



MONETARY AND CAPITAL MARKETS

Global Financial Stability Notes **The Behavior of Fixed-income Funds during COVID-19 Market Turmoil**

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This note analyzes the stress experienced (and caused) by open-end mutual funds during the March COVID-19 stress episode, with a focus on global fixed-income funds. In light of increased valuation uncertainty, funds experienced a short period of intense withdrawals while the market liquidity of their holdings deteriorated substantially. To cover redemptions, afflicted funds predominantly shed liquid assets first—for example, cash, cash equivalents, and US Treasury securities. But forced asset sales amplified price pressures in markets and contributed to liquidity falling across fixed-income markets. This drop in market liquidity, as well as the general stress in financial markets, may have led to fund investors becoming even more sensitive to challenging portfolio performance and encouraged further withdrawals. Only after central banks intervened, directly and indirectly supporting asset managers, did liquidity and redemption stress subside. Overall, the March episode validated the financial-stability concerns about liquidity vulnerabilities in the fund industry and calls for further action to address them.

EVOLUTION OF FUND FLOWS DURING COVID-19¹

In March 2020 the COVID-19 crisis led to an unexpected increase in uncertainty and rapidly falling asset prices in equity and credit markets. Some market participants “dashed for cash” by selling off relatively safe and liquid assets, while central banks and certain types of money market funds stepped in, as was seen in US Treasury securities markets (Figure 1, panel 1). Funds experienced a period of rapidly intensifying daily outflows in March 2020 (Figure 1, panel 2, left side), which—according to monthly Morningstar data—amounted to outflows from the global fixed-income fund sector of \$481 billion in March 2020. Even money market funds, which are generally less exposed to credit risk, were affected: in particular, US prime money market funds faced several weeks of large redemptions, while government money market funds saw inflows as investors sought the safety and liquidity of government securities (Figure 1, panel 2, right side).

At the same time, the market liquidity of securities held by fixed-income funds deteriorated substantially: in a sample of fixed-income funds average bid-ask spreads almost doubled (Figure 1, panel 3). For some fixed-

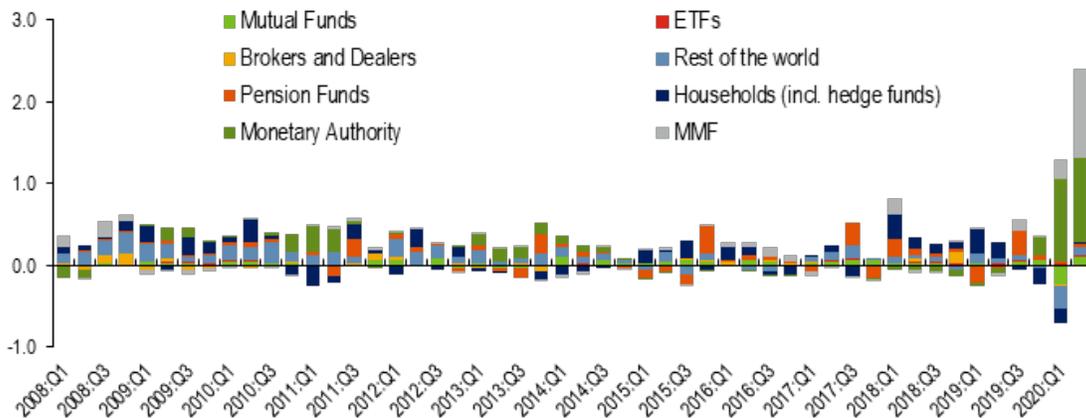
¹ The analysis in this note is based on three separate samples of fixed-income funds representing up to 2,877 funds or up to about 65 percent of global fixed-income funds (see Appendix Table 1).

income fund portfolios, average bid-ask spreads more than tripled temporarily, indicating that a few funds bore the brunt of the liquidity impact.

Figure 1. Asset Sales, Fund Flows, and Liquidity

The COVID-19 crisis triggered an unprecedented sell-off of US Treasury securities by mutual funds, foreign accounts, and households and hedge funds, followed by swift and large policy action.

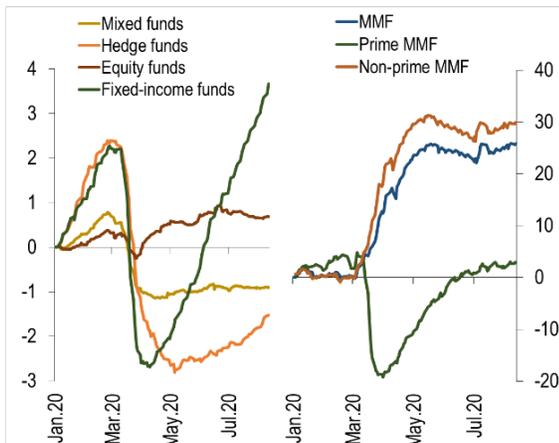
1. Financial Transactions in US Treasury Securities (Trillions of US dollars)



