Lending at a Cost: Liquidity Fragility in Bond Mutual Funds

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Abstract

This paper examines how securities lending affects liquidity management and performance in corporate bond mutual funds. We show that funds engaging in lending hold significantly less cash than non-lenders, suggesting a more aggressive portfolio strategy. While lending funds outperform in normal times due to additional income from lending fees and collateral reinvestment, they underperform during periods of large outflows. Using detailed fund-level and position-level data, we document that lending funds are more likely to recall and sell previously lent bonds when facing redemptions, especially bonds they hold in large ownership, creating price pressure and dragging down performance. Importantly, we find that this mechanism is unique to bond funds and not present in equity funds, reflecting the greater illiquidity of bond markets. Our findings highlight a tradeoff between return enhancement and fragility, and offer new insight into how a common fund practice like securities lending can amplify risks during stress.

Keywords: Corporate bond funds, Securities lending, Liquidity management, Asset fire sales

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1 Introduction

Securities lending has long served as a low-risk mechanism through which mutual funds generate incremental income. By temporarily transferring portfolio securities to borrowers in exchange for fees and collateral, typically cash that can be reinvested, funds can enhance returns without necessarily altering their core investment strategies. While studies have been focused mostly on securities lending in equity mutual funds (Rizova, 2011, Dong and Zhu, 2022, and Chen, Tran, and Wang, 2024), participation rate in securities lending is similar in bond mutual funds, yet we know comparatively little about how it shapes portfolio management, liquidity decisions, and fund performance. This paper addresses this gap by studying the behavior and consequences of securities lending among corporate bond mutual funds.

Liquidity management is a first-order concern for open-end bond funds (Goldstein, Jiang, and Ng, 2017; Jiang, Li, and Wang, 2021; Kim and Randall, 2023). These funds promise daily redemptions but invest in assets that trade in fragmented and illiquid over-the-counter markets. To meet redemptions without incurring substantial transaction costs, bond funds typically hold cash or other liquid assets. However, holding idle cash comes with opportunity costs, especially in a high interest rate environment (Tobin, 1956). Securities lending offers an alternative way to enhance returns: by lending out securities and reinvesting the cash collateral, funds can deploy capital more aggressively without altering their core portfolio (Foley-Fisher, Narajabad, and Verani, 2016). Importantly, funds that pursue securities lending as a return-enhancing strategy may also manage the rest of their portfolio more aggressively by holding less cash. This more capital-intensive strategy increases performance in normal times but can create fragility during stress, when redemptions require quick asset sales in illiquid markets (Schrimpf, Shim, and Shin, 2021).

We show that corporate bond funds engaging in securities lending (lenders) hold significantly less cash than their non-lending peers, as they deploy capital more aggressively. However, this aggressive strategy is distinct from the reaching-for-yield strategy documented in the literature (Choi and Kronlund, 2018), as lenders do not appear to hold more risky or higher yield securities than non-lender peers in the same investment style. While lending funds outperform in normal times, they underperform significantly during periods of large investor outflows. We document a direct mechanism behind this asymmetry: lending funds facing redemptions recall previously lent bonds and subsequently sell them. These sales create significant price pressure, particularly because the recalled bonds tend to be held primarily by the lending fund itself. By tracing the full sequence from reduced cash buffers to forced recalls and eventual sales, we provide a comprehensive view of how securities lending affects bond funds' exposure to liquidity risk.

Our analysis begins by documenting several descriptive facts about securities lending activity in corporate bond mutual funds. Using comprehensive fund- and position-level data, we show that roughly 38% of corporate bond funds engage in lending, with substantial heterogeneity across investment styles. High-yield and BBB-rated funds are among the most active lenders, while short-duration and multi-sector income funds lend significantly less. Lending generates economically meaningful revenue for active participants: high-yield funds earn, on average, 4.2 basis points annually from lending, and individual fund-level variation in lending revenue is large, primarily explained by variations in lending volume, bond lending fees, and the fraction of collateral that is in cash for reinvestment. Lenders are more likely to lend bonds that have higher trading volume and lending fees, which reflects borrowers' demand, and bonds in which the lending funds have a large ownership and are not commonly held by other mutual funds.

We then examine the role of securities lending in liquidity management. Consistent with our hypothesis, lending funds systematically hold less cash and cash equivalents than non-lending funds, even after controlling for investment style, fund size, turnover, and other characteristics. On average, lending funds hold about 25% less cash than their non-lending counterparts. Moreover, the gap in cash holding between lenders and non-lenders widens during the second subsample, when the Fed increased the interest rate, and the cost of holding cash became larger. We further show that, within funds, increases in lending activity are associated with reductions in cash holdings, underscoring a dynamic relationship between lending behavior and liquidity management. These patterns suggest that securities lending facilitates a more capital-intensive investment strategy, which has implications for fund performance and fragility in different market conditions.

Next, we assess the performance implications of securities lending. In normal periods, defined as months without large outflows, lending funds earn approximately 1.8 basis points more per month in net-of-fee returns than non-lenders after controlling for investment style and other characteristics. This performance advantage is consistent with the income generated from lending fees and cash collateral reinvestment. However, this advantage reverses during stress periods. In months when outflows exceed 1%, around the 25th percentile of the flow distribution, lending funds underperform non-lending peers by 2.9 to 3.4 basis points per month. These differences are economically meaningful: the performance swing between tranquil and stressed conditions can exceed 60 basis points per year, enough to materially affect fund rankings and investor flows.

To understand the source of this underperformance, we turn to fund-level trading behavior during redemption events. We show that, conditional on experiencing large outflows, lending funds are significantly more likely to sell bonds than non-lending peers. More im-

portantly, this selling is concentrated among bonds that were on loan in the prior quarter, consistent with funds actively selecting bonds to sell rather than scaling down proportionally (Choi, Hoseinzade, Shin, and Tehranian, 2020). As we documented earlier, these bonds tend to be those in which the lending fund has dominant ownership and are less likely to be held by other funds. Their forced sale during periods of stress exerts considerable price pressure, which can explain their underperformance.

