSB 2021, IMF 2021). This paper contributes to these discussions by assessing the effectiveness of three specific liquidity management tools: liquidity buffers, the use of swing pricing and the temporary suspension of redemptions.

We proxy liquidity buffers based on funds' holdings of cash and of liquid assets. We find that funds increase cash positions in periods of high volatility, such as the March 2020 period, and thereby contribute to pro-cyclical selling of assets. For most funds, the liquid asset ratio generally exceeds the maximum daily redemptions, suggesting that funds generally have sufficient liquidity buffers to meet elevated redemptions. However, it remains unclear whether the liquid asset ratio, as self-assessed by fund managers, takes sufficiently into account the risk of concerted sales of the same, or highly correlated, assets by other funds. This raises the question of whether the assessment of liquidity for stressed scenarios is overly optimistic.

Swing pricing is a mechanism that passes on costs of trading to transacting investors to mitigate dilution risk and protect remaining investors. In line with this objective, our estimates suggest that swing pricing reduces the dilution of the fund value caused by investor redemptions. In addition, swing pricing lowers fund outflows during episodes of elevated market volatility, suggesting that it helps to reduce investor first mover advantages. However, during the March 2020 episode, outflows from swing pricing funds do not differ systematically from those of their peers. During this systemic event, first mover advantages might have been dominated by other investor considerations, such as imminent liquidity needs ("dash-for-cash") or reducing exposure to market risk.

Finally, we assess the temporary suspensions of redemptions, which are designed to preserve the fund's value in exceptional circumstances. We find that suspensions often precede permanent closure and liquidation of the fund. Suspensions due to large redemptions can also be associated with higher outflows in related funds. Limited survival rates and adverse signalling may imply that funds wait too long before suspending.

These results generally confirm the relevance and effectiveness of these tools in contributing to the overall liquidity risk management of open-ended funds. They also call for further guidance on the way fund managers assess the liquidity of their assets in view to better reflect a macroprudential perspective and internalise the potentially similar behaviour of other fund managers (FSB 2021), further guidance on the dynamic calibration of swing pricing factors and thresholds in view to make them more responsive at the eve of crises (as already requested by ESRB Recommendations (ESRB 2017)), and finally, further guidance on suspensions to make them more effective and more rapidly used in order to maximize their positive externalities.

However, the effectiveness of these liquidity management tools during systemic stresses (such as the global financial crisis and the COVID-19 crisis episode) is still not fully conclusive. Cash ratios are procyclical, which could reflect a precautionary build-up of cash positions to meet future redemptions or a pre-emptive reduction of exposure to market risks. Incentivising the use of cash buffers to mitigate system-wide effects could thus clash with fund managers' objective to generate performance. Swing pricing limits fund dilution and mitigates redemption incentives under certain circumstances, but it does not meaningfully reduce redemptions during episodes of stressed market conditions. Temporary suspensions during crises seem to be associated with larger outflows from related funds, and from the suspended fund upon re-opening. Overall, a clear delineation of the microprudential and macroprudential uses of these liquidity management tools remains key to reap their full financial stability benefits. Further research is thus warranted to help establish a macroprudential framework for open-ended funds.

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