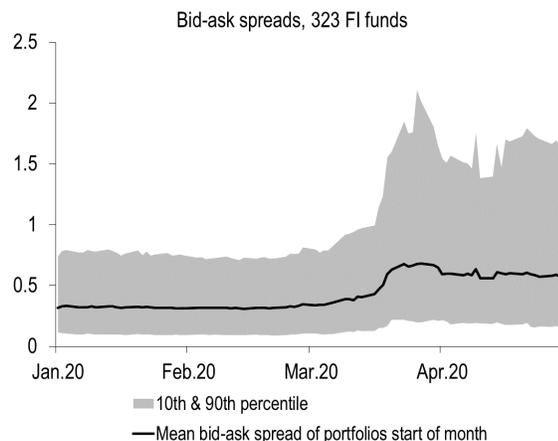
In March most fund sectors faced large outflows. MMFs faced inflows as investors switched from prime MMFs to safer MMFs.

Funds' liquidity profiles deteriorated in March 2020, together with overall market liquidity.

2. Cumulative Daily Net Flows into Funds (relative to January 2, 2020) (Percent)



3. Bid-Ask Spread of Fixed-Income Funds' Portfolios, Median, 10th and 90th Percentiles, January 2020–May 2020 (Percent)



Sources: Board of Governors of the Federal Reserve System; Morningstar; and Refinitiv Datastream.

Note: The monetary authority sector in panel 1 is the group of institutions and financial accounts that supply reserve funds to depository institutions and absorb funds from them. The sector includes the 12 Federal Reserve Banks and their subsidiary offices. Panel 2 shows asset-weighted average cumulative daily net flows for equity, fixed-income, and mixed funds larger than \$0.5 billion and all MMFs and hedge funds larger than \$50 million. Hedge funds include only open-end funds with alternative strategies. Coverage is limited due to the availability of daily flow and asset data: the figure covers at the end of June 2020 45 percent of the equity funds, 43 percent of the fixed-income funds, 30 percent of the mixed funds, and 78 percent of the money market funds reported by the International Investment Fund Association for the global fund sector, including funds of funds. For hedge funds no coverage data are available, since the available data universe for the hedge fund sector also includes closed-end funds. The sample covers the time from January 1, 2020 to August 12, 2020. In panel 3 portfolio compositions are observed at the beginning of each month only. Bid-ask spreads are based on end-of-day composite bid and ask prices. ETF = exchange-traded fund; FI = fixed-income; MMF = money market fund.

With unprecedented central bank policy support, daily flows returned to their pre–COVID-19 levels in less than a month (IMF 2020), and there have not been any widespread fund closures so far.² Nevertheless, the episode rekindled a debate among market participants, policymakers, and researchers about financial stability risks emanating from an asset management sector that has grown substantially since the global financial crisis (FT 2020). In response to large outflows, funds holding relatively illiquid assets but offering near-daily redemptions could be vulnerable to runs, forcing them to sell assets in relatively illiquid markets (IMF 2015, 2019; Chen, Goldstein, and Jiang 2010). If multiple funds are affected, fire sales could lead to a further decline in asset liquidity and asset prices (Coval and Stafford 2007).

This note attempts to inform the ongoing discussion about risks and vulnerabilities and their mitigation through preliminary insight into the liquidity and redemption management of global fixed-income funds during the recent COVID-19 episode. For this purpose, the note explores three questions: (1) How did fixed-income funds manage liquidity risk, and how did they react to the jump in redemption requests; that is, how did they raise the cash needed to meet investors' capital withdrawals? (2) Is there evidence that redemption pressure during the COVID-19 shock led to fire sales by asset managers? (3) What factors made funds more prone to capital redemption by end investors when market conditions were stressed?

FUNDS' PORTFOLIO COMPOSITION IN RESPONSE TO REDEMPTION SHOCKS

With only a handful of funds suspending redemptions, most fixed-income funds resorted to a mix of strategies to deal with outflows. The most afflicted funds used their relatively ample liquidity buffers and shed liquid assets such as cash and cash equivalents to cover redemptions; the small number of funds that received inflows hoarded cash and delayed investment, presumably because of uncertain market conditions (Figure 2, panel 1).³

As funds facing outflows were burning through liquid assets, the proportion of less liquid assets in their portfolios, such as corporate bonds and to a lesser extent sovereign bonds, increased (Figure 2, panels 2 and 3). Such increases were particularly pronounced in funds with high exposure to corporate credit, which faced heavy outflows.

Despite these portfolio reallocations observed in March 2020, funds' portfolios saw marginal improvements in their average rating quality profiles in April 2020, suggesting that while asset managers sold predominantly liquid assets, they did not let the risk profile of their holdings deteriorate, at least over the short time period assessed in this note (Figure 2, panel 4).

² In the first half of 2020, mutual funds suspended withdrawals from funds with a total of \$62 billion in assets under management, 0.11 percent of the sector's total assets (Fitch Ratings 2020). Of the funds that suspended redemptions, real estate funds were the most prevalent.