How do lending funds end up selling bonds that were previously on loan? First, we show that lending activity contracts in response to outflows. During episodes of large redemptions, lending volume reduces by 21% on average. Moreover, bonds recalled during outflows are 13.8% more likely to be sold than other bonds, and over 13% of recalled positions are liquidated in the same period. These findings reinforce the notion that securities lending adds fragility to fund portfolios: in good times, it provides modest return enhancement, but in bad times, it amplifies liquidity pressures, leading to asset fire sales and underperformance.

We focus on bond mutual funds because the risks tied to securities lending are especially pronounced in the fixed income space. Unlike equities, corporate bonds are less liquid and trade in over-the-counter markets, making them harder to sell quickly without affecting prices. This matters when funds face large redemptions. We find that bond funds engaging in securities lending often recall and sell the very bonds they had lent out, bonds that tend to be in high shorting demand and heavily held by the fund itself, putting additional pressure on prices. Interestingly, this mechanism appears unique to bond funds. When we repeat the analysis in the equity fund space, we don't see the same behavior: equity lenders do not systematically recall and sell loaned securities during outflows, as equities in general are fairly liquid to trade (Chernenko and Sunderam, 2020).

Our study makes several contributions to the literature on mutual funds and financial

intermediation. First, we add to the growing body of work on liquidity management and fragility in open-end funds (e.g., Chernenko and Sunderam, 2016; Goldstein et al., 2017). Existing research has primarily focused on how funds manage liquidity through cash buffers, portfolio composition, and trading behavior during redemptions. We build on this foundation by introducing securities lending as a novel and previously underexplored dimension of liquidity management. Although securities lending is often viewed as a low-risk, income-enhancing strategy, we show that it has meaningful implications for how aggressively funds deploy capital and how vulnerable they become under stress. By linking lending activity to reduced cash holdings and forced selling during redemptions, we demonstrate that securities lending is not just a side activity. It is a key factor that shapes both fund behavior and fragility, particularly in illiquid markets. This insight deepens our understanding of how operational choices made in normal times can affect fund resilience in periods of market stress.

Second, we extend the literature on securities lending in mutual funds, which has so far focused mostly on equity funds (e.g., Rizova, 2011; Dong and Zhu, 2022; Chen et al., 2024). While this work has provided important insights into the role of lending in equity portfolio management and fund performance, bond funds operate in a fundamentally different environment, the market frictions of which amplify the consequences of securities lending decisions in fixed income portfolios. We show that, unlike their equity counterparts, bond funds that lend securities are more likely to recall and liquidate these positions when facing outflows, which is not observed among equity funds. Our findings suggest that the implications of securities lending are not one-size-fits-all, and that the dynamics in bond funds are not only distinct but potentially more fragile. By shifting the focus toward fixed income funds, our study broadens the scope of the literature and highlights the importance of market structure

in shaping fund behavior.

Third, we contribute to the literature on securities lending of fixed income assets by institutional investors. Foley-Fisher et al. (2016) examines insurance companies and finds that securities lending, especially the associated collateral reinvestment, is a source of wholesale funding that they can invest in longer-maturity securities. Different from them, we find that corporate bond mutual fund lenders mostly reinvest cash collateral in short-term safe assets. In the meantime, they deploy capital more aggressively by holding less cash, which generates fragility during periods of large outflows.

The rest of the paper is organized as follows. Section 2 describes the data and sample construction. Section 3 provides empirical results. Section 4 concludes.

2 Data and Sample Construction

We construct our sample of U.S. corporate bond mutual funds using the Center for Research in Security Prices (CRSP) Survivor-Bias-Free Mutual Fund Database. A fund is classified as a corporate bond fund if, on average, more than 50% of its portfolio is invested in corporate bonds. We identify passively managed funds using the CRSP index fund flag (`index_fund_flag`), ETF flag (`et_flag`), and by screening fund names. From CRSP, we collect fund returns, Lipper investment style classifications, and other fund-level characteristics, including expense ratio, turnover, and total net assets.

To examine our research questions, we construct a novel dataset that incorporates newly available information on mutual fund securities lending from SEC Forms N-CEN and N-PORT.[1] We obtain lending revenue from Form N-CEN, and position-level lending activity from Form N-PORT. Form N-CEN is a regulatory SEC form that registered investment

[1]See Chen et al. (2024) for a detailed discussion of Forms N-CEN and N-PORT.

companies in the United States must file to report certain census-type information about the funds. SEC designed the form to monitor and supervise the investment fund industry more effectively. N-CEN became effective for funds with fiscal years ending on or after June 1, 2018, and registered investment companies have been required to file Form N-CEN annually since then. A fund discloses whether it is allowed to do securities lending, and if so, the identity of its lending agents (name, is affiliated), the average value on loan of its portfolio, and the net income of securities lending in a fiscal year.

N-PORT form, effective in September 2019, requires mutual funds to report detailed information about their portfolio holdings at a quarterly frequency. It collects a comprehensive range of data, including: [1] detailed information on each portfolio holding, such as the issuer, asset type, quantity and market value held, and currency denomination; [2] use of derivatives and their exposure; [3] liquidity and additional risk metrics of a fund's portfolio; and [4] data on securities lending activities. For example, at the position level, we can observe whether a fund lent out securities at the time of reporting and, if so, the value of securities on loan. At the position level, we can also observe whether part of the holding is a reinvestment of cash collateral the fund receives. This allows us to examine how funds manage their cash collateral reinvestment, an important part of the securities lending process.