³ Assets designated as cash equivalents include securities as well as time deposits with maturities of less than 92 days. In fact, cash buffers were depleted more strongly than assets with liquidity features equivalent to cash. In unreported results we show that US Treasury securities served as an alternative source for financing redemptions, especially for fixed-income funds not specialized in any particular asset class segment. Funds holding exchange-traded fund shares, which typically have higher secondary market liquidity than underlying securities, used those for redemptions as well.

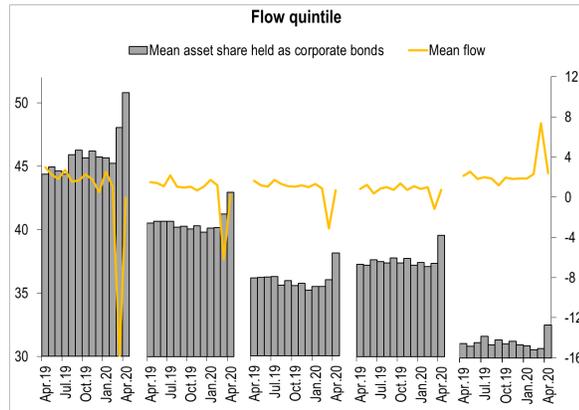
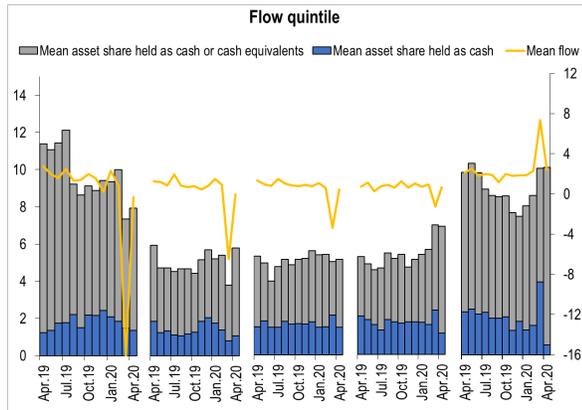
Figure 2. Fixed-Income Funds Met High Outflows with Liquid Assets if Possible, but Massive Liquidation Needs Still Lowered Portfolio Risks

Fixed-income funds reacted to severe outflow pressure with reductions in their positions in cash and cash equivalents ...

... and increased their exposures to corporate bonds, despite being already heavily exposed to associated valuation risk.

1. Holdings of Cash and Cash Equivalents (left scale) and Fund Net Flows (right scale) by March 2020 Flow Quintile, Fixed-Income Funds (Percent of assets under management)

2. Corporate Bond Holdings (left scale) and Fund Net Flows (right scale) by March 2020 Flow Quintile, Fixed-Income Funds (Percent of assets under management)

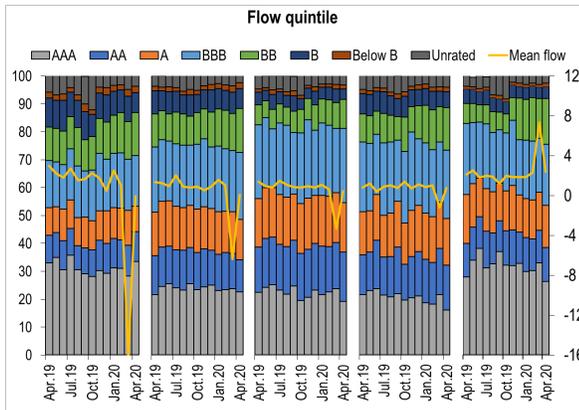
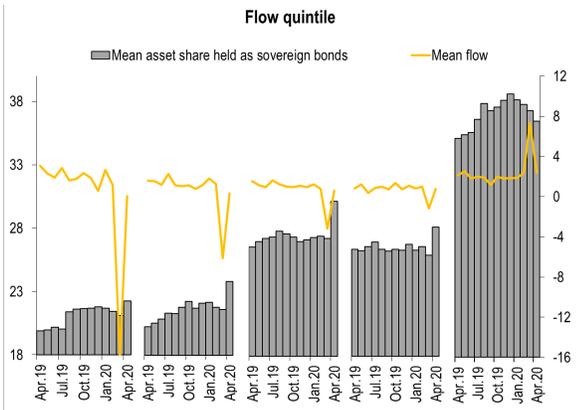


Funds holding more sovereign bonds saw less severe outflows in March 2020, as investors preferred liquidity.

Subsequent to severe outflows, fixed-income funds experienced a marginal improvement in their rating profile.