We link the SEC data to our CRSP-based sample using the mapping provided in the CRSP mutual fund database, which connects `crsp_fundno` (CRSP's share-class identifier) to `contract_id`. The fund-level identifier is referred to as `series_id`, the corresponding identifier in SEC filings.[2] Our final sample includes 1011 unique corporate bond funds spanning the period from 2019Q3 to 2024Q4.

[2]This link is available through the CRSP-provided table `crsp_cik_map`.

We further enrich the dataset with bond-level characteristics from the Mergent Fixed Income Securities Database (FISD). Our market-level data on US corporate bonds is based on TRACE, which provides variables such as monthly bond returns, amount outstanding, trading volume, and so on. In addition, we incorporate bond-level securities lending data from IHS Markit Securities Finance, a leading provider of global securities lending analytics. Markit's data include both the simple average fee and the indicative fee for equities and bonds. However, the simple average fee is mostly missing for bonds, whereas the indicative fee is consistently reported. The indicative fee is a model-derived rate calculated using Markit's proprietary analytics and a dataset of borrowing costs contributed by agent lenders, prime brokers, and hedge funds. Asquith, Au, Covert, and Pathak (2013) studies a large institutional lender active in both equity and bond markets and finds that lending fees are generally comparable across asset classes.

3 Empirical Results

In this section, we examine how securities lending by corporate bond mutual funds relates to their liquidity management, performance, and trading behavior, particularly during periods of investor redemption. We start the section by providing some descriptive facts on securities lending by these funds, and what characteristics drive lending decisions both at the fund and bond levels. We then compare liquidity management across lending and non-lending funds, and assess the performance implications of lending, highlighting asymmetries across normal and stressed conditions. Finally, we explore the mechanisms behind underperformance during periods of outflows, providing evidence that lending funds recall and sell previously lent securities to raise cash, which in turn imposes price impact.

3.1 Descriptive facts about securities lending by corporate bond funds

3.1.1 Summary statistics

Around 38% of corporate bond funds engage in securities lending, as shown in Panel A of Table 1. The prevalence of securities lending among corporate bond funds is similar to what has been documented in equity funds (Dong and Zhu, 2022; Chen et al., 2024). Lending activity is notably more concentrated among certain investment styles. For instance, over half (52%) of funds categorized as "Corporate Debt BBB-rated" by Lipper investment style engage in lending, the highest among all style groups, followed closely by high-yield bond funds (44%) and intermediate investment-grade funds (41%), as shown in Panel B of Table 1. In contrast, only 30% of short-term investment-grade and multi-sector income funds participate in lending markets, reflecting variation in lending incentives and opportunities across styles.

Among lending funds, the lending volume and lending revenue they generate are economically meaningful. High-yield funds lend the most aggressively, with an average lending volume of 6.65% of total net assets and corresponding revenue of 4.2 basis points per year relative to total net assets. The ability to generate revenue through lending also varies largely across funds, as the standard deviation in lending revenue is 5.3 basis points per year. BBB-rated corporate debt funds also exhibit significant lending intensity (5.27% in terms of lending volume, 1.5 basis points in terms of lending revenue), suggesting that credit-risky but relatively liquid instruments are fairly active in bond lending markets. In contrast, short-duration and investment-grade funds lend relatively little, both in volume and revenue terms.

An important part of securities lending is collateral. Corporate bond funds overwhelmingly receive cash collateral and reinvest it mainly in conservative instruments. On average, 91% of collateral is in cash, significantly higher than the 82% cash collateral observed among equity funds (Chen et al., 2024). Moreover, short-term investment vehicles (STIV), such as money market funds, account for the majority of cash collateral reinvestment. Specifically, at the fund-level, 86% of lending funds reinvest their cash collateral into STIV, while the remaining 14% are evenly split between repurchase agreements and other securities. This is different from insurance companies, where cash collateral is mainly reinvested into longer-maturity securities, as documented in Foley-Fisher et al. (2016).

3.1.2 Determinants of lending at the fund and bond levels

Next, we examine which types of funds are more likely to engage in securities lending. Specifically, we estimate a regression where the dependent variable is a dummy indicator that equals one if the fund engages in securities lending and zero otherwise. We include a set of fund controls and style-by-time fixed effects to account for the variations in lending decisions driven by style. Moreover, all continuous variables are standardized so that we can directly compare magnitudes of coefficient estimates. As shown in Column (1) of Table 2 Panel A, larger funds are more likely to lend. Turnover ratio and flow volatility are negatively associated with lending, so that funds facing more trading or redemption uncertainty may refrain from lending to preserve liquidity. Moreover, index funds are more likely to lend than active funds, as index funds do not frequently trade and thus face fewer constraints from potential recall risk, making lending a more feasible and consistent source of additional income.

In Column (2) of Table 2 Panel A, we focus on the subset of lending funds to examine

the sources of variation in lending revenue. In addition to the control variables used in Column (1), we include the average lending fee for bonds on loan, lending volume, and the fraction of cash collateral received. The dependent variable is the lending revenue scaled by the fund's total net assets, and the regression again includes style-by-time fixed effects. As expected, lending revenue is strongly driven by both lending volume and fund-level lending fees. Moreover, the share of cash collateral received also contributes to lending revenue, as it can be reinvested to generate additional returns.

Lastly, we turn to position-level data to examine which bonds are more likely to be on loan. The dependent variable, $On\ loan_{ijt}$, is equal to one if bond j is on loan by fund i in quarter t. The independent variables include a set of bond-level and position-level controls, and fund-by-time fixed effects to zoom in the lending choice within a fund's portfolio.

As shown in Panel B of Table 2, bonds with higher lending fees are significantly more likely to be lent, reflecting borrower demand and the potential returns to lenders. More liquid bonds, as proxied by higher trading volume, are also more likely to be on loan. Funds are more likely to lend bonds in which they hold a dominant ownership position, effectively serving as the primary supplier in the lending market. Conversely, bonds that are widely held across many funds are less likely to be lent, consistent with lower scarcity value. We also find that bonds with longer time to maturity are less likely to be lent, suggesting a preference for shorter-duration bonds due to lower transaction cost (Edwards, Harris, and Piwowar, 2007).

3.2 Liquidity management of lending funds

We start by studying how securities lending funds differ from non-lending funds in terms of liquidity management. If securities lending serves as an active strategy to enhance fund re-

turns, one would expect lending funds to manage their portfolios differently than non-lending funds. Specifically, by earning additional income through lending and reinvesting cash collateral, these funds may be more willing to invest their capital more aggressively rather than holding larger cash buffers. Therefore, we conjecture that, in the cross-section, lending funds should systematically hold less cash than their non-lending peers. Furthermore, if lending activity varies over time in response to market conditions or fund-level opportunities, then we should observe a negative time-series relationship between lending volume and cash holdings within funds.

We first examine the cross-sectional difference in cash holdings between lenders and non-lending funds using the following regression specification:

$$Cash_{it} = \beta_0 Lender_{it} + \mathbf{X'}_{it}\boldsymbol{\beta}_1 + \mu_{ist} + \epsilon_{it}, \tag{1}$$

where $Cash_{it}$ is the weight of cash and cash equivalents of a fund i's portfolio in period t. The key independent variable, $Lender_{it}$, is the lender indicator that equals one if a fund engages in securities lending in period t, and zero otherwise. Table 3 presents the results in three stages: Column (1) estimates a baseline specification that includes only the lender indicator, without fixed effects, μ_{ist}, or fund control variables, $\mathbf{X}_{it}$. Column (2) adds Lipper style-by-time fixed effects, μ_{ist}, to account for time-varying differences across peer groups. Column (3) further includes a set of fund-level control variables, $\mathbf{X}_{it}$, capturing characteristics such as fund size, expense ratio, turnover, and index dummy.

In Column (1), we find that non-lending funds hold, on average, 3.5% of their portfolios in cash and cash equivalents, compared to 2.6% for lending funds, which is 25% lower. The inclusion of style-by-time fixed effects in Column (2) does not materially alter the result.

Even after adding the full set of controls in Column (3), the cash holding gap persists at 0.4 percentage points, remaining economically large and statistically significant.

Next, we find that the gap in cash holdings between lending and non-lending funds widens during the second subsample of our sample, consistent with higher interest rates and stronger incentives for lending funds to deploy capital aggressively. Specifically, the gap in cash is 0.76% in the first subsample between 2019 and 2021, and widens to 1.04% in the second subsample between 2022 and 2024. We also find non-lenders slightly decrease their cash holdings by 10% in the second subsample, from 3.67% to 3.32%, which is also consistent with the higher opportunity cost of holding cash in general (Tobin, 1956).

We then turn to the time-series variation in cash holdings and lending volume, and show that they move in the opposite directions. We focus on a sample of funds that have engaged in securities lending at least once over our sample period. To capture within-fund variation over time, we re-estimate Equation (1), but now include fund fixed effects, which allows us to examine how changes in lending activity are associated with changes in cash holdings. As shown in Column (1) of Table 4, when a lending fund does not lend in a given quarter, it simultaneously increases its cash holding by 0.27%, which is 61% of the gap between lenders and non-lenders documented in column (3) of Table 3. In Column (2), we use the continuous variable *Lending volume* instead of a dummy variable, and the result is robust.

Given that lending funds are more aggressive in employing their capital, it could be that they are more likely to reach for yield by investing in more risky bonds than their peers (Choi and Kronlund, 2018). However, we find that there is no significant difference in average bond yields between the two groups, as shown in Columns (4)-(6) of Table 3, ruling out the documented reach-for-yield channel.

3.3 Performance difference between lending and non-lending funds

Next, we test the performance implications of securities lending. While lending generates fee income in normal times, it may create liquidity frictions during periods of large outflows, especially given their lower cash buffers compared to their peers as we documented in the previous section. Table 5 evaluates this tradeoff by comparing lending and non-lending fund returns conditional on large outflows. We define large outflows for months when funds experience net outflows more than 1% of their total net assets, which is around the 25^{th} percentile in flow distributions. We then estimate a set of regressions, where the dependent variables are either net-of-fee returns in odd columns or benchmark-adjusted returns in even columns. Our key independent variable is the *Lender* dummy. We also control for a set of fund characteristics and Lipper style-by-time fixed effects to isolate market- and sector-wide conditions and zoom in peer comparisons.

During normal times, lending funds outperform non-lending funds by 1.8 (1.9) basis points per month using net-of-fee returns (benchmark-adjusted returns), as shown in the first two columns of Table 5. These differences are statistically significant at the 5% level. The results are consistent with securities lending acting as a steady source of excess returns in bond markets and lenders being more aggressive in deploying their capital than non-lenders.

In contrast, the outperformance in normal times completely reverses in periods of large outflows. Columns (3) and (4) show that during such periods, lending funds not only do not outperform, but underperform by 2.9 to 3.4 basis points per month. The difference in fund performance between the two states is as large as 60 basis points per year, which is economically meaningful in affecting fund rankings and investor flows.