3. Government Bond Holdings (left scale) and Fund Net Flows (right scale) by March 2020 Flow Quintile, Fixed-Income Funds (Percent of assets under management)

4. Rating Distribution in Fixed-Income Funds' Portfolios (left scale) and Net Flows (right scale) Sorted by Flows in March 2020 (Percent of assets under management)

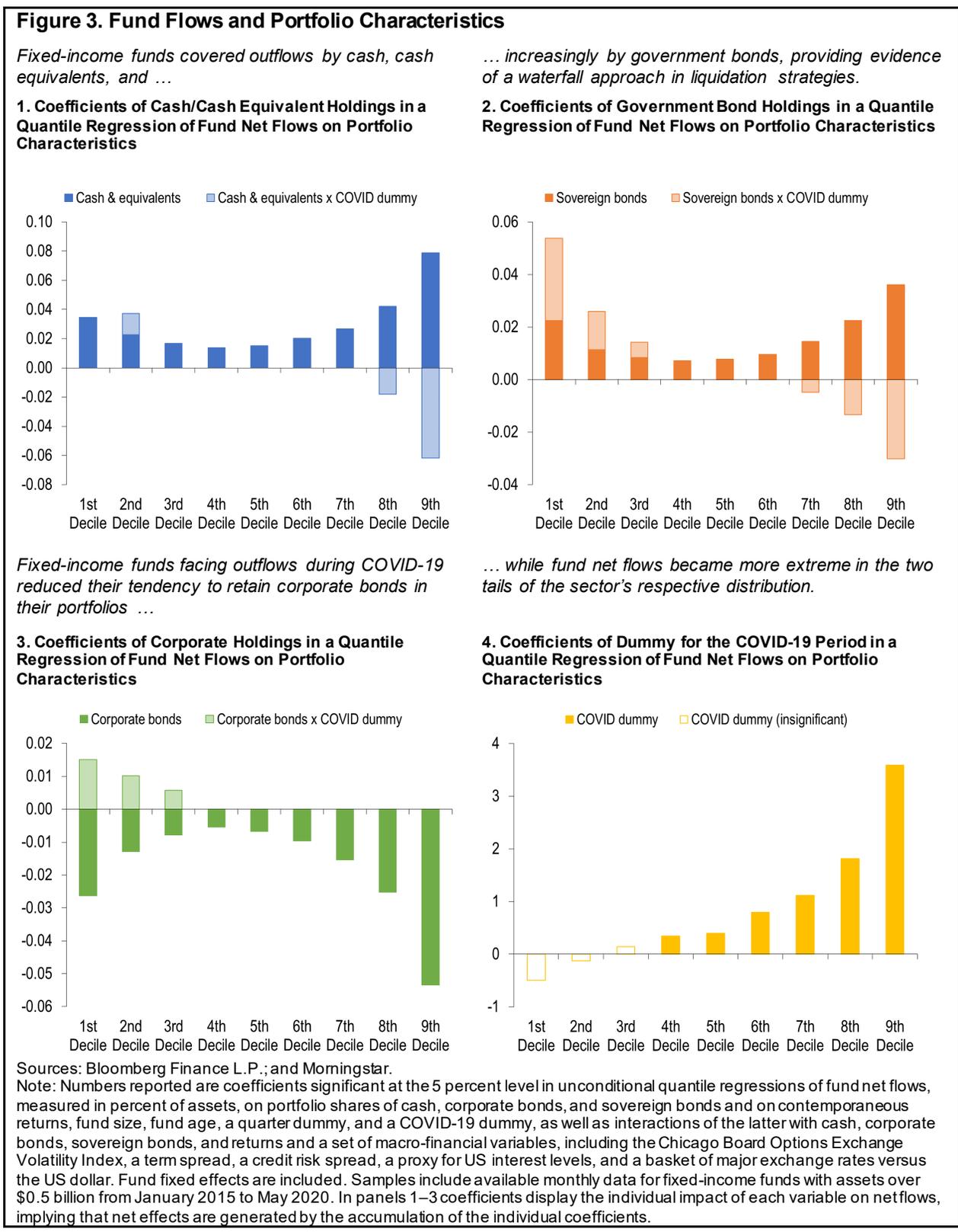


Source: Morningstar.

Note: All panels, except panel 4, show balanced samples; that is, only funds that do not enter or exit during January 2017 and April 2020 are included. In panel 1, Treasury bills and other securities that mature in less than 92 days are included in cash equivalents. In panels 1–3, the sets of funds reporting respective portfolio components differ, while the set of funds reporting flows remains unchanged. Samples include available monthly data from January 2015 to April 2020 for fixed-income funds with assets over \$0.5 billion.

Quantile regressions confirm that, in normal times, fixed-income funds experiencing high outflows are likely to cover redemptions with cash, cash equivalents, and sovereign bonds while actually holding onto corporate exposures. More specifically, in normal times, outflows are accompanied by declines in cash, its equivalents, and sovereign bonds, especially for funds facing either pronounced out- or inflows (Figure 3, panels 1–2). Corporate bond positions, on the other hand, are negatively correlated with fund net flows, especially at the tails of the fund flow distribution; that is, outflows are accompanied by increases in holdings of corporate bonds

(Figure 3, panel 3). The tendency for more pronounced flow reactions at more extreme quantiles may stem from delays in portfolio re-optimization as well as differing time needs in the purchase of assets of varying liquidities.