3.4 Lending and trading during periods of large outflows

3.4.1 Selling pressure during large outflows

Why do lending funds underperform during periods of large outflows? Given their low cash buffers relative to non-lending peers, they may need to sell some of their bonds to meet the redemption, which lowers their performance due to price pressure and potential portfolio distortion. To test this hypothesis, we estimate a set of regressions at the fund-position level, using the following regression specification:

$$\begin{aligned} \textit{Sell dummy}_{ijt} = \beta_0 \textit{Large outflow}_{it} + \beta_1 \textit{Lender}_{i,t-1} + \beta_2 \textit{Large outflow}_{it} \times \textit{Lender}_{i,t-1} \\ + \mathbf{Y'}_{ijt}\boldsymbol{\beta}_3 + \mu_{jt} + \epsilon_{ijt}, \end{aligned} \tag{2}$$

where $\textit{Sell dummy}_{ijt}$ is a dummy variable equal to one if fund i sells a bond j in the quarter t. $\textit{Large outflow}_{it}$ is a dummy variable equal to one if fund i's average monthly outflows exceed 1% in quarter t. $\textit{Lender}_{i,t-1}$ is a dummy indicator of whether fund i was a lender in the previous quarter. We use a lagged lender indicator so that a fund can potentially recall all its bonds on loan and no longer be a lender in the current quarter. In the regression, we also include bond-by-time fixed effects, μ_{jt}, to isolate all time-varying characteristics at the bond level, such as bond returns and liquidy, which can also affect trading, and focus on trading differences of a same bond between lenders and non-lenders when they experience large outflows. $\mathbf{Y}_{ijt}$ includes a set of fund- and position-level characteristics.

The regression result is shown in Column (1) of Table 6. The coefficient estimate of *Large outflow* dummy is positive and significant, suggesting that non-lending funds that experience large outflows are 4.7% more likely to sell a bond than funds without large outflows. The *Lender* dummy itself is simply zero, suggesting that lenders and non-lenders do not differ

in the probability of selling in normal times. More importantly, the coefficient estimate of the interaction term, *Large outflow* $\times$ *Lender*, suggests that lenders are 3.7% more likely (or 78.7% on a relative scale) to sell a bond than non-lenders when they both experience large outflows.

This result echoes with our earlier finding that lending funds hold less cash. With smaller buffers, lenders are less able to absorb outflows without selling assets. That's why, during large redemptions, they're much more likely to sell bonds than non-lenders, despite showing no difference in normal times. It highlights a key tradeoff that we examine in the paper: securities lending lets funds deploy capital more aggressively, but also leaves them more exposed when liquidity is needed most. Our contribution is to show this link clearly, connecting lending activity to real-time trading decisions during stress.

What bonds are lenders more likely to sell to meet redemptions? To answer this question, we decompose the lagged lender dummy into two dummies, depending on whether the bond was on loan in the previous quarter. As shown in column (2), lenders are three times more likely to sell a bond that was on loan than a bond that was not on loan during periods of large outflows. Our result highlights that lenders, when facing large outflows, do not simply wind down their positions proportionally, but rather selectively trade certain bonds to meet redemptions, which is consistent with the finding in Choi et al. (2020).

The fact that a lender prioritizes selling a bond that was previously on loan is consistent with it being more liquid than other bonds, as we documented in Section 3.1. Moreover, lending funds are more likely to lend bonds that they have high ownership in, and selling them would be more likely to generate price pressure, which is consistent with lenders' underperformance during periods of large outflows.

3.4.2 Flow-driven recalls and forced sales

We next study how large outflows affect lending funds' recall decisions and whether they subsequently sell recalled bonds to meet redemptions. To test the sensitivity of lending activity and investor flows, we focus on a sample of lenders and estimate a set of regressions, where the dependent variables, $\Delta Lending\ volume_{it}$, is the change in fund i's loan value from quarter $t-1$ to quarter t relative to the fund's total net assets. The independent variable is the fund flows in quarter t. We also control for style-by-time fixed effects to focus on peer comparison in the cross-section.

The result is shown in Column (1) of Table 7. The coefficient estimate of fund flows is 0.007, suggesting that a 1 percentage point decrease in flows is associated with a 0.7 basic point contraction in lending volume. In Column (2), we further decompose fund flows into positive and negative parts. While both estimates are positive, the sensitivity is over four times larger for outflows. In Column (3), the key independent variable is the dummy indicator of large outflows. When funds are hit with large outflows, they reduce lending volume by 0.632 percentage points on average, which translates to a 21% reduction relative to the mean. Dong and Zhu (2022) focuses on a sample of equity funds and finds a positive relationship between fund flows and change in loan supply at the stock level. Our analyses focus on the fund level with a particular emphasis on lending volume contractions and outflows.

Lastly, to link recalls directly to sales, we examine whether lenders are more likely to sell bonds that are recalled when they experience large outflows. At the position level, we identify whether a fund recalls and sells a bond using either dummy or continuous variables.

Specifically, we define recall and sell intensity as follows:

$$\textit{Sell intensity}_{ijt} = \begin{cases} \dfrac{(n_{ij,t-1} - n_{ijt})p_{j,t-1}}{TNA_{i,t-1}} & \text{, if } n_{ij,t-1} - n_{ijt} > 0 \\ 0 & \text{, otherwise.} \end{cases}$$

$$\textit{Recall intensity}_{ijt} = \begin{cases} \dfrac{(n^{loan}_{ij,t-1} - n^{loan}_{ijt})p_{j,t-1}}{TNA_{i,t-1}} & \text{, if } n^{loan}_{ij,t-1} - n^{loan}_{ijt} > 0 \\ 0 & \text{, otherwise.} \end{cases}$$

where n_{ijt} (n^{loan}_{ijt}) is the par value of bond j held (lent) by fund i in quarter t, and p_{jt} is the price of bond j per par value in quarter t. The dummy variables *Sell dummy* and *Recall dummy* are equal to one if the continuous variables are positive and zero otherwise. Conditional on a sample of lending funds identified in quarter $t-1$ experiencing large outflows in quarter t, we regress *Sell dummy/intensity* on *Recall dummy/intensity*, with fund-by-time fixed effects, so that we can examine whether bonds sold by the fund are also the ones they recalled.