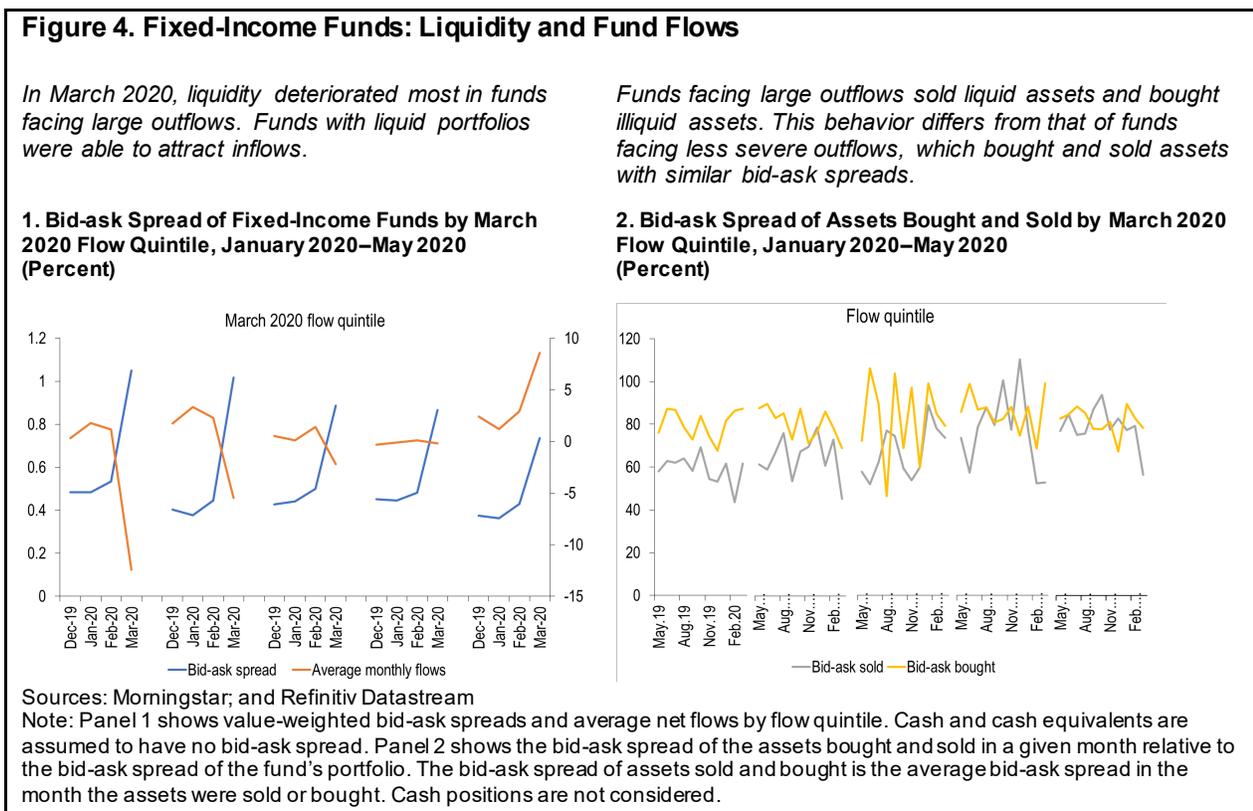


However, as outflows accelerated during the COVID-19 episode for the more vulnerable tail of funds (Figure 3, panel 4), funds modified their behavior. In the period starting February 2020 sensitivities observed for the lower-flow deciles increased in some cases for cash and cash equivalents, more than doubled for sovereign bonds, and lost substantially in strength for corporate bonds (Figure 3, panels 1–3).

Taken together, this evidence is for the most part consistent with funds following a “waterfall” approach; that is, instead of keeping portfolio weights unchanged, funds sold the most liquid assets first. However, although funds facing extreme outflows tended to sell less risky, higher-quality assets first, during the COVID-19 period—compared with previous periods of stress—they were less reluctant to shed riskier assets, such as corporate bonds.

FUNDS’ LIQUIDITY CONDITIONS AND SELLING PRESSURE IN FIXED-INCOME MARKETS⁴

During the COVID-19 stress episode, funds’ liquidity profiles deteriorated together with overall market conditions. While all funds saw the liquidity of their portfolios decline, liquidity reached the lowest levels for funds facing strong outflows (Figure 4, panel 1).