As shown in Column (1) of Table 8, bonds that are recalled are 13.8% more likely to be sold than other bonds, when funds experience large outflows. In terms of levels, 13.7% of the recalled bonds are subsequently sold, as shown in Column (2). These findings establish a direct mechanism: lending funds, facing redemptions, must recall and liquidate positions that would otherwise remain in the portfolio, exacerbating price pressure and driving underperformance.

Our identified mechanism builds on the assumption that securities held by these funds are generally illiquid. We conduct similar exercises among equity funds and do not find evidence that equity lenders are more likely to sell stocks on loan during periods of large outflows, as shown in Table A1, which is consistent with the fact that equities are much

more liquid than corporate bonds to trade (Chernenko and Sunderam, 2020). This finding emphasizes the importance and unique setting of focusing on corporate bond funds.

Taken together, our results highlight a fundamental tradeoff in the use of securities lending by corporate bond mutual funds. Lending provides a modest performance boost in normal times, reflecting the value of lending fee and income from cash collateral reinvestment. However, lenders being more aggressive in deploying capital and holding less cash buffers make them vulnerable during periods of large outflows. By tracing the full sequence of actions, from reduced cash holdings, to flow-induced recalls and sales and eventual underperformance, we offer new evidence on how lending reshapes fund risk profiles. These dynamics are especially important in fixed income markets, where bonds are illiquid and sales during stress events impose a sizable price impact.

4 Conclusion

This paper explores how securities lending affects the liquidity management and risk profile of corporate bond mutual funds. While securities lending is often viewed as a straightforward way to boost returns, we show that it has deeper implications for how funds operate. Lending funds tend to hold significantly less cash than their non-lending peers, suggesting a more aggressive approach to deploying capital. This strategy works well in normal times because of income from lending fees and reinvested collateral. But when redemptions spike, they are more exposed and underperform their peers. With smaller cash buffers, they are forced to unwind positions, often recalling and selling the very bonds they had lent out.

What makes this mechanism especially important in the bond fund space is the nature of the assets involved. Corporate bonds are less liquid than equities, and many of the

bonds on loan are heavily owned by lending funds. When these bonds are recalled and sold under pressure, it creates a sizable price impact, hurting fund performance even further. Interestingly, this behavior appears unique to bond funds, as we don't see the same pattern in equity funds. That contrast highlights why market structure matters: practices that may be benign in one setting can be destabilizing in another.

Our findings have practical implications. For fund managers, the results serve as a reminder that strategies designed to enhance returns can also introduce hidden risks, especially during periods of stress. For investors, they suggest a need to look beyond surface-level performance and understand how a fund manages liquidity. And for policymakers, our findings raise important questions about how securities lending interacts with broader market stability, particularly in less liquid asset classes. As bond mutual funds continue to grow in size and significance, understanding these dynamics will be increasingly important for the broader market stability.

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Table 1
Fund-level Summary Statistics and Style Distribution.

This table presents fund-level summary statistics in Panel A and the distribution of lending activity across Lipper styles in Panel B. In Panel A, *Lender* is a dummy variable equal to one if a fund engages in securities lending, and zero otherwise. *Fund size* is the natural logarithm of total net assets. *Flow volatility* is the annualized standard deviation of monthly flows over the past year. *Flow* is the annualized net flow, expressed in percentage points. *Return* is the annualized net-of-fees fund return, also in percentage points. *Index Fund* is a dummy variable equal to one if the fund is an index fund. Panel B reports the distribution of funds across Lipper styles. For each style, we report the fraction of funds, the fraction of lenders, along with the average and the standard deviation of lending volume, is defined as the aggregate value of bonds lent out, and lending revenue as a percentage of total net assets.

Panel A: Fund characteristics

	mean	sd	p25	p50	p75
Lender	0.38	0.49	0.00	0.00	1.00
Fund size	6.28	2.04	4.82	6.28	7.66
Turnover ratio	1.14	2.01	0.37	0.64	1.26
Expense ratio (%)	0.50	0.29	0.30	0.49	0.67
Flow volatility (%)	16.42	16.35	5.48	10.32	21.25
Flow (%)	12.95	73.41	-14.27	-0.28	22.28
Return (%)	1.51	14.15	-4.77	2.02	8.14
Index fund	0.17	0.38	0.00	0.00	0.00

Panel B: Lending characteristics by fund investment style

	Fraction	Fraction	Lending volume		Lending revenue	
Investment style	of Funds	of Lenders	mean	sd	mean	sd
Intermediate investment grade debt	0.27	0.41	2.51	3.36	0.006	0.008
High yield	0.19	0.44	6.65	6.81	0.042	0.053
Corporate debt BBB-rated	0.13	0.52	5.27	6.11	0.015	0.022
Short investment grade debt	0.12	0.30	1.69	2.55	0.004	0.006
Multi-sector income	0.10	0.31	2.28	3.95	0.012	0.026
Other	0.20	0.30	2.85	3.55	0.012	0.028

Table 2
Determinants of Securities Lending.