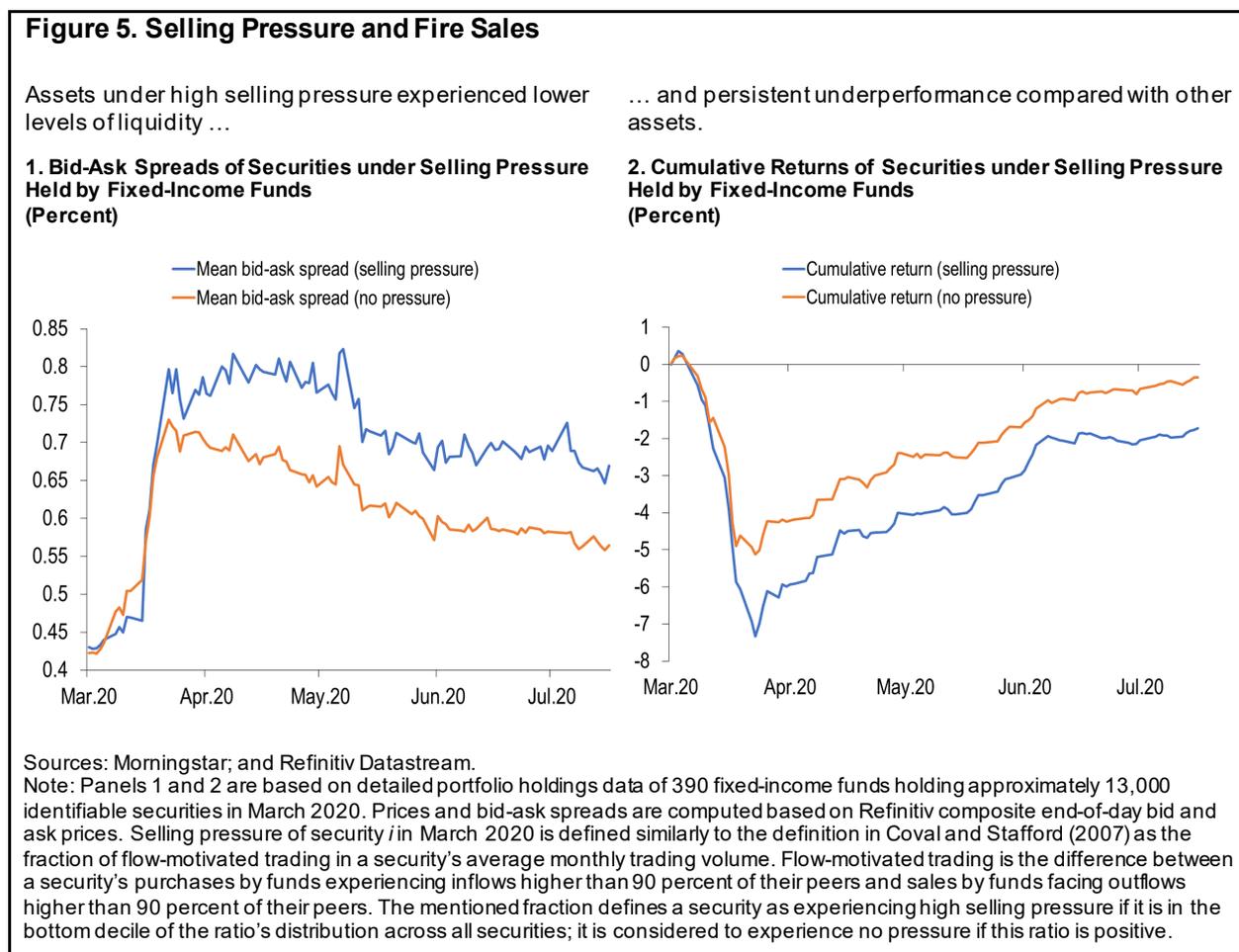


⁴ Detailed portfolio holdings data are available only for a subset of funds (638 funds representing about 24 percent of the global fixed-income sector). Bid-ask spreads are not available for all securities and are based on end-of-day composite spreads, which may not fully reflect the costs of trading bonds in large quantities.

As shown above, funds facing outflows sold safe and liquid assets first in order to avoid realizing losses. Figure 4, panel 2, shows the trading behavior of fixed-income funds expressed as the bid-ask spread of assets bought and sold relative to the average bid-ask spread of a fund's portfolio.

For funds facing outflows, the liquidity differential between assets sold and assets bought increased in the first quarter of 2020. For funds facing modest outflows or inflows on the other hand the bid-ask spreads of assets bought are generally close to the bid-ask spreads of assets sold, even though assets bought tend to be less liquid than assets sold. Hence, some funds' willingness to absorb relatively illiquid assets even under uncertain market conditions worsened their portfolios' liquidity positions further but may have also helped to marginally mitigate price pressures.

Even though fixed-income funds seem to have sold predominantly liquid assets first, the large off-loading of assets in March 2020 may have had some adverse effect on both asset prices and market liquidity, although mitigated by the unprecedented and speedy policy support.



In March 2020 the bid-ask spreads of assets most heavily sold across all fixed-income funds facing large redemptions increased more than the bid-ask spreads of assets not facing such selling pressure (Figure 5, panel 1). As a consequence, during March 2020, cumulative returns of assets under selling pressure declined more than those of assets experiencing no selling pressure. Hence, funds' sales of liquid assets are likely to have contributed to price pressures and liquidity strains observed in core fixed-income markets such as US Treasury markets. Similarly, funds increasingly having to sell corporate bonds may have amplified the price dislocations observed in risky credit markets in March 2020.