Panel A reports the determinants of engaging in securities lending and lending revenue. $Lender_t$ is a dummy variable equal to one if a fund engages in securities lending in period t, and zero otherwise. In column (2), the sample includes only lending funds, and *Lending revenue* is scaled by the fund's total net assets. Control variables include fund size, expense ratio, turnover ratio, flows, flow volatility, an index fund indicator, the average lending fee across bonds on loan by the fund, lending volume, fraction of collateral in cash, and style-by-time fixed effects. Panel B shows the determinants of securities lending at the position level. $On\ loan_{ijt}$ is a dummy variable that equals one if bond j is on loan by fund i in period t, and zero otherwise. Control variables include the portfolio weight of bond j held by fund i, time to maturity of bond j, number of funds holding bond j, fund i's ownership of bond j, other funds' ownership of bond j, trading volume of bond j, and the lending fee of bond j. All continuous variables are standardized to have a mean of zero and a standard deviation of one. Standard errors are two-way clustered at the fund and time levels. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Fund level

	(1) $Lender_t$	(2) $Lending\ revenue_t$
$Fund\ size_t$	0.027*	-0.021
	[2.02]	[-0.69]
$Expense\ ratio_t$	0.022	0.010
	[1.49]	[0.19]
$Turnover\ ratio_t$	-0.026**	-0.008
	[-2.18]	[-0.25]
$Flow_t$	-0.000	-0.001
	[-0.03]	[-0.05]
$Flow\ volatility_t$	-0.015*	-0.008
	[-1.78]	[-0.40]
$Index\ fund_t$	0.427***	0.219**
	[9.76]	[2.33]
$Fund\ lending\ fee_t$		0.103***
		[4.45]
$Lending\ volume_t$		0.683***
		[14.61]
$Fraction\ of\ cash\ collateral_t$		0.054**
		[2.44]
Sample	All Funds	Lenders
Style×Time FE	Yes	Yes
Observations	14,111	4,112
Adjusted R^2	0.13	0.40

Panel B: Security level

	(1) $On\ loan_{ijt}$
$Portfolio\ weight_{ijt}$	0.004
	[1.60]
$Time\ to\ maturity_{jt}$	-0.005**
	[-2.45]
$Number\ of\ funds_{jt}$	-0.017***
	[-6.93]
$Fund's\ ownership_{ijt}$	0.002**
	[2.28]
$Other\ funds'\ ownership_{ijt}$	0.001
	[0.33]
$Trading\ volume_{jt}$	0.014***
	[9.89]
$Lending\ fee_{jt}$	0.023***
	[10.44]
Fund×Time FE	Yes
Observations	3,092,717
Adjusted R^2	0.20

Table 3
Liquidity Management and Yield Difference between Lenders and Non-lenders.

This table compares the holdings of cash and cash equivalents, as a percentage of total net assets, and average yield between lending and non-lending funds. In column (1), we regress the portfolio weight of cash and cash equivalents on a lender dummy without controls or fixed effects. Column (2) adds style-by-time fixed effects, and column (3) further includes fund-level controls: fund size, expense ratio, turnover ratio, and an index fund dummy. Columns (4) to (6) repeat the same specifications using the average yield of bonds in the portfolio. Standard errors are two-way clustered at the fund and time levels. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	$Cash_t$			$Yield_t$		
	(1)	(2)	(3)	(4)	(5)	(6)
$Lender_t$	-0.880***	-0.741***	-0.440**	0.050	-0.047	0.001
	[-4.50]	[-3.89]	[-2.15]	[0.64]	[-1.40]	[0.03]
Constant	3.504***			3.972***		
	[27.19]			[37.39]		
Controls	No	No	Yes	No	No	Yes
Style×Time FE	No	Yes	Yes	No	Yes	Yes
Observations	14,170	14,167	14,167	14,122	14,119	14,119
Adjusted R^2	0.01	0.06	0.09	0.00	0.75	0.76

Table 4
Time-series Relationship between Cash Holding and Lending Volume.

This table compares the holdings of cash and cash equivalents and lending volume as a percentage of total net assets. The sample includes a set of funds that have engaged in securities lending at least once in our sample period. The dependent variable is the weight of cash and cash equivalents. The independent variables are either $Lender_t$ dummy that indicates if a fund is a lender in the current quarter, or its lending volume, $Lending\ volume_t$, defined as the total value of bonds on loan as a percentage of total net assets. The regressions include a set of fund-level controls: fund size, expense ratio, turnover ratio, and fund fixed effect. Standard errors are two-way clustered at the fund and time levels. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) $Cash_t$	(2) $Cash_t$
$Lender_t$	-0.273*	
	[-1.82]	
$Lending\ volume_t$		-0.099**
		[-2.42]
Controls	Yes	Yes
Fund FE	Yes	Yes
Observations	7,215	7,215
Adjusted R^2	0.60	0.61

Table 5
Fund Performance: Lenders vs. Non-Lenders.

This table compares the performance of lending and non-lending funds during periods with and without large outflows, defined as months with outflows exceeding 1%. The dependent variables are net-of-fees fund returns in columns (1) and (3), and benchmark-adjusted returns in columns (2) and (4), all expressed in percentage points. The key independent variable is a lender dummy. Control variables include fund size, expense ratio, turnover ratio, index fund indicator, and style-by-time fixed effects. Standard errors are clustered at the time level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) $Return_t$	(2) $Adjusted\ return_t$	(3) $Return_t$	(4) $Adjusted\ return_t$
$Lender_t$	0.018**	0.019**	-0.029*	-0.034
	[2.20]	[2.24]	[-1.90]	[-1.55]
Sample	$Flow_t > -0.01$	$Flow_t > -0.01$	$Flow_t \leq -0.01$	$Flow_t \leq -0.01$
Control variables	Yes	Yes	Yes	Yes
Style×Time FE	Yes	Yes	Yes	Yes
Observations	32,061	32,061	11,831	11,831
Adjusted R^2	0.88	0.26	0.88	0.49

Table 6
Selling Behavior During Large Outflows: Lenders vs. Non-Lenders.