DETERMINANTS OF INVESTOR FLOWS

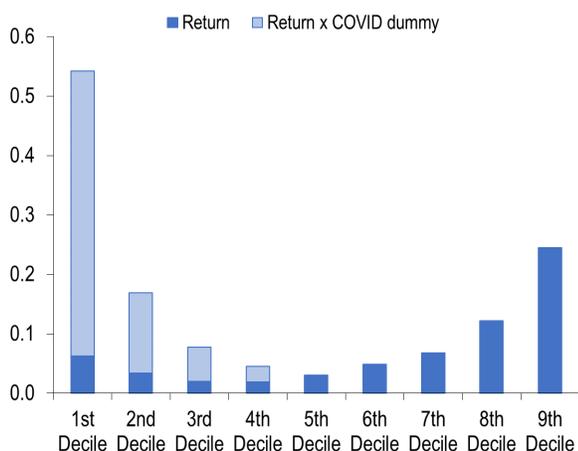
The evidence so far suggests that funds tend to prioritize a waterfall approach when liquidating assets in periods of severe redemption stress, selling relatively liquid assets first. While this approach may have prevented liquidity conditions from deteriorating even further in already illiquid assets, it also left funds' remaining investors with fewer liquid asset holdings. Moreover, the sheer size of the outflows observed in March 2020 required sales of riskier portfolio components, which may have also contributed to selling pressure in this market segment.

Funds holding relatively illiquid assets but offering near-daily redemptions are inherently fragile because investors who redeem their shares do not necessarily absorb all the costs from trading. This leads to strategic complementarities that can amplify outflows following, during, or in anticipation of bad performance (Chen, Goldstein, and Jiang 2010). As a consequence, the relationship between flows and poor performance is expected to be stronger for funds facing outflows, at least during periods of extreme stress, when market liquidity deteriorates, such as the COVID-19 period or other stress periods of comparable severity.

Figure 6. Flow-Performance Relationship

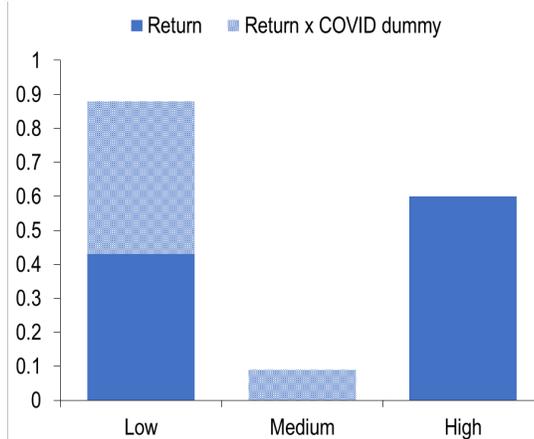
After February 2020 monthly net flows to fixed-income funds facing below-average net flows became more sensitive to returns.

1. Coefficients from Quantile Regressions of Monthly Fund Net Flows on Returns, January 2015–May 2020



Similarly, looking at daily fund net flows shows that fund net flows became much more sensitive to performance for the low-performing funds during the COVID-19 stress episode.

2. Coefficients from a Regression of Daily Fund Net Flows on Returns, January 2019–May 2020



Sources: Bloomberg Finance L.P.; Morningstar; and Refinitiv Datastream.

Note: Displayed coefficients are significant at the 5 percent level. The model specification for panel 1 is the same as the one reported in Figure 3. Panel 2 shows the coefficient of a piecewise linear regression of daily net flows on daily returns over the period January 2019–May 2020. Returns are first grouped by date and global category group and ranked on a scale from 0 to 100, then “Low” is defined as $\min(0.2, \text{rank})$, “Medium” as $\min(0.6, \text{rank})$, and “High” as $(\text{rank} - (\text{low} + \text{mid}))$.

In line with this hypothesis, sensitivities of flows to contemporaneous returns deviated in the COVID-19 episode substantially from what was observed over the previous five years: sensitivities increased for funds with very high outflows (Figure 6, panel 1). For the bottom decile of net flows the respective sensitivity increased from 0.06 percent to 0.54 percent for each 1 percent increase in returns. Thus, during the COVID-19 episode, it

appears that investors started sanctioning the inferior performance of funds already facing large outflows with additional redemption requests.⁵

Similarly, looking at daily fund net flows and differentiating flow sensitivities across performance levels reveals that flows tend to react generally more to returns for funds showing either high or low performance levels, relative to those in the center of the return distribution (Figure 6, panel 2).⁶ During the COVID-19 pandemic, however, the sensitivity of flows of funds facing low returns more than doubled, to 0.86 percent for each 1 percent increase in returns.