This table examines the tendency of funds to sell securities during periods of large outflows, and how this behavior differs between lending and non-lending funds. *Sell dummy*$_{ijt}$ is a dummy variable equal to one if fund i sells a bond j in the quarter t. *Large outflow*$_{it}$ is the dummy variable equal to one if fund i's average monthly outflows exceed 1% in quarter t. Column (2) further decomposes the lender dummy, *Lender*$_{i,t-1}$, into two separate indicators based on whether the lending fund i also has bond j on loan in the previous quarter. Control variables include the bond's portfolio weight, fund size, expense ratio, turnover ratio, and an index fund indicator. Bond-by-time fixed effects are included. Standard errors are two-way clustered at the fund and time levels. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) *Sell dummy*$_{ijt}$	(2) *Sell dummy*$_{ijt}$
Large outflow$_{it}$	0.047***	0.047***
	[6.91]	[7.01]
Lender$_{i,t-1}$	0.000	
	[0.03]	
Large outflow$_{it}$ × *Lender*$_{i,t-1}$	0.037**	
	[2.67]	
Lender w/o Bond j on loan$_{i,t-1}$		-0.005
		[-0.48]
Lender with Bond j on loan$_{i,t-1}$		0.092***
		[4.22]
Large outflow$_{it}$ × *Lender w/o Bond j on loan*$_{i,t-1}$		0.029**
		[2.43]
Large outflow$_{it}$ × *Lender with Bond j on loan*$_{i,t-1}$		0.104***
		[3.64]
Control variables	Yes	Yes
Bond×Time FE	Yes	Yes
Observations	11,431,625	11,431,625
Adjusted R^2	0.51	0.51

Table 7
Fund Lending Activity and Flows.

This table examines the relationship between fund-level lending activity and investor flows. The sample includes a set of lending funds at either quarter $t-1$ or t. Δ*Lending volume*$_{it}$, is the change in loan value from quarter $t-1$ to quarter t relative to fund size, in percentage points. The independent variable in column (1) is fund flows, in percentage, in quarter t. In column (2), we decompose fund flows into the positive and negative components. In column (3), *Large outflow*$_{it}$ is the dummy variable equal to one if fund i's average monthly outflows exceed 1% in quarter t. Control variables include fund size, expense ratio, turnover ratio, index fund indicator, and style-by-time fixed effects. Standard errors are two-way clustered at the fund and time levels. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

	(1) Δ*Lending volume*$_t$	(2) Δ*Lending volume*$_t$	(3) Δ*Lending volume*$_t$
Flow$_t$	0.007***		
	[4.32]		
$\max(Flow_t, 0)$		0.004***	
		[3.93]	
$\min(Flow_t, 0)$		0.017***	
		[3.41]	
Large outflow$_t$			-0.632***
			[-4.45]
Control variables	Yes	Yes	Yes
Style×Time FE	Yes	Yes	Yes
Observations	5,679	5,679	5,679
Adjusted R^2	0.04	0.04	0.02

Table 8
Security Sales and Recall Behavior During Large Outflows.

This table examines whether lenders are more likely to recall securities on loan and subsequently sell them when experiencing large outflows. The sample is restricted to a set of lending funds experiencing large outflows in quarter t. *Sell intensity*$_{ijt}$ is defined as the dollar sale in fund i's holdings of bond j, scaled by the fund's lagged total net assets, and it is set to 0 if there is no sale. The dollar sale in holding is the bond price per par value in the previous quarter, multiplied by the reduction in par values between quarters. *Sell dummy*$_{ijt}$ is a dummy variable that equals to one if *Sell*$_{ijt}$ is positive, and equals 0 otherwise. *Recall intensity*$_{ijt}$ is the dollar reduction on loan by fund i's bond j, scaled by the fund's lagged total net assets, and is equal to 0 if there is no reduction. The dollar reduction on loan is the bond price per par value in the previous quarter multiplied by the reduction in par values on loan between quarters. *Recall dummy*$_{ijt}$ is a dummy variable that equals one if *Recall*$_{ijt}$ is positive, and 0 otherwise. Control variables include the portfolio weight of the security and the fund-by-time fixed effects. Standard errors are two-way clustered at the fund and time levels. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) *Sell dummy*$_{ijt}$	(2) *Sell intensity*$_{ijt}$
Recall dummy$_{ijt}$	0.138***	
	[15.97]	
Recall intensity$_{ijt}$		0.137***
		[3.72]
Control variables	Yes	Yes
Fund×Time FE	Yes	Yes
Observations	134,348	134,348
Adjusted R^2	0.28	0.21

Appendix

Table A1
Selling Behavior During Large Outflows among Equity Funds.

This table examines the tendency of equity funds to sell securities during periods of large outflows, and how this behavior differs between lending and non-lending funds. *Sell dummy*$_{ijt}$ is a dummy variable equal to one if fund i sells a stock j in the quarter t. *Large outflow*$_{it}$ is the dummy variable equal to one if fund i's average monthly outflows exceed 1% in quarter t. Column (2) further decomposes the lender dummy, *Lender*$_{i,t-1}$, into two separate indicators based on whether the lending fund i also has stock j on loan in the previous quarter. Control variables include the stock's portfolio weight, fund size, expense ratio, turnover ratio, and an index fund indicator. Stock-by-time fixed effects are included. Standard errors are two-way clustered at the fund and time levels. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) *Sell dummy*$_{ijt}$	(2) *Sell dummy*$_{ijt}$
Large outflow$_{it}$	0.172***	0.172***
	[24.37]	[24.44]
Lender$_{i,t-1}$	0.015	
	[1.29]	
Large outflow$_{it}$ × *Lender*$_{i,t-1}$	0.005	
	[0.42]	
Lender w/o Stock j on loan$_{i,t-1}$		0.012
		[1.03]
Lender with Stock j on loan$_{i,t-1}$		0.071***
		[4.55]
Large outflow$_{it}$ × *Lender w/o Stock j on loan*$_{i,t-1}$		0.003
		[0.22]
Large outflow$_{it}$ × *Lender with Stock j on loan*$_{i,t-1}$		0.024
		[1.05]
Control variables	Yes	Yes
Stock×Time FE	Yes	Yes
Observations	10,496,474	10,496,474
Adjusted R^2	0.07	0.07