These results thus point to an increased inclination of investors to redeem their shares when perceiving mounting valuation risk for their investments as they did during the COVID-19 episode. Such behavior suggests that feedback mechanisms from the devaluation in securities prices to capital withdrawals by investors may have intensified and could have led to runs on funds, had liquidity conditions deteriorated further.

CONCLUSIONS

Assets under management by investment funds have grown rapidly since the global financial crisis (FSB 2020). As previously highlighted (IMF 2015, 2019), funds can be subject to fragilities because of the mismatch between the liquidity of funds' underlying assets and end investors' ability to redeem on a near-daily basis. Second-round effects can occur when redemptions cause selling pressure that then reinforces price declines and leads to further redemptions. Recognizing these risks, policymakers have called for the implementation of various liquidity and redemption management tools, such as swing pricing, redemption fees, and other anti-dilution methods (FSB 2017; IOSCO 2018), which until recently had been largely untested in a market-wide stress scenario. Similarly, fund sector-wide liquidity stress scenario exercises, used in numerous reports of the IMF's Financial Stability Assessment Program and by other institutions as well, picked up on these particular risks.

The decline in prices across various asset classes and subsequent large portfolio losses and significant outflows observed in March 2020 presented an unparalleled stress test for the fund industry. Central banks reacted with unprecedented speed to the market turmoil and implemented wide-ranging policy measures to preserve market functioning and maintain the flow of credit to the economy. Among these measures were lending against risky assets, including commercial paper, mortgage-backed securities, corporate bonds, and exchange-traded fund shares, and offering credit to primary dealers and money market funds. Supported by rebounding asset prices and improved investor confidence, fund flow patterns normalized relatively quickly.⁷

Even though the stress episode in March 2020 was relatively short-lived, this note highlights important weaknesses funds faced. Most funds sold relatively liquid assets first, which could have deepened their redemption stress if liquidity conditions had not improved following massive central bank interventions. When looking at the flow-performance relationship, fund investors seem to have responded to this risk very consciously, by reducing their holdings in underperforming funds already exposed to high redemption pressure.

⁵ Running several robustness tests, including an alternative stress dummy based on values of the VIX exceeding or equal to its 95th percentile during January 2010 to May 2020, adding additional variables such as lagged flows and lagged returns (the latter together with interaction terms for the respective dummy used) did not change results qualitatively.

⁶ Results are drawn from piecewise linear regressions (as in Siri and Tufano 1998; Ferreira and others 2012) of daily fund net flows on past returns, which allow flow performance sensitivities to vary across performance levels.

⁷ In the long run markets may start to anticipate future central bank interventions in times of stress, which could lead to moral hazard.

Even though funds only marginally engaged in large-scale sales of low-liquidity assets there was some evidence of price declines in markets following selling pressure, which highlights the risk of fire sales if funds must unload relatively illiquid assets quickly.

Looking ahead, a comprehensive review of available prudential tools in the investment fund sector, including a broad set of tools to better manage redemptions—such as enhanced use of minimal requirements for liquidity buffers; more widespread adoption of swing pricing; or, if that is not possible, requiring funds to better match redemption periods to the liquidity profiles of their portfolios—could help mitigate vulnerabilities revealed during the COVID-19 market turmoil (FSB 2020; IMF 2019).⁸

⁸ Although data limitations did not allow this result to be established clearly for the March 2020 turmoil period, Jin and others (2019) provide respective evidence for UK corporate bond funds during stress periods.

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Appendix

Table 1. Sample Overview and Summary Statistics

| | Fund net flow and return data (daily) | Fund net flow, return and portfolio data (monthly) | Detailed portfolio data (monthly) |
|--|---------------------------------------|--|-----------------------------------|
| Sample period | Jan. 1, 2019–May 1, 2020 | January 2015–May 2020 | April 2019–March 2020 |
| Number of funds | 2,073 | 2,877 | 638 |
| Fund domicile | | | |
| United States | 34% | 29% | 43% |
| Luxembourg | 27% | 21% | 30% |
| Ireland | 9% | 8% | 6% |
| Other | 30% | 42% | 21% |
| NAV (bn USD, mean) | 2.3 | 2.5 | 3.8 |
| NAV (bn USD, median) | 1.1 | 1.1 | 2.1 |
| Of global fixed income sector (IIFA, March 2020) | 25.33% | 64.52% | 22.47% |
| Flow net (mean) | 0.0487% | 1% | 0.92% |
| Flow net (median) | 0.0015% | 0.22% | 0.44% |
| Return (median) | 0.0096% | 0.21% | 0.25% |
| Return (mean) | 0.003% | 0.14% | –0.02% |

Sources: Refinitiv Datastream; and Morningstar.

Note: The sample is compared with the global fixed income sector, including funds of funds, as reported by the International Investment Funds Association in March 2020. Observations with net flows below –50 percent or above 50 percent have been dropped. Bn = billion; EM = emerging market; NAV = net asset value; USD = US dollars.